Threatened & Endangered Species
Investigation
for

Alabama STAMP

Town of Alabama
Genesee County, New York

for

Clark Patterson Lee

EARTH DIMENSIONS, INC.
Soil & Hydrogeologic Investigations • Wetland Delineations
1091 Jamison Road • Elma New York 14059
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September 27, 2010
Revised: February 25, 2011
EDI Project Code: W9A10a

REPORT SUMMARIZING
THE RESULTS OF
A THREATENED & ENDANGERED SPECIES SURVEY
OF

ALABAMA STAMP

Prepared for Submission to

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH, WILDLIFE & MARINE RESOURCES
NEW YORK NATURAL HERITAGE PROGRAM
625 BROADWAY
ALBANY, NEW YORK 12233-4757

Prepared by

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DATE PREPARED

September 27, 2010
Revised: February 25, 2011
Project Code: W9A10a

PROJECT INFORMATION

Project Name ..... Alabama STAMP

Street Address ..... Southwest of Lewiston Road & Allegany Road Intersection

Town ..... Alabama

County ..... Genesee

State ..... New York

Latitude/Longitude (NAD83) ..... 43.08903° N, 78.40360° W

Investigation Area ..... 1,340.37± Acres

USGS 7.5 Minute Topographical Map ..... Akron Quadrangle

Consultant ..... Earth Dimensions, Inc.
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(716) 655-1717

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Property Owner ..... NA

Waterway ..... Whitney Creek

Hydrologic Unit Code 04130001

ACKNOWLEDGMENTS

Clark Patterson Lee has retained Earth Dimensions Inc. (EDI) to complete a threatened & endangered species investigation study for the Alabama STAMP located southwest of the Lewiston Road & Allegany Road intersection in the Town of Alabama, County of Genesee, State of New York. EDI would like to thank Clark Patterson Lee for their assistance with this project. Clark Patterson Lee provided the drafting services required to prepare the baseline map included in this report. EDI would also like to thank Copy Market, Inc. for providing the duplicating and binding services.

Duplicated onto recycled paper.

EXECUTIVE SUMMARY

Clark Patterson Lee has proposed the development of a 1,340.37± acre site located southwest of the Lewiston Road & Allegany Road intersection, in the Town of Alabama, County of Genesee, State of New York. The project has been given the name Alabama STAMP and is located on USGS 7.5 minute quadrangle map indexed as Akron/2002 DeLorme (Figure 1). Clark Patterson Lee has retained Earth Dimensions, Inc. (EDI) to perform an ecological study and evaluation that would allow the New York State Department of Environmental Conservation (NYSDEC) to determine their jurisdictional authority over the investigation area, pursuant to 6NYCRR Part 182 of the New York State Conservation Law. The investigation was completed in accordance with Title 15, Section 11-0536, paragraph 2 of the New York State Environmental Conservation Law (see Attachment B). It is as follows: *"Notwithstanding any other provision of this chapter, the taking, importation, transportation, possession or sale of any endangered or threatened species of fish, shellfish, crustacea or wildlife, or hides or other parts thereof, or the sale or possession with intent to sell any article made in whole or in part from the skin, hide or other parts of any endangered or threatened species of fish, shellfish, crustacea or wildlife is prohibited, except under license or permit from this department."*

A preliminary review of available information pertaining to vegetation, soils, and hydrology in the project area was implemented prior to conducting a field investigation at the site. Sources of information included the United States Geological Survey (USGS), Soil Conservation Service (SCS), National Wetland Inventory (NWI), and NYSDEC Freshwater Wetland maps. EDI applied methodology specified by the New York Natural Heritage Program in performing threatened and endangered species surveys within the site.

Within the project areas, EDI identified twelve (12) ecological communities. These communities consisted of successional shrubland, successional northern hardwood, cropland/ field crop, cropland/row crop, successional old field, successional southern hardwood, floodplain forest, reed canary/phragmites marsh, shallow emergent marsh, shrub swamp, hardwood swamp, and deep emergent marsh communities. In a letter dated November 3, 2009, the NYSDEC New York Natural Heritage Program identified the pied-billed grebe (*Podilymbus podiceps*), heartleaf

plantain (*Plantago cordata*), nodding pogonia (*Triphora trianthophora*), persius duskywing (*Erynnis persius persius*), and karner blue (*Plebejus melissa samuelis*), as potentially occurring on-site. In a letter dated March 5, 2010, NYSDEC Division of Environmental Permits identified the grasshopper sparrow (*Ammodramus savannarum*), Henslow's sparrow (*Ammodramus henslowii*), horned lark (*Eremophila alpestris*), least bittern (*Ixobrychus exilis*), king rail (*Rallus elegans*), black tern (*Chlidonias niger*), short-eared owl (*Asio flammeus*), bald eagle (*Haliaeetus leucocephalus*), and northern harrier (*Circus cyaneus*), Houghton's goldenrod (*Oligoneuron* houghtonii), eastern prairie fringed orchid (*Platanthera leucophaea*), pied billed grebe (*Platanthera leucophaea*), bog turtle (*Glyptemys muhlenbergii*), and the eastern massasauga (*Sistrurus catenatus catenatus*), as potentially occurring on-site. The parcel was thoroughly examined for any evidence of the aforementioned species.

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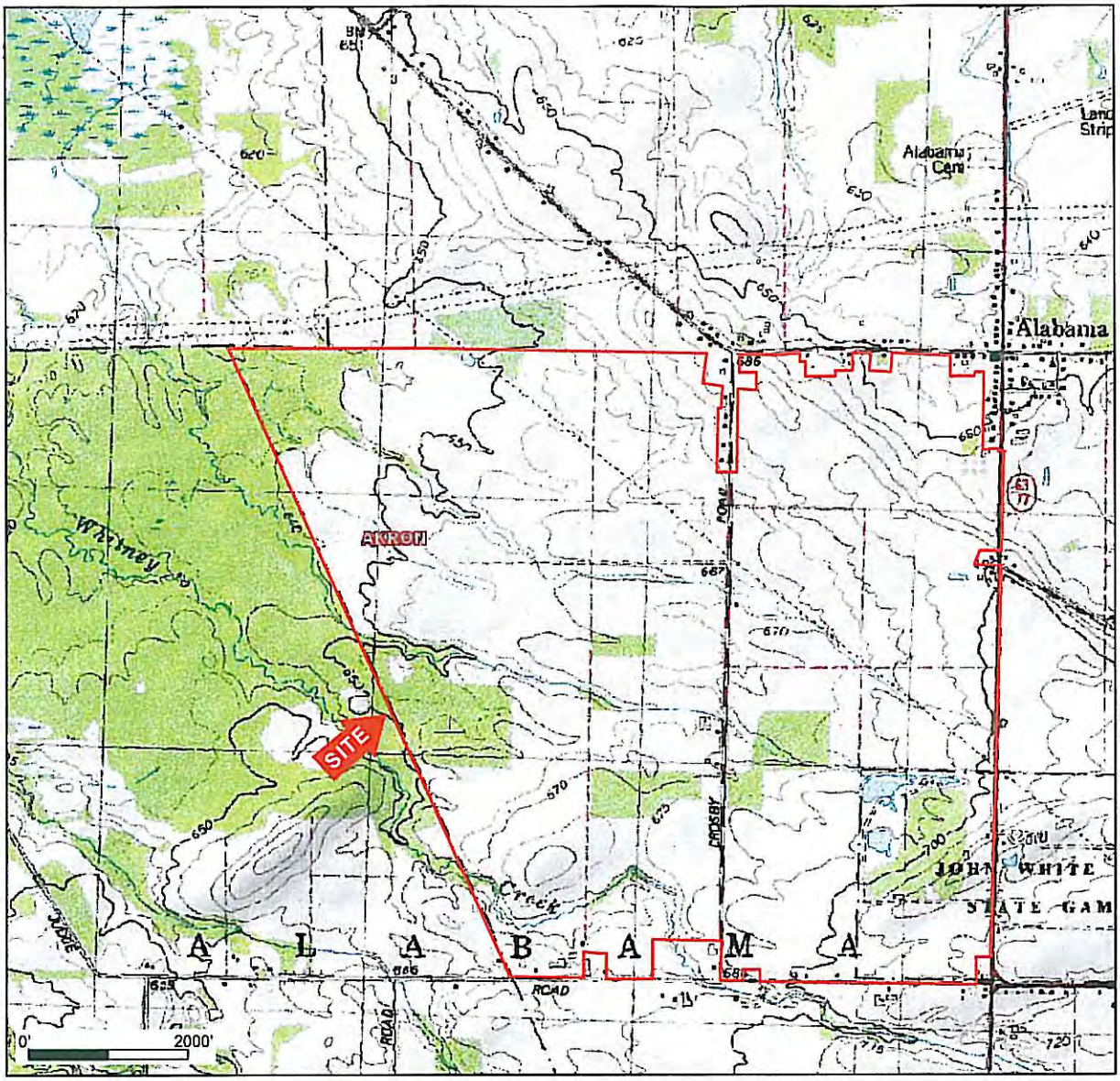

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Figure 1: USGS 7.5 Minute Topographical Map
Akron Quadrangle/ 2002 DeLorme

Alabama STAMP
Town of Alabama, Genesee County, New York

000992

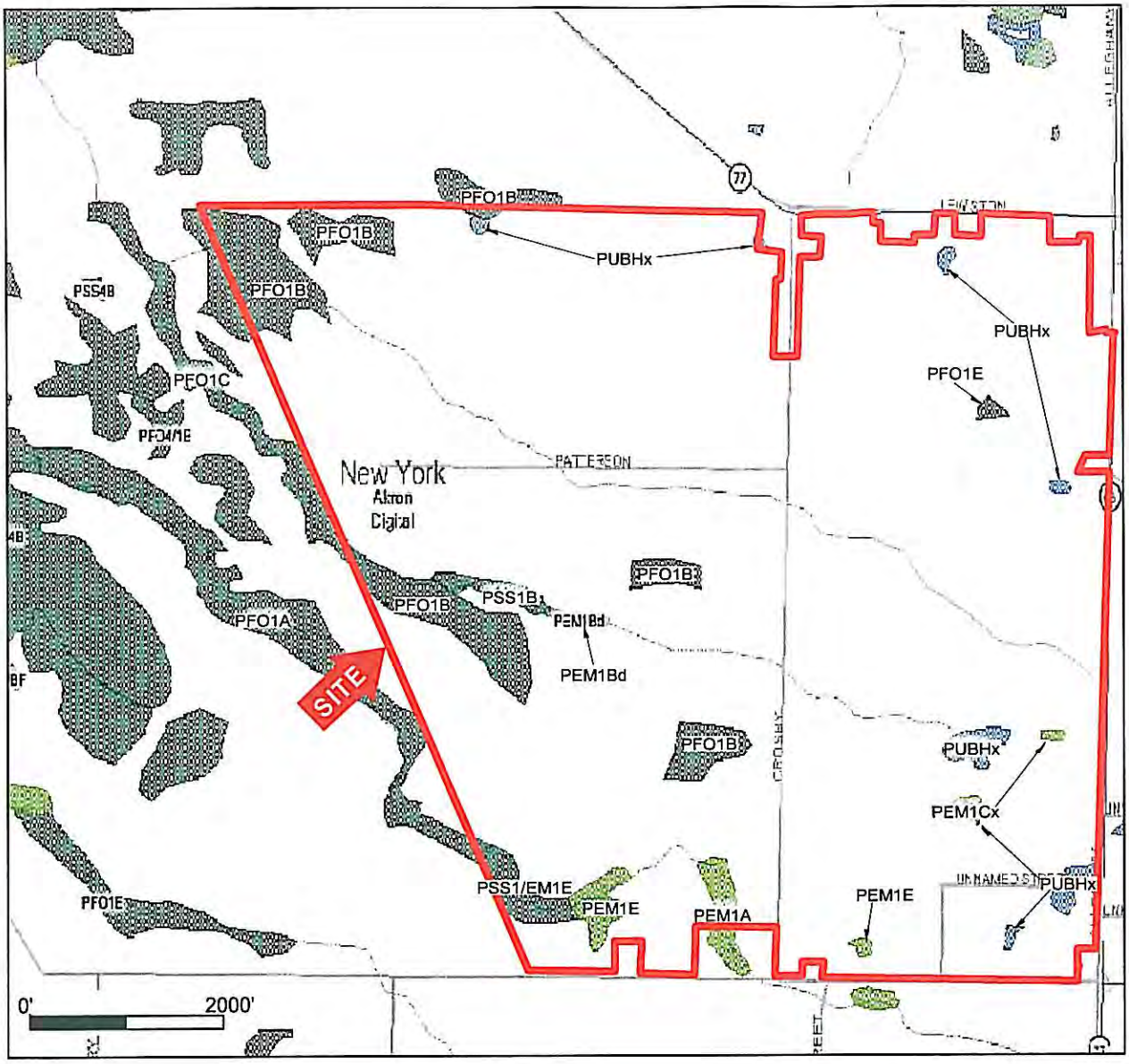

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Figure 2: National Wetlands Inventory Map
http://wetlandsfws.er.usgs.gov
Site visited 10/31/08

Alabama STAMP
Town of Alabama, Genesee County, New York

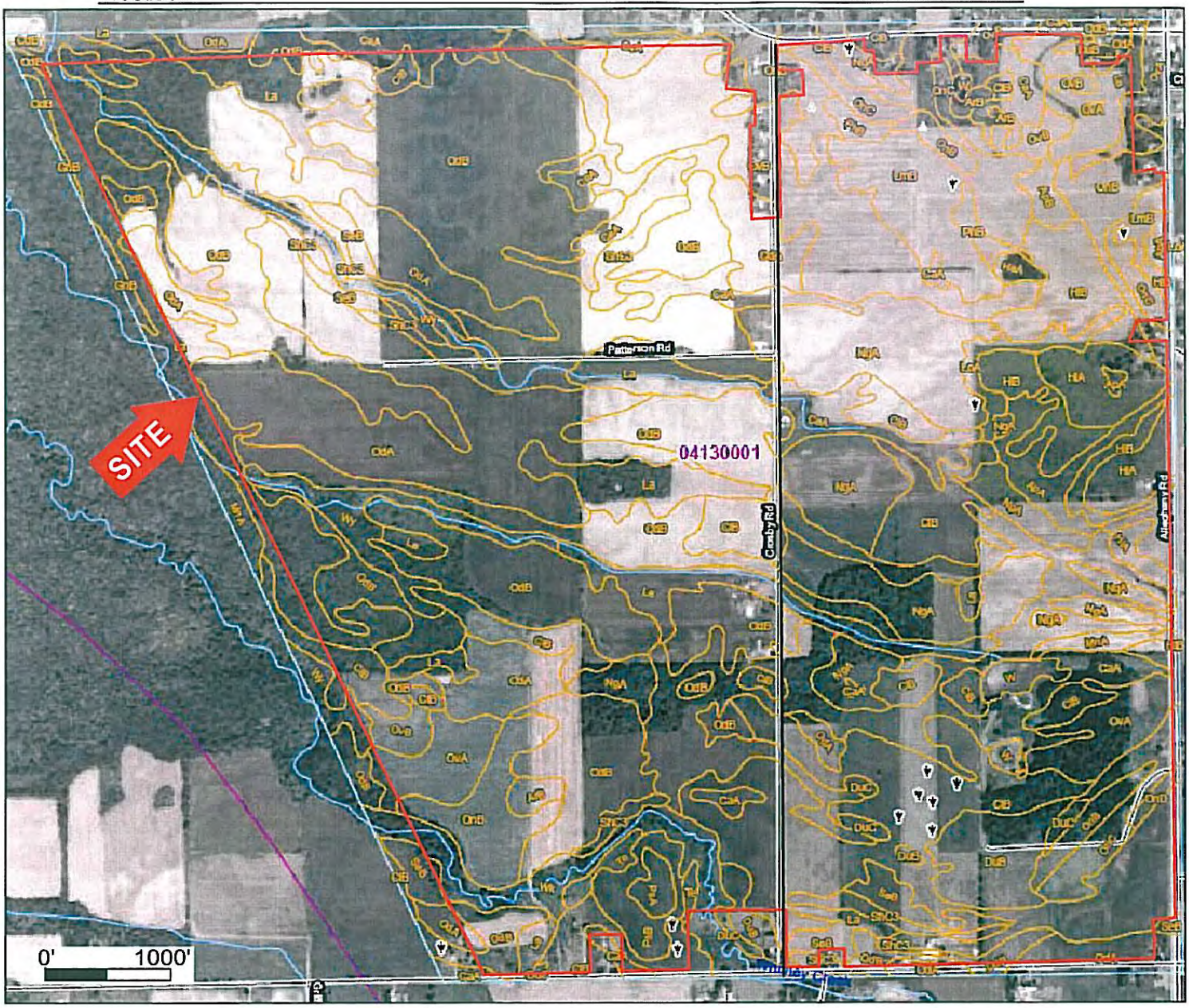

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Figure 3: NRCS Genesee County Soil Survey Map
http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
Site visited 10/31/08

Alabama STAMP
Town of Alabama, Genesee County, New York

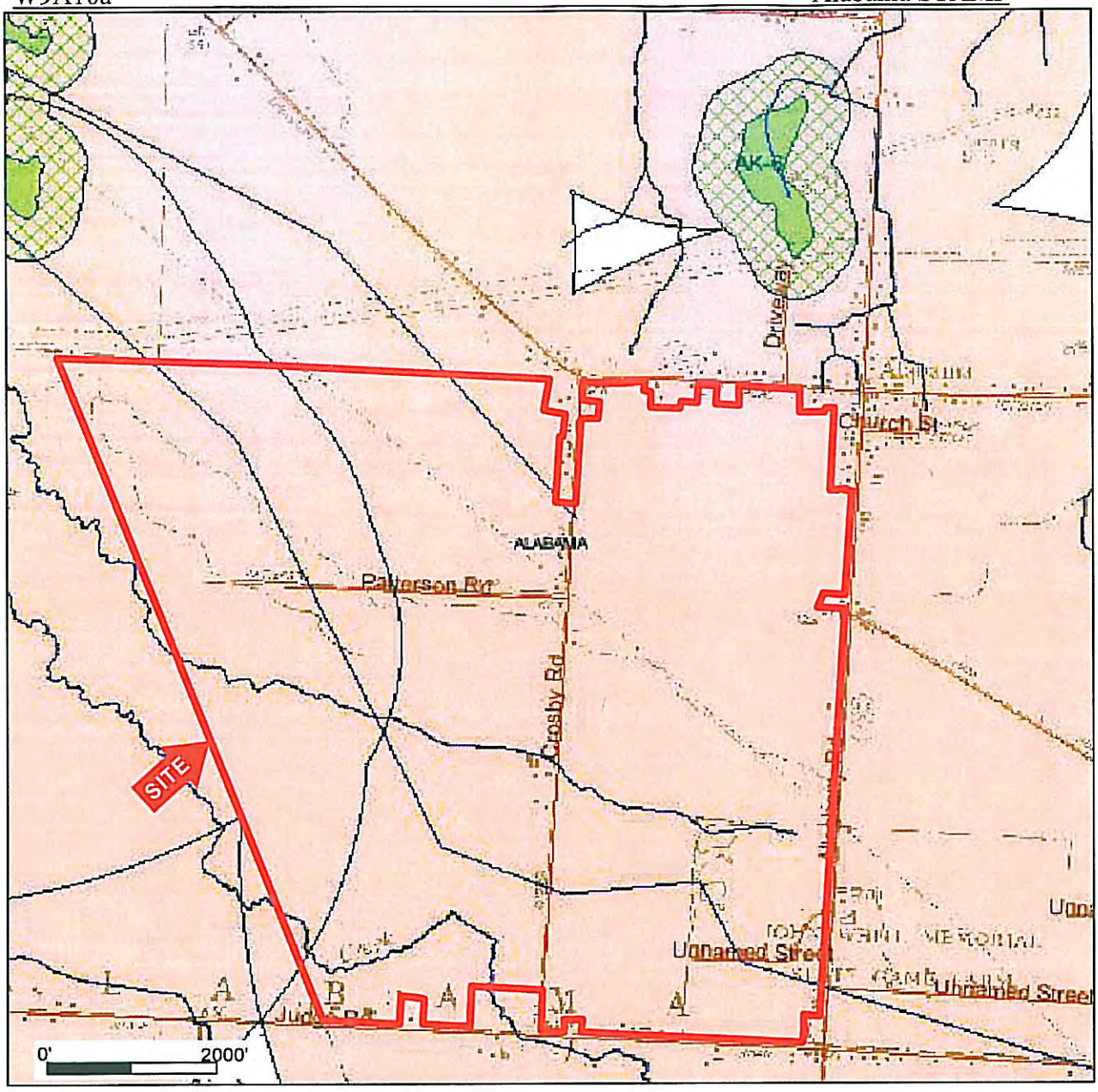

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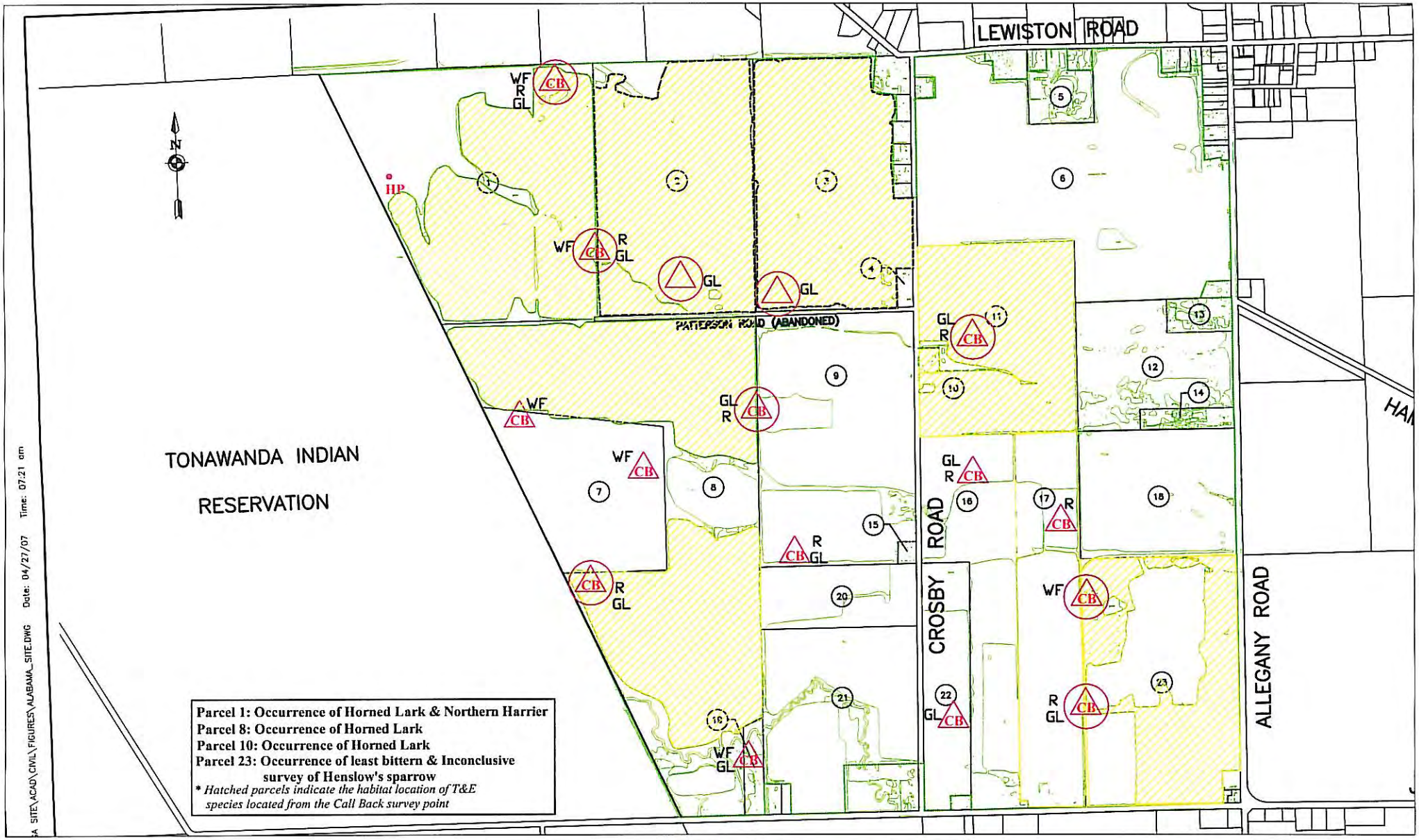
Figure 4: NYSDEC Environmental Resource Mapper
http://www.dec.ny.gov/imsmaps/ERM/Viewer.htm
Site visited 10/31/08

Alabama STAMP
Town of Alabama, Genesee County, New York



Alabama Stamp

966000

Figure 5: Location Map of Species Occurrences

Town of Alabama — Erie County, New York

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LEGEND

- Tree Line
- Call Back Survey Location
- Positive Response Location
- WF — Water Fowl Group Call
- R — Raptor Group Call
- Limits of Investigation
- Identified Positive T&E Habitat Location
- HP — Heartleaf Plantain Location
- Positive Sighting Location
- GL — Grassland Bird Group Call

Scale: Not To Scale
Map Date: September 2, 2010/ CMS for EDI Revised: February 24, 2011/ CMS for EDI
Base Map Provided By: Clark Patterson Lee
File Name: FINAL MAP.dwg
EDI Project Code: W9A10a

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INTRODUCTION

Clark Patterson Lee has proposed the development of a 1,340.37± acre site located southwest of the Lewiston Road & Allegany Road intersection, in the Town of Alabama, County of Genesee, State of New York. Clark Patterson Lee has retained Earth Dimensions, Inc. (EDI) to complete a threatened & endangered species study at the site to investigate for the potential occurrences of grasshopper sparrow (*Ammodramus savannarum*), Henslow's sparrow (*Ammodramus henslowii*), horned lark (*Eremophila alpestris*), least bittern (*Ixobrychus exilis*), king rail (*Rallus elegans*), black tern (*Chlidonias niger*), pied-billed grebe (*Podilymbus podiceps*), short-eared owl (*Asio flammeus*), bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), heartleaf plantain (*Plantago cordata*), nodding pogonia (*Triphora trianthophora*), Houghton's goldenrod (*Oligoneuron houghtonii*), eastern prairie fringed orchid (*Platanthera leucophaea*), pied billed grebe (*Platanthera leucophaea*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*), persius duskywing (*Erynnis persius persius*), and karner blue (*Plebejus melissa samuelis*). Included in the investigation was wild (sundial) lupine (*Lupinus perennis*), as it is the primary larval host plant of karner blue and persius duskywing butterflies.

It should be noted that the Alabama Stamp parcel is in close proximity to the John White Wildlife Management Area (WMA), the Iroquois National Wildlife Refuge (NWR), Tonawanda WMA, and Oak Orchard WMA. Species that have significant populations on the public lands near the site include bald eagle, pied-billed grebe, least bittern, black tern, northern harrier and grasshopper sparrow. Though the site is located in close proximity of the these varying wildlife complexes the majority of the site has been utilized for active agricultural purposes and is consistently being disturbed throughout most of the avian breeding season with plowing, seeding, fertilizing, herbiciding, and harvesting applications, lowering the quality of potential habitat overall.

The grasshopper sparrow (*Ammodramus savannarum*), is a late spring migrant to New York State returning from mid to late May. The grasshopper sparrow is a nocturnal migrant, and it is rarely seen during migration. Upland meadows, pastures, hayfields, and croplands are primary habitats. This sparrow depends on dense grasses for foraging and nesting cover. The nest is built on the ground at the base of a clump of vegetation, consists of a deep cup of stems, and grasses with over-hanging vegetation creating a dome. A nesting pair will raise 2 to 3 broods per year. Photographs and descriptions of this species are included in Attachment A.

The Henslow's sparrow (*Ammodramus henslowii*), is found in New York from April through December. Breeding Henslow's sparrows may be found from May through August. The Henslow's Sparrow is a grassland species, preferring tall, dense, grassy fields without woody vegetation. Henslow's sparrows nests are found on or near the ground and can be either open or dome-shaped. When nests are built off the ground, they are attached to grasses or forbs. Photographs and descriptions of this species are included in Attachment A.

The horned lark (*Eremophila alpestris*), is the earliest nesting, native bird species in New York State with nesting reports as early as late February. The horned lark commonly nests in row crops, hayfields, short grass prairie and deserts. It prefers open, barren country, and bare ground to short grasses. Nests are typically in a small depression and are made of grasses, roots and hair. Nests are constructed on the ground and are often lined with small pebbles along the outer rim. Two or more clutches per season are common. Photographs and descriptions of this species are included in Attachment A.

Least bitterns (*Ixobrychus exilis*), are rarely seen in New York before late April or after September. The best time to observe the species is between May and July. This species is often heard and not seen. Least bitterns inhabit shallow & deep emergent marshes, freshwater tidal marshes, and brackish tidal marshes. They prefer stands of cattails or bulrushes with bur-reed, sedges or common reed interspersed with pools of open water or slow-moving channels and some woody vegetation. Large marshes are important breeding areas for this species. Photographs and descriptions of this species are included in Attachment A.

King rails (*Rallus elegans*), begin to migrate to their breeding grounds in April, with courtship and egg laying occurring in late April to mid-July. The king rail inhabits fresh and brackish marshes that are fairly shallow (0-25cm of water), and have well developed areas of emergent vegetation. Marsh meadow communities that occur on soils that are permanently saturated and seasonally flooded are found to be suitable habitat for the king rail. Photographs and descriptions of this species are included in Attachment A.

Black terns (*Chlidonias niger*), typically arrive in New York State in early May and begin searching for suitable nesting marshes. June through July is the prime nesting season though. Black terns inhabit productive freshwater marshes, typically in sites with mixtures of emergent vegetation and open water. Areas with persistent emergents, such as bur-reed, and 50/50 vegetation cover/open water ratio, with water depths of about 50cm have been found as the most common habitat. Black terns are area dependant and in addition to marsh size, proximity to other wetlands is a critical factor in habitat selection. Terns favor marshes >20 ha, but will nest in marshes between 5-11 ha only if they are a part of a larger wetland complex. Photographs and descriptions of this species are included in Attachment A.

The short-eared owl (*Asio flammeus*), is found in New York throughout the year. The short-eared owl inhabits salt marshes, hay fields, fallow farmlands and pastures. Typically, short-eared owls roost on the ground, on low, open perches, under low shrubs, or in conifers during the day. Their preference of habitats containing some water is most likely related to the habitat requirements of meadow voles, their preferred prey. During the winter months, *Asio flammeus* use habitats similar to those of the breeding season. Photographs and descriptions of this species are included in Attachment A.

The bald eagle (*Haliaeetus leucocephalus*), is found in New York throughout the year. Bald eagles are typically found near large bodies of water, such as bays, rivers and lakes that support a healthy population of fish and waterfowl, their primary food source. Generally, bald eagles tend to avoid areas with human activities. They will perch in either deciduous or coniferous trees. Large, heavy nests are built near water in tall pine, spruce, fir, cottonwood, oak, poplar or

beech trees. During the winter, roost sites may be farther away from feeding areas, which may be due to the need for a more sheltered, warmer area. Photographs and descriptions of this species are included in Attachment A.

The northern harrier (*Circus cyaneus*) is found in New York throughout the year. During the breeding season, the best time to look for Northern Harriers is May through June. This species utilizes a wide range of open grasslands, shrubland and freshwater marshes. Nests are placed on the ground, usually in dense cover. Concentrations of birds may be found in suitable habitat with abundant prey during the winter months. This species inhabits open wetlands, meadows, pastures, prairies, grasslands, croplands and riparian woodlands. Photographs and descriptions of this species are included in Attachment A.

The pied-billed grebe (*Podilymbus podiceps*), is a rare to uncommon local breeder in New York State, but is a fairly common migrant. Migratory grebes are most common from mid April through mid May. Grebes inhabit quiet marshes, marshy shorelines of ponds, shallow lakes, or marshy bays and slow moving streams with sedgy banks or adjacent marshes. Desired plant species may vary in nesting sites but a 50/50 vegetation cover/open water ratio is most common. Photographs and descriptions of this species are included in Attachment A.

In New York, heartleaf plantain (*Plantago cordata*), is in fruit from June to early October. In western New York, it is found along gravelly streams through red maple-hardwood swamps of the Tonawanda Oak Orchard Swamp drainage. It is a semi-aquatic plant occurring in marshes, along streams and swampy woods especially on calcareous substrate. Photographs and descriptions of this species are included in Attachment A.

The nodding pogonia (*Triphora trianthophora*), blooms for a very short period sometime in August, with all flowers of a population blooming at the same time. These flowers usually last only for a single day. According to several sources synchronicity extends over great areas in the northeast flowering on the same day across several states. This orchid is an ephemeral plant of dry to moist areas of mesophytic forests over sandstone or limestone. It is generally found in moist leaf-mold pockets of mixed hardwood forests, hemlock-northern hardwood forests, coniferous

forests, within shale ravine systems, sandy woods within the Great Lakes Plains, white cedar-tamarack swamps, floodplain forests, wet muck in glacial lake bed forests, and seasonally flooded sinkhole swamps. It is often found growing on rotten logs. Photographs and descriptions of this species are included in Attachment A.

There is one flight season for the persius duskywing (*Erynnis persius persius*), from April to June. The duskywings will use a wide range of legumes as hostplants, principally wild (sundial) lupine (*Lupinus perennis*) and wild indigo (horseflyweed) (*Baptisia tinctoria*). Eggs are laid singly under leaves. Larvae share the habit of other members of the same genus of tying leaves of the host plant together with silk to form a simple shelter in which they rest between bouts of feeding and eventually hibernate in solitary nests on the plant. Pupation occurs the following spring. Adults have been observed taking nectar from a variety of plants (Nielsen 1999), suggesting that they will visit any available flowers. Persius Duskywing is most commonly encountered in open forests and savannas, forest clearings and roadsides in forested areas. Photographs and descriptions of this species are included in Attachment A.

In New York, karner blue (*Plebejus melissa samuelis*), adults emerge from May to early June and are active for two to three weeks. Second brood adults fly for about three weeks and peak numbers usually occur for about a week in the second half of July. The eggs overwinter and hatch, but not all at once, around the middle of April. The larvae mature mostly in late May and pupate. Larvae feed only on the native lupine (*Lupinus perennis*). It is unlikely to be seen more than a few yards from patches of lupine (*Lupinus perennis*), although wandering individuals do occur up to a mile or more away from main breeding areas. Karner Blue butterflies can be found in extensive pine barrens, oak savannas or openings in oak woodlands, and unnatural openings such as airports and right-of-ways that contain lupine (*Lupinus perennis*). The adults take nectar from many kinds of low growing flowers, native or otherwise. Some recent populations have occurred in sandy old fields. Photographs and descriptions of this species are included in Attachment A.

During spring, eastern massasaugas use open shallow wetlands or shrub swamps. They can be found in crayfish towers or small animal burrows, which are adjacent to drier upland open shrub

forest sites. During summer, massasaugas move upland to drier areas. They can be best seen "sunning" in open fields, grassy meadows or farmed sites. Photographs and descriptions of this species are included in Attachment A.

In New York, the bog turtle (*Glyptemys muhlenbergii*), is generally found in open, early successional types of habitats such as wet meadows or open calcareous boggy areas generally dominated by sedges (*Carex spp.*) or sphagnum moss. Like other cold-blooded or ectothermic species, it requires habitats with a good deal of solar penetration for basking and nesting. Bog turtles are diurnal and are normally active during the early morning to mid-day hours, often in the direct sun. This species hibernates communally and shows site-fidelity to hibernacula - a shelter occupied during the winter by a dormant animal. Photographs and descriptions of this species are included in Attachment A.

The eastern prairie fringed orchid (*Planthera leucophaea*), occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges and bogs. Requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. A symbiotic relationship between the seed and the mycorrhizae is necessary for seedlings to become established. This orchid is a perennial herb that grows from an underground tuber. Flowering begins from late June to early July, and lasts 7 to 10 days. Blossoms often rise just above the height of the surrounding grasses and sedges. Photographs and descriptions of this species are included in Attachment A.

Houghton's goldenrod (*Oligoneuron houghtonii*), is a rare species endemic to the Great Lakes region, usually occurring in wetlands, moist beaches, and moist swales behind dunes; it is also occasionally found in little bluestem alvar grasslands. The persistence of Houghton's goldenrod in alvars indicates it is likely to be drought-resistant (Penskar, 1997). It is also limited to calcareous areas, suggesting that the species may have a high calcium requirement. Houghton's goldenrod is a perennial, frequently forming small clumps (clones) produced vegetatively by means of relatively short rhizomes (underground stem). Flowering occurs primarily in August and early September,

but some plants may flower well until October. Photographs and descriptions of this species are included in Attachment A.

Wild lupine (*Lupinus perennis*), according to reviews, in the northern portion of its range begins sprouting from rhizomes in late March or April and flowers in May and June. Wild lupine typically occurs in well-drained, sandy soils with slightly acidic pH. Wild lupine's occurrence in sandy soil has been widely reported. It has also been reported on neutral to strongly acidic soils of northern hardwoods, northeastern oak-pine and coniferous forests. According to reviews, wild lupine is an early successional species that prefers open and partially shaded conditions. Photographs and descriptions of this species are depicted in Attachment A.

The purpose of this report is to present EDI's methods, results and conclusions relative to the threatened and endangered species investigation within the Alabama STAMP development site.

SITE DESCRIPTION

The Alabama STAMP property is comprised of a series of individual land parcels. The investigation area has a total acreage of 1,340.37± acres and is outlined on Figure 1. Two roads, Patterson Road (abandoned road) and Crosby Road are located within the project boundaries. The natural topography of the Alabama STAMP site is a flat to moderately sloping landscape, with the steeper slopes associated with the banks of Whitney Creek.

The upland within the project area is comprised of successional shrubland, successional northern hardwood, cropland/ field crop, cropland/row crop, successional old field, rich mesic forest and successional southern hardwood communities. The wetland areas are comprised of floodplain forest, reed canary/phragmites marsh, shallow emergent marsh, shrub swamp, hardwood swamp, and deep emergent marsh communities. The vegetative communities of the investigation area are described according to Ecological Communities of New York State (Edinger et al. 2002). The vegetative communities of the investigation area are described according to *Ecological Communities of New York State* (Edinger et al. 2002).

The successional shrubland community (D36, 45, 61) consisted of the following species: grey dogwood (*Cornus racemosa*), staghorn sumac (*Rhus typhina),* white ash (*Fraxinus americana),* reed canary grass (*Phalaris arundinacea*), goldenrod *(Solidago* spp.), common red raspberry (*Rubus idaeus),* crack willow (*Salix fragilis),* annual bluegrass *(Poa annua),* summer grape (*Vitis aestivalis),* tartarian honeysuckle (*Lonicera tatarica),* silky dogwood (*Cornus amomum),* common dandelion (*Taraxacum officinale),* Queen Anne's lace (*Daucus carota*), goldenrod (*Solidago* spp.), teasel (*Dipsacus sylvestris),* yellow rocket (*Barbarea vulgaris),* aster *(Aster* spp.*),* false baby's breath *(Galium mollugo),* and summer grape (*Vitis aestivalis).*

The successional northern hardwood and rich mesic forest communities (D3, 4, 5, 20, 21, 23, 25, 33, 35, 36, 56, 59, 62) consisted of the following species: eastern cottonwood (*Populus deltoides),* tartarian honeysuckle (*Lonicera tatarica),* American hornbeam *(Carpinus caroliniana),* multiflora rose (*Rosa multiflora*), white willow (*Salix alba),* spring avens (*Geum vernum),*

Japanese barberry (*Berberis thunbergii*), summer grape (*Vitis aestivalis),* quaking aspen *(Populus tremuloides),* eastern hornbeam *(Ostrya virginiana),* red maple (*Acer rubrum),* American beech (*Fagus grandifolia),* white ash (*Fraxinus americana),* Pennsylvania sedge (*Carex pennsylvanica),* New York fern *(Thelypteris noveboracensis),* poison ivy *(Toxicodendron radicans),* silver maple *(Acer saccharinum),* big tooth aspen *(Populus grandidentata),* pin cherry (*Prunus pennsylvanica),* cut leaf toothwort (*Cardamine concatenata),* green ash (*Fraxinus pennsylvanica),* Christmas fern (*Polystichum acrostichoides),* Virginia strawberry (*Fragaria virginiana),* fowl bluegrass (*Poa palustris),* shagbark hickory (*Carya ovata),* black cherry (*Prunus serotina),* eastern woodland sedge (*Carex blanda),* freeman's maple (*Acer freemanii),* cockspur hawthorn *(Crataegus crus-galli),* sugar maple *(Acer saccharum),* white oak *(Quercus alba),* shellbark hickory *(Carya lacinosa),* dogtooth violet *(Erythronium americanum),* cut leaf toothwort *(Cardamine concatenate),* garlic mustard *(Aliaria petiolata),* ramp *(Allium tricoccum),* false baby's breath *(Galium mollugo),* early meadow rue *(Thalictrum dioicum),* common red raspberry *(Rubus idaeus),* crack willow *(Salix fragilis),* and may apple *(Podophyllum peltatum).*

The floodplain forest community (D6, 18, 28) consisted of the following species: eastern cottonwood (*Populus deltoides),* red maple (*Acer rubrum),* American hornbeam *(Carpinus caroliniana),* pin cherry (*Prunus pennsylvanica),* green ash (*Fraxinus pennsylvanica),* American beech (*Fagus grandifolia),* yellow birch (*Betula allegheniensis),* American elm (*Ulmus americana),* eastern hemlock (*Tsuga canadensis),* ostrich fern (*Matteuccia struthiopteris*), sensitive fern (*Onoclea sensibilis),* fowl bluegrass (*Poa palustris),* black ash (*Fraxinus nigra),* hawthorn (*Crataegus* spp.), large leaf avens (*Geum macrophyllum),* giant goldenrod *(Solidago gigantea),* fowl manna grass (*Glyceria striata),* summer grape (*Vitis aestivalis),* box elder (*Acer negundo),* tartarian honeysuckle (*Lonicera tatarica),* silky dogwood (*Cornus amomum),* rough avens (*Geum lacinatum),* garlic mustard (*Alliaria petiolata)* and riverbank grape (*Vitis riparia).*

The cropland/ field crop community (D9, 14, 29, 42, 43, 55, 58) consisted of the following species: common wheat (*Triticum aestivum),* red clover (*Trifolium pratense),* annual bluegrass (*Poa annua),* common ragweed (*Ambrosia artemisiifolia),* old field cinquefoil (*Potentilla simplex),*

colt's foot (*Tussilago farfara),* reed canary grass (*Phalaris arundinacea),* white clover (*Trifolium repens),* annual bluegrass (*Poa annua),* common dandelion (*Taraxacum officinale),* Queen Anne's lace (*Daucus carota*), goldenrod (*Solidago* spp.), teasel (*Dipsacus sylvestris),* timothy (*Phleum pratense),* false baby's breath *(Galium mollugo),* Kentucky bluegrass (*Poa pratensis),* common speedwell (*Veronica officinalis)* and alfalfa (*Medicago sativa).*

The cropland/ row crop community (D14, 31, 37, 50, 52,) consisted of the following species: soybean (*Glycine* spp.), corn (*Zea mays),* annual bluegrass (*Poa annua),* common dandelion (*Taraxacum officinale),* and common speedwell (*Veronica officinalis*).

The reed canary/ phragmites marsh community (D13, 27) consisted of the following species: eastern cottonwood (*Populus deltoides),* silky dogwood (*Cornus amomum),* reed canary grass (*Phalaris arundinacea),* common reed (*Phragmites australis),* green ash (*Fraxinus pennsylvanica),* tartarian honeysuckle (*Lonicera tatarica),* fowl bluegrass (*Poa palustris),* goldenrod (*Solidago* spp.) and riverbank grape (*Vitis riparia).*

The shallow emergent marsh community (D15, 26, 30, 34, 38, 40, 46, 49, 53, 54) consisted of the following species: water plantain (*Alisma plantago-aquatica),* staghorn sumac (*Rhus typhina),* multiflora rose (*Rosa multiflora),* common burdock (*Arctium minus),* reed canary grass (*Phalaris arundinacea),* Pennsylvania smartweed (*Polygonum pensylvanicum),* fowl bluegrass (*Poa palustris),* water knotweed (*Polygonum amphibium emersum),* black willow (*Salix nigra),* tartarian honeysuckle (*Lonicera tatarica),* silky dogwood (*Cornus amomum),* common reed (*Phragmites australis),* Queen Anne's lace (*Daucus carota),* bebb willow (*Salix bebbiana),* white clover (*Trifolium repens),* silky willow (*Salix* sericea), goldenrod (*Solidago* sp.), small spike false nettle (*Boehmeria cylindrical),* green ash (*Fraxinus pennsylvanica),* grey dogwood (*Cornus racemosa*), aster (*Aster* spp.), box elder (*Acer negundo),* white willow (*Salix alba),* grape (*Vitis* sp.*),* narrow leaf cattail (*Typha angustifolia)* and giant goldenrod *(Solidago gigantea).*

The successional old field community (D17, 63) consisted of the following species: annual bluegrass (*Poa annua),* reed canary grass (*Phalaris arundinacea),* barnyard grass (*Echinochloa crusgalli),* Russian olive (*Elaeagnus angustifolia),* tartarian honeysuckle (*Lonicera tatarica),*

teasel (*Dipsacus sylvestris)* and switch grass (*Panicum virgatum).*

The shrub swamp community (D16, 19, 39, 47, 51) consisted of the following species: grey dogwood (*Cornus racemosa*), silky dogwood (*Cornus amomum),* green ash (*Fraxinus pennsylvanica),* reed canary grass (*Phalaris arundinacea),* sensitive fern (*Onoclea sensibilis),* wild cucumber (*Echinocytis lobata),* crooked stem aster (*Aster prenanthoides),* aster (*Aster* spp.), bebb willow (*Salix bebbiana),* fowl bluegrass (*Poa palustris),* fringed sedge (*Carex crinita),* box elder (*Acer negundo),* crack willow (*Salix fragilis),* tartarian honeysuckle (*Lonicera tatarica),* skunk currant (*Ribes glanulosum),* creeping jennie (*Lysimachia nummularia),* marsh marigold (*Caltha palustris),* sedge (*Carex* spp.), white willow (*Salix alba),* eastern cottonwood (*Populus deltoides),* broad leaf cattail (*Typha latifolia)* and summer grape (*Vitis aestivalis).*

The successional southern hardwood community (D1) consisted of the following species: eastern cottonwood (*Populus deltoides),* eastern white pine (*Pinus strobus),* pin cherry (*Prunus pennsylvanica),* red spruce (*Picea rubens),* Norway spruce (*Picea abies),* tartarian honeysuckle (*Lonicera tatarica),* glossy buckthorn (*Rhamnus frangula),* eastern woodland sedge (*Carex blanda),* spring avens (*Geum vernum),* common dandelion (*Taraxacum officinale)* and summer grape (*Vitis aestivalis).*

The hardwood swamp community (D2, 7, 8, 10, 11, 12, 22, 24, 32, 41, 44, 57, 60) consisted of the following species: white willow (*Salix alba),* green ash (*Fraxinus pennsylvanica),* tartarian honeysuckle (*Lonicera tatarica),* grey dogwood (*Cornus racemosa),* fowl bluegrass (*Poa palustris),* summer grape (*Vitis aestivalis),* silver maple *(Acer saccharinum),* eastern cottonwood (*Populus deltoides),* American hornbeam *(Carpinus caroliniana),* northern spicebush (*Lindera benzoin),* pin cherry (*Prunus pennsylvanica),* eastern hornbeam *(Ostrya virginiana),* fringed sedge (*Carex crinita),* common frog bit *(Hydrocharis morsus-ranae),* poison ivy *(Toxicodendron radicans),* swamp white oak *(Quercus bicolor),* cockspur hawthorn *(Crataegus crus-galli),* shagbark hickory *(Carya ovata),* eastern woodland sedge (*Carex blanda),* Pennsylvania sedge (*Carex pennsylvanica),* fineleaf sheep fescue (*Festuca filiformis),* Virginia strawberry (*Fragaria virginiana),* shellbark hickory (*Carya laciniosa),* American elm (*Ulmus americana),* giant

goldenrod (*Solidago gigantea*), water purslane (*Ludwigia palustris*), Canada clearweed (*Pilea pumila),* multiflora rose (*Rosa multiflora*), silky dogwood (*Cornus amomum),* cinnamon fern (*Osmunda cinnamomea),* rattlesnake mannagrass (*Glyceria canadensis*), white snake root (*Eupatorium rugosum),* fowl manna grass (*Glyceria striata),* large leaf avens (*Geum macrophyllum),* blue wood aster (*Aster cordifolius),* heal all (*Prunella vulgaris),* red maple (*Acer rubrum),* yellow birch (*Betula allegheniensis),* eastern hemlock (*Tsuga canadensis),* American beech (*Fagus grandifolia),* New York fern *(Thelypteris noveboracensis),* grey dogwood *(Cornus racemosa),* upright sedge *(Carex stricta),* dogtooth violet *(Erythronium americanum),* rough avens (*Geum lacinatum),* soft rush (*Juncus effusus),* poison ivy (*Toxicodendron radicans),* quaking aspen *(Populus tremuloides),* bebb willow (*Salix bebbiana),* marsh marigold (*Caltha palustris),* wood anemone (*Anemone quinquefolia),* herb Robert (*Geranium robertianum),* field horsetail (*Equisetum arvense),* white ash (*Fraxinus americana),* pussy willow (*Salix discolor),* hawkweed (*Hieracium* spp.), goldenrod (*Solidago* spp.), common dandelion (*Taraxacum officinale),* large leaf avens (*Geum macrophyllum),* freeman's maple (*Acer freemanii),* common red raspberry (*Rubus idaeus)* and giant goldenrod *(Solidago gigantea).*

The deep emergent marsh community (D48) consisted of the following species: soft rush (*Juncus effusus),* fowl bluegrass (*Poa palustris),* silky dogwood (*Cornus amomum),* and bebb willow (*Salix bebbiana).*

The soils mapped on the parcel include Appleton silt loam, Arkport very fine sandy loam, Canandaigua silt loam, Collamer silt loam, Dunkirk silt loam, Galen very fine sandy loam, Halsey silt loam, Hilton loam, Lakemont silty clay loam, Lima silt loam, Lyons silt loam, Minoa very fine sandy loam, Niagara silt loam, Odessa silt loam, Ontario loam, Ovid silt loam, Palmyra gravelly loam, Phelps gravelly loam, Schoharie silt loam, Teel silt loam, Wakeville silt loam, and Wayland silt loam. Their descriptions are as follows:

Appleton silt loam This soil is very deep and somewhat poorly drained. The parent material consists of calcareous loamy till derived mainly from limestone, sandstone, and shale. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Shrink-swell potential is low. Available water capacity is high.

Arkport very fine sandy loam This soil is very deep and well drained. The parent material consists of glaciofluvial or deltaic deposits with a high content of fine and very fine sand. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is moderate.

Canandaigua silt loam This soil is very deep and poorly drained. The parent material consists of silty and clayey glaciolacustrine deposits. Depth to the top of a seasonal high water table ranges from 0 to 6 inches. Shrink-swell potential is low. Available water capacity is high.

Collamer silt loam This soil is very deep and moderately well drained. The parent material consists of silty and clayey glaciolacustrine deposits. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Shrink-swell potential is low. Available water capacity is high.

Dunkirk silt loam This soil is very deep and well drained. The parent material consists of silty and clayey glaciolacustrine deposits. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is high.

Galen very fine sandy loam This soil is very deep and moderately well drained. The parent material consists of deltaic deposits with a high content of fine and very fine sand. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Shrink-swell potential is low. Available water capacity is moderate.

Halsey silt loam This soil is very deep and very poorly drained. The parent material consists of loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits. Depth to the top of a seasonal high water table ranges from 0 to 6 inches. Annual ponding is frequent. Shrink-swell potential is low. Available water capacity is moderate.

Hilton loam This soil is very deep and moderately well drained. The parent material consists of calcareous loamy till derived principally from sandstone and limestone. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Shrink-swell potential is low. Available water capacity is moderate.

Lakemont silty clay loam This soil is very deep and poorly drained. Slopes range from 0 to 3 percent. The parent material consists of reddish clayey and silty glaciolacustrine deposits. Depth to the top of a seasonal high water table ranges from 0 to 6 inches. Shrink-swell potential is moderate. Available water capacity is high.

Lima silt loam This soil is very deep and moderately well drained. The parent material consists of loamy till derived mainly from limestone and calcareous shale. Depth to the top of a seasonal high water table ranges from 12 to 24 inches. Shrink-swell potential is low. Available water capacity is moderate.

Lyons silt loam This soil is very deep and poorly drained. The parent material consists of calcareous loamy till derived from limestone, calcareous shale, and sandstone, with a mantle of silty glaciolacustrine deposits in some places. Depth to the top of a seasonal high water table ranges from 0 to 6 inches. Shrink-swell potential is low. Available water capacity is high.

Minoa very fine sandy loam This soil is very deep and somewhat poorly drained. The parent material consists of deltaic or glaciolacustrine deposits with a high content of fine and very fine sand. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Shrink-swell potential is low. Available water capacity is high.

Niagara silt loam This soil is very deep and somewhat poorly drained. The parent material consists of silty and clayey glaciolacustrine deposits. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Shrink-swell potential is low. Available water capacity is high.

Odessa silt loam This soil is very deep and somewhat poorly drained. The parent material consists of reddish clayey and silty glaciolacustrine deposits. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Shrink-swell potential is moderate. Available water capacity is high.

Ontario loam This soil is very deep and well drained. The parent material consists of calcareous till high in limestone and sandstone. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is moderate.

Ovid silt loam This soil is very deep and somewhat poorly drained. The parent material consists of loamy till with a significant component of reddish shale or reddish glaciolacustrine clays, mixed with limestone and some sandstone. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Shrink-swell potential is moderate. Available water capacity is high.

Palmyra gravelly loam This soil is very deep and well drained. The parent material consists of loamy over sandy and gravelly glaciofluvial deposits, derived mainly from limestone and other sedimentary rocks. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is moderate.

Phelps gravelly loam This soil is very deep and moderately well drained. The parent material consists of loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits, containing significant amounts of limestone. Depth to the top of a seasonal high water table ranges from 12 to 24 inches. Shrink-swell potential is low. Available water capacity is moderate.

Schoharie silt loam This soil is very deep and moderately well drained. The parent material consists of reddish clayey and silty glaciolacustrine deposits. Depth to the top of a seasonal high

water table ranges from 18 to 24 inches. Shrink-swell potential is moderate. Available water capacity is high.

Schoharie silty clay loam This soil is very deep and moderately well drained. The parent material consists of reddish clayey and silty glaciolacustrine deposits. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Shrink-swell potential is moderate. Available water capacity is high.

Teel silt loam This soil is very deep and moderately well drained. Slopes range from 0 to 3 percent. The parent material consists of silty alluvium. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Annual flooding is occasional. Shrink-swell potential is low. Available water capacity is high.

Wakeville silt loam This soil is very deep and somewhat poorly drained. Slopes range from 0 to 3 percent. The parent material consists of silty alluvium washed from areas of glacial drift derived mainly from shale, siltstone, and sandstone, with some limestone. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Annual flooding is occasional. Shrink-swell potential is low. Available water capacity is high.

Wayland silt loam This soil is very deep and poorly drained. Slopes range from 0 to 3 percent. The parent material consists of silty and clayey alluvium washed from uplands that contain some calcareous drift. Depth to the top of a seasonal high water table ranges from 0 to 6 inches. Annual flooding is frequent. Shrink-swell potential is low. Available water capacity is high.

Hydrology is generally highly variable during a field investigation and accurate examinations of the landscape must be conducted to assure an accurate habitat assessment. Drainage on-site is generally to the northwest. Whitney Creek flows northwest through the southwestern portion of the project site.

FIELD INVESTIGATION PROCEDURES

The threatened & endangered species investigation was conducted by Ecologist's from EDI on March 16, 24, 31, April 12, 14, 16, 30, May 5, 17, June 25, July 16, and August 6, & 26, 2010. These dates were determined to be sufficient to perform survey's for the heartleaf plantain, bald eagle, northern harrier, king rail, black tern, horned lark, grasshopper sparrow, short-eared owl, least bittern, pied-billed grebe, persius duskywing, wild lupine, eastern massasauga, Henslow's sparrow, karner blue butterfly, Houghton's goldenrod, eastern prairie fringed orchid, nodding pagonia, and bog turtle.

EDI applied methodology specified by the *1987 Corps of Engineers Wetlands Delineation Manual* and *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* to perform a delineation of Federal jurisdictional wetlands within the site. EDI used the Level 2 Routine Determination method (on-site inspection necessary) since insufficient information was available for making a determination for the entire project area. This methodology is consistent with Part IV, Section D of the Corps Manual. The results of the wetland delineation are outlined in the wetland delineation report entitled Alabama STAMP, dated July 14, 2010.

EDI mapped the extent of the vegetative communities using pace-count and compass. Further resolution to these community locations was attained through the interpretation of aerial photographs, combined with field observations.

Avian Survey Methods:

The site was investigated for the presence of bald eagles (*Haliaeetus leucocephalus*), northern harrier's (*Circus cyaneus*), and short-eared owl's (*Asio flammeus*) by following the survey protocol outlined in the "Inventory Methods for Raptors" published in the Standards for Components of British Columbia's Biodiversity No. 11 publication. The site was investigated for the presence of least bittern (*Ixobrychus exilis*), king rail (*Rallus elegans*), black tern (*Chlidonias niger*), and pied-billed grebe (*Podilymbus podiceps*), by following the survey protocol outlined in the "Standardized North American Marsh Bird Monitoring Protocols" USGS Wildlife Research Report #2005-04. The site was investigated for the presence of the grasshopper sparrow (*Ammodramus savannarum*), Henslow's sparrow (*Ammodramus henslowii*), and horned lark (*Eremophila alpestris*), by following methods outlined in the "Grassland Bird Survey Protocol"

created by the Audubon Society.

Though some protocols only called for visual observations to be performed at specific times of day and season, to extensively survey the area the following survey protocol were used for **ALL** bird species under investigation:

Breeding Season Survey
Bird surveys were conducted during the breeding season, when species are territorial and active nests may be located. Three or more surveys were performed for each species that had a high possibility of inhabiting the area to confirm seasonal presence/absence of each species with a 90% certainty.

Weather
Surveys were not conducted during rain or during periods of high winds (greater than 12mph - Beaufort 3).

Time of Day Survey Conducted
Birds are crepuscular, nocturnal or diurnal and depending on the season and the species maybe all three at the same time. Surveys were planned for the active cycle of each species being studied. Morning surveys began no earlier than 30 minutes before sunrise (first light) and were to be completed prior to the time when most birds cease calling (generally no later than 10:00 am). Evening surveys began 30 minutes before sunset and were completed by 30 minutes after sunset.

Habitat Analysis
Habitat data was collected for each habitat type. The data was then analyzed and mapped to locate potential habitat locations for each species in question and then used to determine specific areas to perform the reproduction call playback survey locations for the varying classifications of avian species under investigation (i.e. raptors, grassland birds, and marsh birds).

Foot Transect Survey
Surveys on foot enabled ecologists to search areas that could not be approached by vehicles. They also allowed for a better analysis of habitats, and allowed the ecologists to scan areas for bird signs. It allowed surveyors to escape background noise (from vehicles) and improve their awareness of the surroundings. During the foot survey, identified bird usage signs within specific habitats could be analyzed in place of an actual sighting of the bird itself. For example signs left by raptors after killing and consuming prey and evacuating waste materials could indicate habitat use. Ecologists looked for prey remains, pellets, whitewash, and nests and combined their findings with evaluations of the habitat where the material was found, to use as a possible indication of the presence of species of the birds under investigation.

Reproduction Call Playback Survey

At each survey point, observers recorded all bird species detected and prepared to broadcast pre-recorded reproduction vocalizations into the potential habitat. Once the observer arrived at the survey point they waited 2 minutes before beginning the reproduction call playback survey. The reproduction call of each particular species to be surveyed at the identified survey location was recorded three times in one-minute intervals on the broadcast tape. The surveyor then played a minute interval, stopped for 30 seconds and recorded a positive or negative response on the data sheet for the particular species being surveyed at that time. The two remaining intervals were then completed in the same manner, before moving onto the next species to be surveyed within that habitat type (i.e. grassland, marsh, woodland).

By integrating the survey techniques of all three protocols to survey for all birds in question, EDI was able to perform a comprehensive in depth analysis with an extremely high accuracy rate.

The entire site was first investigated and characterized using transects at 400-foot intervals. Transect data was recorded and compiled using GPS methods. Traversing the site in this manner enabled EDI to methodically inspect all areas of the site for the presence or evidence of protected species. At each vegetative community change, data of the ecology was documented in order to pinpoint where individual species would most likely occur. The transect/foot survey employed was advantageous in analyzing habitat suitability and for identifying evidence of use (whitewash, nests and feathers). Suitable habitat was identified by conducting vegetative surveys in accordance with the NY Natural Heritage Program guidelines where the ecological communities within the investigation area are classified according to *Ecological Communities of New York State* (Edinger et al. 2002). The initial transect survey was subsequently followed by more intense surveys that were targeted toward particular areas of special interest. Meandering searches, i.e. those that do not follow transect lines, were then used to better examine possible habitat for nesting activity. In this way, the property was subdivided into more uniform habitat types that were then surveyed according to their particular attributes for each species they could possibly support. Meandering search intervals were at

no less of a distance than 400 feet from adjacent search corridors and were averaged at approximately 200 feet apart.

The site was further investigated by conducting reproduction call playback surveys from 0.5 hour before sunrise to 4 hours after sunrise, as well as from 0.5 hours before sundown to 0.5 hours after sundown. Reproduction call recordings were broadcasted using a Sony M-570V cassette tape recorder with the speaker positioned between approximately four to six feet above the ground. The volume of the broadcast was set for human ears to hear it at a maximum distance of 300 feet. Playback sessions were conducted on ten separate days and were broadcasted over twelve separate locations found to contain potential habitat for the classifications of avian species under investigation. At each survey point, observers recorded all bird species detected and prepared to broadcast pre-recorded reproduction vocalizations into the potential habitat. Once the observer arrived at the survey point they waited 2 minutes before beginning the reproduction call playback survey. Each playback session was composed by one minute of playback of an individual species, followed by thirty seconds of silence, to account for responsive birds (Johnson et al. 1981), and repeated twice more until five minutes were completed. At each session, the response by the birds was recorded as negative (no response) or positive.

Plants, Insect, & Reptile Survey Methods:

The site was investigated for the presence of heartleaf plantain (*Plantago cordata*), nodding pogonia (*Triphora trianthophora*), persius duskywing (*Erynnis persius persius*), karner blue (*Plebejus melissa samuelis*), bog turtle (*Glyptemys muhlenbergii*), the eastern massasauga (*Sistrurus catenatus catenatus*), and wild (sundial) lupine (*Lupinus perennis*), by initially transecting the property at property at 200 - 400' intervals, which was used in locating areas of potential habitat. Traversing the site along each transect enabled EDI to methodically inspect all areas of the site for the habitat and presence of these protected species and the food sources of larval persius duskywing and karner blue butterflies, wild (sundial) lupine (*Lupinus perennis*) and wild indigo (horseflyweed) (*Baptisia tinctoria*). At each interval, the ecology was considered in order to pinpoint the areas in which these species would most likely occur. Areas determined to

contain potential habitat were then thoroughly inspected during the duration of the investigation. Investigation for the nodding pagonia also included one survey completed following the first drenching rain of August and research of blooms occurring in neighboring states.

RESULTS & CONCLUSIONS

Earth Dimensions Inc. (EDI) completed a threatened & endangered species investigation at the proposed Alabama STAMP property located in the Town of Alabama, County of Genesee, State of New York.

The ecological communities present provide opportunities for the eastern massasauga, which use open shallow wetlands or shrub swamps as well as, open fields, grassy meadows or farmed sites. Though these communities were found to exist within the project area, no evidence of species inhabitation was located. Weighing the commonality of these communities within the region, and no evidence of the species present, it is EDI's opinion that eastern massasauga are not present at the site and that the project will not have an impact on the species.

The bog turtle (*Glyptemys muhlenbergii*), requires open, early successional types of habitats such as wet meadows or open calcareous boggy areas. Though these communities were found to exist within the project area, no evidence of species inhabitation was located. Weighing the commonality of these communities within the region, and no evidence of the species being present, it is EDI's opinion that the project will not have an impact on the species.

The ecological communities present provide opportunities for the eastern prairie fringed orchid (*Planthera leucophaea*), which occurs in shallow emergent marsh communities with little or no woody encroachment. Though these communities were found to exist within the project area, no evidence of species inhabitation was located. Weighing the commonality of this community within the region, and no evidence of the species present, it is EDI's opinion that project will not have an impact on the species.

The ecological communities present provide opportunities for Houghton's goldenrod (*Oligoneuron houghtonii*), which occurs in wetlands over calcareous parent material. Though these communities were found to exist within the project area, no evidence of species inhabitation was located. Weighing the commonality of this community within the region, and no evidence of the species present, it is EDI's opinion the project will not have an impact on the species.

Based on the lack of emergent marsh with 50/50 open water/vegetation cover and multiple negative reproduction call playback sessions it is our analysis that the pied-billed grebe

(*Podilymbus podiceps*), and the black tern (*Chlidonias niger*), would most likely not inhabit the site and therefore the project will not have a significant impact on the species.

The grasshopper sparrow (*Ammodramus savannarum*), and the short-eared owl (*Asio flammeus*), require successional old field, and cropland/field crop communities. Both of these community types are present. However, weighing the commonality of this community within the region with the multiple negative reproduction call playback sessions, it is EDI's opinion that grasshopper sparrow and short-eared owl are not present at the site and that the project will not have an impact on the these species.

The ecological communities present offer king rails (*Rallus elegans*) habitat. The shallow emergent marsh and successional old field communities provide opportunities for this ground-nesting species. However, weighing the commonality of this community within the region, with the multiple negative reproduction call playback sessions it was determined that king rail were not present at the site, and that the project would not have an impact on the species.

Based on the lack of suitable large body of water adjacent to woodlands and multiple negative reproduction call playback sessions, it was determined that the bald eagle (*Haliaeetus leucocephalus*), would not inhabit the site. However, a bald eagle was noted flying over the site on March 16, 2010.

The nodding pogonia (*Triphora trianthophora*), was determined to require dry to moist rich beech-maple mesic forests occurring on sandstone or limestone derived soils. Several woodlots of beech-maple mesic forest were found to exist at the site. A survey session was conducted of the area on August 6, 2010, due to the rainfall event documented that week, and the ephemeral nature of the orchid. Research confirmed that sightings of the species in bloom were recorded in Vermont on August 6, 2010. Weighing the commonality of the rich beech-maple forest community within the region with surveys that were completed during the optimal blooming peak of 2010 for the New England Region, and no evidence of species inhabitation, it is EDI's professional opinion that the nodding pogonia is not present at the site and that the project would not have an impact on the species.

Investigations for the persius duskywing (*Erynnis persius persius*), larval food sources wild lupine (*Lupinus perennis*) and wild indigo (*Baptisia tinctoria*), indicated that these species require well-drained, neutral to strongly acidic soils in open or partially shaded northern hardwoods, northeastern oak-pine or coniferous forests. Though these communities were found to exist within the project area, no evidence of species inhabitation was located and it was determined that the persius duskywing would not inhabit the site because of the lack of food source.

Investigations for the karner blue (*Plebejus melissa samuelis*), larval food source wild lupine (*Lupinus perennis*), was determined to require well-drained, neutral to strongly acidic soils in open or partially shaded northern hardwoods, northeastern oak-pine or coniferous forests. Though these communities were found to exist within the project area they did not contain *Lupinus perennis,* therefore it was determined that the karner blue would not inhabit the site due to a lack of food source. On June 25, 2010 documentation of a small blue butterfly was acquired while transecting parcel 18. Photos were taken of the individual butterfly and forwarded to the New York Natural Heritage Program for identification purposes. The response received from the agency is as follows: "*DEC planted some areas on the Tonawanda WMA with lupine, but it does not amount to much yet, and there were no known Karner populations within dispersal distance of those to colonize it. The forewings of many butterflies look longer than the hindwings that are usually rounder. If she had a clear photo of the underside of the wings it would have helped. I would love nothing more than to have a long lost population discovered out there, but nothing thus far makes me think it was a Karner blue*- Kathleen O'Brien." The small butterfly was thus determined to most likely be a spring azure (*Celastrina ladon*) which feeds on flower nectar from dogbane, privet, New Jersey tea, blackberry, and common milkweed, many of which were present at the area the butterfly was documented.

Though no active nests were found to lie within the proposed project area, an occurrence of the northern harrier was documented at the site on March 16, 2010. A pair of northern harrier (*Circus cyaneus*), were observed flying low over the hedgerow and open field habitats and then traveling towards the Tonawanda Indian Reservation. Northern harrier hunting habitat is determined by several factors including proximity to the nest site, prey abundance and location.

Female harriers tend to hunt adjacent to the nest site, where males extend their hunting ranges farther from the nest and may enter into different habitat types (Martin 1987). Based on multiple negative reproduction call playback sessions and the absence of the species throughout the remaining six month investigation, it is EDI's professional opinion that the project site is not used as a nesting location and that the project would not have an impact on the species.

The ecological communities present offer Henslow's sparrow (*Ammodramus henslowii*), habitat. The successional old field, and cropland/field crop communities provide opportunities for this ground-nesting species. Several call back surveys resulted in negative and inconclusive sessions. No active nests were found during the surveys and it is EDI's professional opinion that the project site is not used at this time as a nesting location.

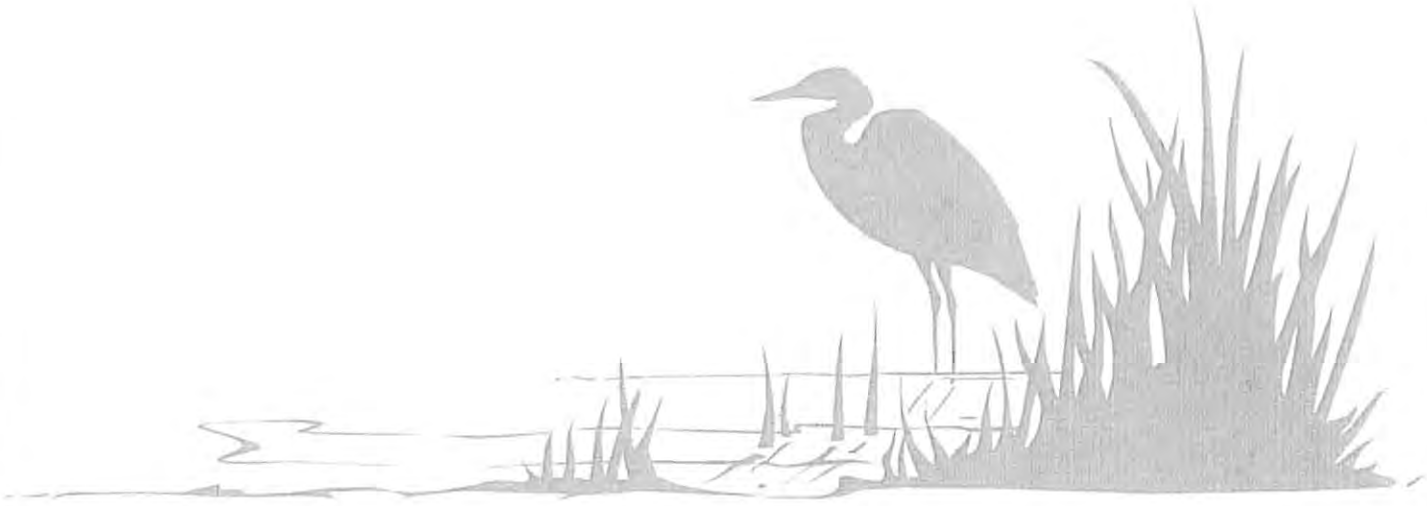
Though no active nests were found during the surveys, several sightings and positive results of call back surveys for the horned lark (*Eremophila alpestris*), were documented throughout the agricultural fields of the site on March 16, 2010, April 14, 2010 and June 25, 2010. It is EDI's professional opinion that though no nesting locations were observed, that the agricultural fields are utilized by the horned lark.

Least bitterns (*Ixobrychus exilis*), were determined to require large shallow & deep emergent marshes, interspersed with pools of open water or slow-moving channels and some woody vegetation. Though no complete active nests were found to lie within the proposed project area, a positive call back response was documented near the man made ponds at the John White Memorial State Game Farm site on May 5, 2010. The location coordinates were collected using the datum: DD NAD83, they are as follows (1) 43.08070, 78.39690. The species in question was visually sighted at a potential nesting location, after the call response was documented, positioned on a clump of matted cattails during the foot survey. The surveyor noted on the data form that the bird appeared to be nesting as it was found resting on a clump of matted cattails. Once the bittern was sighted, it flew from the location and headed east. Subsequent foot surveys entailed revisiting the suspected nest location where the bittern had been sighted resting on the matted cattails, but no feathers, whitewash, completed nest or any other type of evidence of habitation were found within the vicinity. Based on multiple subsequent negative reproduction call playback sessions and the

absence of the species throughout the remaining four months of investigation, it is EDI's professional opinion that the project site is not used at this time as a nesting location.

The heartleaf plantain (*Plantago cordata*), was determined to require hydric calcareous soils. These soils were found to exist within the project area. Evidence of species inhabitation was located at one location within the woodlands located on Parcel 1, within the vicinity of the soil type Odessa silt loam and Lakemont silty clay loam (please see Attachment D: Site Photos). The location coordinates were collected using the datum: DD NAD83, they are as follows (1) 43.09357, 78.42401.

Alabama STAMP



ATTACHMENT A

Species Descriptions

Karner Blue

Karner Blue butterfly

Photo credits: *Carly Voight*

Scientific Name *Plebejus melissa samuelis* (Nabokov, 1944)

Family Name Lycaenidae
Blues, Coppers, Hairstreaks, Elfins

Did you know?
This species would not persist without active management in New York. The Albany Pine Bush Preserve manages for this butterfly through prescribed fire and by planting and encouraging growth of wild blue lupine.

Summary

Protection Endangered Species in New York State, listed as Endangered federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species in imminent danger of extirpation or extinction in New York. 2) Any species listed as endangered by the United States Department of the Interior.

This level of federal protection means: this species is formally listed as endangered.

Rarity G5T2, S1

A global rarity rank of G5T2 means: Imperiled globally - The subspecies/variety is at high risk of extinction due to rarity or other factors; typically 20 or fewer populations or locations in the world, very few individuals, very restricted range, few remaining acres (or miles of stream), and/or steep declines. (The species as a whole is common globally.)
A state rarity rank of S1 means: Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology makes it especially vulnerable in New York State.

State Ranking Justification

Even though there are about 50 subpopulations occupied each year, these cluster into about four metapopulations, or recovery units. Of the 50 subpopulations, the vast majority have fewer than 100 butterflies present. This species does not persist well if the total July brood for the metapopulation is fewer than 1,000 adults. This Federally and State-listed species is completely management dependent in New York, and is the case in most or all of the remaining portion of the range.

Conservation Issues

Threats

The threats include habitat loss, degradation, and fragmentation, fire suppression, inappropriate management of lupine (Lupinus perennis), mosquito spraying and the use of other insecticides, and browsing of lupine by herbivores, primarily deer. There is also a concern that a reduction in winter snow pack and other changes, due to climate change, threaten this species. Such threats could be of particular concern in New York, which has a warmer climate and is farther south than most of the current range for this butterfly.

Management Considerations

All occupied sites should be managed to increase the amount of lupine (Lupinus perennis) and to connect nearby demes (subpopulations). Controlling herbivores such as deer and protecting occupied sites from spraying with insecticides is also a management need.

Research Needs

The severity of mosquito spraying to larvae and adults needs to be evaluated, since aerial adulticiding for mosquitoes is more prevalent in New York than most other northern states and sometimes involves large areas.

Short Term Trends

There are over 10,000 individuals in July during at least some years at Saratoga Airport but only three other sites are believed to contain one or two thousand individuals in the summer brood most years, which is marginal for a viable population of this species. The majority of sites contain fewer than 100 adults. However, it should be noted that the estimates not based on mark-recapture (see Gall 1985) are very unlikely to be close to the actual population size. Since the Federal Listing, this species has apparently been fairly stable in New York, but some small subpopulations have declined or increased slightly. At some sites, the current population sizes are not known.

Long Term Trends

The Albany area population has declined by over 90% from what it apparently was in the 1970s and the population was probably even higher originally. The Tonawanda, Brooklyn, and Sullivan County populations are extinct, as are the Rome and Watertown populations, if they really existed. The Warren County populations are now small remnant colonies. The decline has probably been less at Saratoga.

Habitat

Karner Blue butterflies can be found in extensive pine barrens, oak savannas or openings in oak woodlands, and unnatural openings such as airports and right-of-ways that contain lupine (Lupinus perennis), the sole larval food source. The original communities for some remnant populations in Saratoga and Warren Counties are unclear since there is little to suggest former pine barrens in these areas. Some recent populations have occurred in sandy old fields. The largest cluster of colonies was in the Albany-Schenectady County Pine Bush and parts of the region are still occupied, although today the largest population may very well be at Saratoga Airport where it occurs mainly on the approach zones.

Associated Ecological Communities

Calcareous Pavement Barrens
A savanna community that occurs on nearly level outcrops of calcareous bedrock (limestone or dolomite). The community consists of a mosaic of shrub-savanna, grass-savanna, and rock outcrop vegetation.

Pine Barrens Vernal Pond
A seasonally fluctuating pond and its associated wetlands that typically occurs in pine barrens. The water is intermittent, usually a pond in the spring but sometimes losing water through the summer to become a mostly vegetated wetland at the end of the summer. These ponds and wetlands may be small.

Pitch Pine-oak Forest
A mixed forest that typically occurs on well-drained, sandy soils of glacial outwash plains or moraines; it also occurs on thin, rocky soils of ridgetops. The dominant trees are pitch pine mixed with one or more of the following oaks: scarlet oak, white oak, red oak, or black oak.

Pitch Pine-scrub Oak Barrens
A shrub-savanna community that occurs on well-drained, sandy soils that have developed on sand dunes, glacial till, and outwash plains.

Associated Species

Frosted Elfin (*Callophrys irus*)

Range

The map shows the known locations for karner blue (black dots) based on the New York Natural Heritage Program database . A general approximation of the potential range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)

New York State Distribution

Currently, the only known occupied sites are clustered in Albany, Schenectady, Saratoga, and Warren Counties and represent remnants of two or three once large metapopulations. Historically there were also specimens, or at least reports from Watertown, Tonawanda, Rome, Sullivan County, and Brooklyn (Shapiro 1974).

Global Distribution

The Karner Blue is currently found in Minnesota, Wisconsin, Michigan, northern Indiana, and New York. It has been extirpated from Illinois, Iowa, Ohio, Ontario, Pennsylvania, Massachusetts, New Hampshire, and Maine, but was reintroduced in New Hampshire and Ohio. It was falsely reported from North Carolina and Manitoba.

Identification Comments

A small, sivery blue butterfly with orange crescents on the margins of the underside of the wings. The dorsal surface of the male is all violet-blue, as compared to the dorsal surface of the female, which is dull purplish-blue near the body and turning a dull brown away from the body. The dorsal surface of the lower wings also have orange crescents along their bottom edges.

Characteristics Most Useful for Identification

The combination of marginal orange spots on the underside of all wings and lack of tails on the hindwings is diagnostic. The males have no orange at all above. The females have some orange on the hindwing above and, unlike the Eastern Tailed-blue (Cupido (Everes) comyntas), always have some blue near the body on upper side of all wings. Both sexes are also larger than tailed blues. Azures and silvery blues have no orange on any surface.

Best Life Stage for Identifying This Species

The adult is the best life stage for identification. The larvae can be identified by an expert, but both Frosted Elfin (Callophrys irus) and Eastern Tailed-blue [Cupido (Everes) comyntas] larvae occur on lupine and are similar. The eggs can also be identified, but in part this involves context and experts.

Behavior

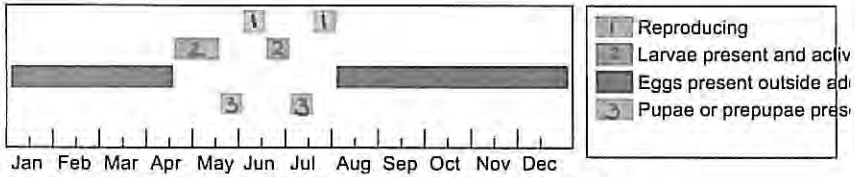
It is unlikely to be seen more than a few yards from patches of lupine (Lupinus perennis), although wandering individuals do occur up to a mile or more away from main breeding areas.

Diet

Larvae feed only on the native lupine (Lupinus perennis) in nature. The adults take nectar from many kinds of low growing flowers, native or otherwise.

The Best Time to See

The exact phenology varies from year to year and colony to colony. Those in the most open habitats tend to be about a week ahead of those in more wooded places. There are always two annual generations. The eggs overwinter and hatch, but not all at once, around the middle of April. The larvae mature mostly in late May and pupate. Adults emerge in late May to early June and are active for two to three weeks. The eggs from these adults hatch in a few days and the larvae are mostly mature in early July. Second brood adults fly for about three weeks and peak numbers usually occur for about a week in the second half of July. The eggs laid by these adults hatch the following spring.



The time of year you would expect to find Karner Blue in New York.

Similar Species

Eastern Tailed-Blue(Everes comyntas):

Spring Azure(Celastrina ladon):

Conservation Comments

Some experts suspect this will prove to be a full species and the number of species in this genus is not well understood. In New York, the Karner Blue is considered a subspecies of the Melissa Blue (Plebejus melissa) because no published works have revised the taxonomy to elevate this subspecies to species status.

Taxonomy

Kingdom Animalia
└ **Phylum** Mandibulates (Mandibulata)
└ **Class** Insects (Insecta)
└ **Order** Butterflies, Skippers, and Moths (Lepidoptera)
└ **Family** Lycaenidae (Blues, Coppers, Hairstreaks, Elfins)

Synonyms

Lycaeides melissa samuelis (Nabokov)

Additional Resources

Links

New York State Department of Environmental Conservation
http://www.dec.ny.gov/animals/7118.html
Google Images
http://images.google.com/images?q=LYCAEIDES+MELISSA+SAMUELIS
NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=LYCAEIDES+MELISSA+SAMUELIS

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Opler, P.A. and V. Malikul. 1992. A field guide to eastern butterflies. Houghton Mifflin, Boston, MA. 396 pp.

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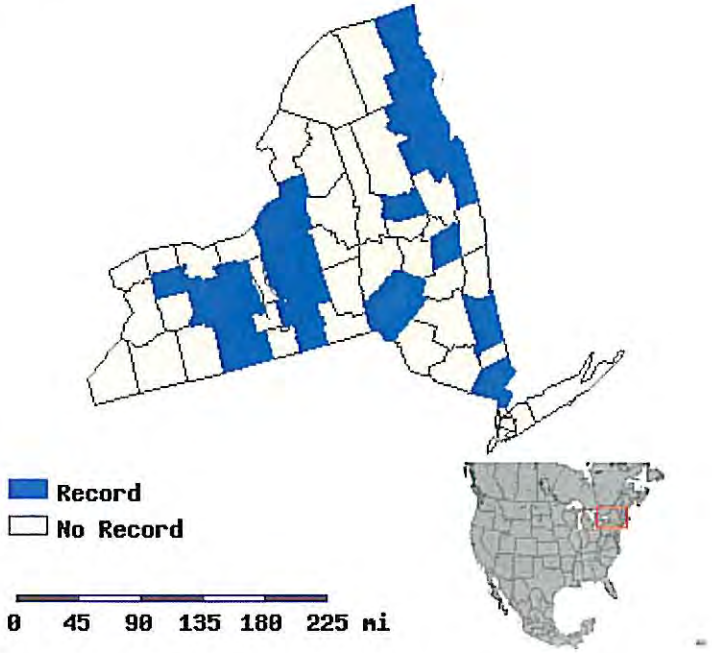
Persius Duskywing

Erynnis persius (Scudder, 1863)

Attributes of *Erynnis persius*



Family: Skippers (*Hesperiidae*)

Subfamily: Spread-wing Skippers (*Pyrginae*)

Identification: Upperside is brown-black. Forewing has few clear dots and very dim markings; patch at end of cell is grayish. Male forewing has many raised white hairs. Hindwing fringes are dark. Male has a costal fold containing yellow scent scales; female has

a patch of scent scales on the 7th abdominal segment.

Life history: During the day males perch on hilltops to seek females, usually sitting on the ground or on low twigs. Females lay eggs singly under leaves of the host plants. Caterpillars feed on leaves and live in shelters of rolled or tied leaves. Fully-grown caterpillars hibernate.

Flight: One brood from April-June.

Wing span: 1 1/8 - 1 5/8 inches (2.9 - 4.2 cm).

Caterpillar hosts: Lupine (Lupinus), golden banner (Thermopsis), Lotus, and other legumes.

Adult food: Flower nectar.

Habitat: Open areas including mountain grasslands, marshes, sand plains, seeps, streamsides.

Range: In the west, from Alaska and the McKenzie River delta south to southeastern Manitoba; south through the western mountains to southern California, southern Arizona, and southeast New Mexico. In the east, northern New England west to Wisconsin; south in the Appalachians to Virginia. Comments: The Columbine, Wild Indigo, and Persius dusky wings belong to the "Persius complex," a confusing group of very similar butterflies.

Conservation: Populations in the Midwest and Northeast found in pine-oak barrens should be monitored and conserved.

NatureServe Global Status: G4 - Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

Management needs: Manage habitat of lupine-feeding populations by mechanical disturbance or infrequent burns (no more frequent than every 5 years).

Nodding Pogonia

Triphora trianthophora

Photo credits: *Alfred Schotz*

Scientific Name *Triphora trianthophora* (Sw.) Rydb.

Family Name Orchidaceae
Orchid Family

Did you know?
A population of this orchid was recently found in Cayuga County at the exact spot where it was previously collected in 1919. It may be underreported in the state because the time when it is blooming and visible is so short (typically the whole population flowers synchronously, and flowers last only one day) and it may not bloom every year. The flowers do not have nectar and may bloom all at once to ensure pollination before the pollinators learn to avoid flowers with no reward. According to one botanist, this synchronicity apparently extends over great areas, because during 1990 Triphora was observed flowering on the exact same day in New Hampshire, Maine, and Massachusetts.

Summary

Protection Endangered Species in New York State, not listed federally.

This level of state protection means: listed species are those with: 1) 5 or fewer extant sites, or 2) fewer than 1,000 individuals, or 3) restricted to fewer than 4 U.S.G.S. 7 ½ minute topographical maps, or 4) species listed as endangered by U.S. Department of Interior.

Rarity G3G4, S2

A global rarity rank of G3G4 means: Vulnerable globally, or Apparently Secure -- At moderate risk of extinction, with relatively few populations or locations in the world, few individuals, and/or restricted range; or uncommon but not rare globally; may be rare in some parts of its range; possibly some cause for long-term concern due to declines or other factors. More information is needed to assign a single conservation status.

A state rarity rank of S2 means: This plant is threatened/imperiled in New York because of rarity (typically 6-20 populations or few remaining individuals) or is vulnerable to extirpation from New York due to biological factors.

State Ranking Justification

There are nine existing populations but two of them are small. This plant is very difficult to survey because of the limited time it blooms so it is expected that more populations will be found. There are 37 historical populations.

Conservation Issues

Threats

No current threats are known for this species since little is known about their natural history here. Populations occur in areas where there is little development.

Management Considerations

Sites should be monitored to determine threats and health trends.

Research Needs

Research is needed to determine the factors affecting bloom time and frequency. The effect of deer browse, if any, should be studied. Physical and chemical parameters of their preferred sites should be studied to help locate additional populations.

Short Term Trends

Numbers of plants are probably stable but only a couple of occurrences have been monitored over the short term. The flowering biology of this plant makes it difficult to assess trends.

Long Term Trends

There are many more historical records than current known locations so it appears that this orchid has been declining. However, populations are difficult to survey because the window of opportunity to see the plants is so small.

Habitat

An ephemeral plant of dry to moist areas of beech-maple mesic forests, in moist leaf-mold pockets of mixed hardwood forests, hemlock-northern hardwood forests within shale ravine systems, deep mucky soil under yellow birch, sandy woods within the Great Lakes Plains, and white cedar-tamarack swamps (New York Natural Heritage Program 2004). Dry-mesic to mesophytic forests over sandstone or limestone, sandy oak-mixed hardwood forests, seasonally wet and sandy flatwoods, Great Lakes dune forests, coniferous forests, tamarack swamps, rhododendron thickets, floodplain forests, wet muck in glacial lake bed forests, and in seasonally flooded sinkhole swamps (Flora of North America 2002). Rare in humus-rich, moist forests (Rhoads and Block 2000). Rich moist woods, often on rotten logs (Gleason and Cronquist 1991). Humus of beech, oak, maple, or mixed woods (Voss 1972). Humus of hardwood-forests (Fernald 1970).

Associated Ecological Communities

Beech-maple Mesic Forest
A hardwood forest with sugar maple and American beech codominant. This is a broadly defined community type with several variants. These forests occur on moist, well-drained, usually acid soils. Common associates are yellow birch, white ash, hop hornbeam, and red maple.

Hemlock-hardwood Swamp
A swamp that occurs on mineral soils and deep muck in depressions which receive groundwater discharge. These swamps usually have a fairly closed canopy (70 to 90% cover), sparse shrub layer, and low species diversity. The tree canopy is typically dominated by eastern hemlock and co-dominated by yellow birch and red maple.

Other Probable Associated Communities

Appalachian oak-hickory forest
Hemlock-northern hardwood forest
Limestone woodland
Maple-basswood rich mesic forest
Rich mesophytic forest
Successional northern hardwoods
Successional southern hardwoods

Associated Species

Acer pensylvanicum
Red Maple (*Acer rubrum var. rubrum*)
Sugar Maple (*Acer saccharum*)
Northern Maidenhair-fern (*Adiantum pedatum*)
Wild Sarsaparilla (*Aralia nudicaulis*)
Yellow Birch (*Betula alleghaniensis*)
Sweet Birch (*Betula lenta*)
Paper Birch (*Betula papyrifera*)
Beechdrops (*Epifagus virginiana*)
American Beech (*Fagus grandifolia*)
White Ash (*Fraxinus americana*)
American Witch-hazel (*Hamamelis virginiana*)

Sharp-lobed Hepatica (*Hepatica nobilis var. acuta*)
Round-leaved Liverleaf (*Hepatica nobilis var. obtusa*)
Shining Clubmoss (*Huperzia lucidula*)
Wood Nettle (*Laportea canadensis*)
Canada May-flower (*Maianthemum canadense*)
Partridgeberry (*Mitchella repens*)
Indian-pipe (*Monotropa uniflora*)
Christmas Fern (*Polystichum acrostichoides*)
Red Oak (*Quercus rubra*)
American Basswood (*Tilia americana var. americana*)
Northern Starflower (*Trientalis borealis*)
Eastern Hemlock (*Tsuga canadensis*)

Range

The map shows the known locations for nodding pogonia (black dots) based on the New York Natural Heritage Program database . A general approximation of the potential range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)

Best Places to See

Sensitive species. No sites listed.

New York State Distribution

This orchid is currently known only from Zoar Valley (western New York), Tonawanda Creek drainage, and the Catskill Mountains. Historical records have been documented from scattered locations around the state. More populations than are known are likely present within the state.

Global Distribution

This orchid ranges from southern Maine to southern Wisconsin, south to Florida, eastern Texas, and Central America.

Identification Comments

This is a small, attractive orchid with a very short bloom time. The purple to green stems are 10-30 cm tall and nodding at first but straighten out as they grow. A few small, clasping, oval, green leaves can be seen along the stem which is topped by 1-3 white tubular flowers with magenta edges. The flowers turn a pinkish color as they age. The triangular lip curves down and is surrounded by four forward-facing petals.

Identifying Characteristics

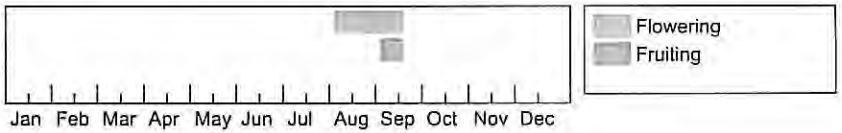
An ephemeral orchid with purple to green stems 10-30 cm tall from a cluster of fleshy roots. These stems are nodding at first but straighten as it grows. The ovate leaves (1-2 cm long) are sessile on or clasping to the stem. The flowers are whitish to pale pink with magenta margins. The sepal and lateral petal are lanceolate and 1.5-2 cm long. The lip is 1.5-2 cm long with three prominent green ridges that are crisped at the tip with upturned lateral lobes.

Best Life Stage for Identifying This Species

This orchid may be identified from the stem, flowers, or fruit. Due to its rarity, only a picture is needed to verify the identify. Do not collect any specimens.

The Best Time to See

This orchid blooms for a very short period sometime around the second or third week of August, with all flowers of a population blooming at the same time. These flowers usually last only for a single day. Occasionally, the blooming window is a few weeks early or late. Since this orchid is only present for a few weeks each year, or remains completely dormant during the growing season, searches can be challenging. Inventories should begin in early August with repeated visits to the search site until early September.



The time of year you would expect to find Nodding Pogonia in New York.

Plant of the Week

Three Birds Orchid (*Triphora trianthophora*)

By Thomas C Philipps

Three birds orchid (*Triphora trianthophora*) is an unusual orchid of deciduous forests ranging across much of central and eastern North America. The common name, three birds orchid, is attributed to the flower's resemblance to three birds in flight. The scientific name, *trianthophora*, means "bearing three flowers," which refers to the typical number on each plant. The pink and white flowers are quite small, rarely reaching 2 cm. in size and the stems vary greatly in length perhaps due to local light and moisture conditions. In some instances stems barely reach the surface of the leaf liter (about 5 cm.), and on other occasions grow up to 20 cm. tall. What this species lacks in size it makes up for in mystery and beauty. The striking flower shape and color often stand out in sharp contrast to the deep and dappled shade of the deciduous forests it occupies.

Range map of three birds orchid. States are colored green where the species may be found.


Three birds orchid is a feast for the eye's if one can spot it in the beech forests of the White Mountain national forest. Photo by Eleanor Saulys.

Three birds orchid occupies a habitat that is seemingly inhospitable to most other plants: American beech forests. It is a denizen of nearly pure stands of American beech (*Fagus grandifolia*) forests that typically have a smattering of another inhospitable species: eastern hemlock (*Tsuga canadensis*). The plants tend to congregate in small depressions on the forest floor that is lined with deep layers of decaying leaves. In New England almost all known populations occur on south facing slopes, although this may be a matter of climate in northern portions of its range.


It is characteristic of three birds orchid for all of the plants of a population bloom at the same time to help ensure pollination. Photo by Eleanor Saulys.

The species is found in the United States from Maine west to Wisconsin and Nebraska, south to Texas and Florida. It also occurs in the Province of Ontario in Canada. It is uncommon throughout much of this range and is listed as endangered or threatened in Maine, New Hampshire, Vermont, New York, Pennsylvania, Ohio, Michigan, Massachusetts, New Jersey, Maryland, and Florida. It was thought to be extirpated in Connecticut, but a recent discovery of a previously unknown population has restored it to that state's flora. Three birds orchid occurs on the Shawnee, Monongahela, and White Mountain national forests in the eastern region, and is considered a regional forester's sensitive species on the Monongahela and White Mountain national forests. Although rare in many states it is often locally abundant. Populations on the White Mountain national forest in New Hampshire often range into the hundreds and even thousands of plants in any given year. As with many orchid species, populations often vary greatly from year to year due the species ability to remain dormant underground for many years without sending up a shoot.

Three birds orchids with its flowers in bud. Photo by Eleanor Saulys.

Three birds orchid is secretive and there is plenty of advice out there on when to go looking for the species. One tale has it that the best time to find the species in bloom is to search beech forests during the first week following the first drenching rain of August. The fact is three birds orchid is extremely ephemeral; appearing only for a short period of time in late summer typically from mid-August to mid-September. The floral beauty is fleeting; the bloom period is short sometimes lasting only a few days in a population. Each plant typically produces three flowers with each flower remaining fresh and viable for only a single day. Flowering tends to be synchronous with most plants within a population blooming at the same time. This synchronized bloom may be an adaptation to ensure successful pollination. A single bloom may not put on enough of a show to attract the appropriate pollinator, but many plants blooming in concert put on quite a show!

For More Information

- PLANTS Profile - *Triphora trianthophora*, three birds orchid

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Location: http://www.fs.fed.us/wildflowers/plant-of-the-week/triphora_trianthophora.shtml
Last modified: Tuesday, 11-May-2010 14:55:34 EDT

DUMMERSTON SIGHTINGS

NATURE TIDBITS FROM AROUND THE AREA

WELCOME

To all those interested in the natural world. Please add your sightings.

In the woods we return to reason and faith-Emerson

Best-Lynn

FRIDAY, AUGUST 6, 2010

Three Birds orchids strut their stuff after a rain.

Narrow-leaved Mountain Mint's purple-speckled flowers take their turns instead of all

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Oligoneuron houghtonii - (Torr. & Gray ex Gray) Nesom
Houghton's Goldenrod

Other Common Names: Houghton's goldenrod
Other Related Name(s): *Solidago houghtonii* Torr. & Gray ex Gray
Related ITIS Name(s): *Oligoneuron houghtonii* (Torr. & Gray ex Gray) Nesom (TSN 507633)
Unique Identifier: ELEMENT_GLOBAL.2.139974
Element Code: PDAST8P0W0
Informal Taxonomy: Plants, Vascular - Flowering Plants - Aster Family

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Kingdom	Phylum	Class	Order	Family	Genus
Plantae	Anthophyta	Dicotyledoneae	Asterales	Asteraceae	Oligoneuron

Check this box to expand all report sections: ☐

Concept Reference

Concept Reference: Kartesz, J.T. 1994. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. 2nd edition. 2 vols. Timber Press, Portland, OR.
Concept Reference Code: B94KAR01HQUS
Name Used in Concept Reference: *Solidago houghtonii*
Taxonomic Comments: Oligoneuron houghtonii, as treated by Kartesz (1999), has usually been treated as Solidago houghtonii (e.g., by Kartesz, 1994).

Conservation Status

NatureServe Status

Global Status: G3
Global Status Last Reviewed: 01Jan1996
Global Status Last Changed: 22Jun1990
Rounded Global Status: G3 - Vulnerable
Reasons: A species that is mostly limited to shoreline habitats within a small geographic range, but which is relatively common where suitable habitat exists. Most extant sites are on the northern shores of Lakes Michigan and Huron, where there are 50-60 sites in 9 Michigan counties. It is also known from several sites in Ontario, Canada and from 1 disjunct population in Genessee County, New York. This species is threatened by habitat loss or modification due to residential development and recreational activities, especially off-road vehicles. At least 20 percent of the historically known populations of this species have disappeared since 1975.
Nation: United States
National Status: N3
Nation: Canada
National Status: N2

U.S. & Canada State/Province Status	
United States	Michigan (S3), New York (S1)
Canada	Ontario (S2)

Other Statuses

U.S. Endangered Species Act: LT: Listed threatened (18Jul1988)
U.S. Fish & Wildlife Service Lead Region: R3 - North Central
Canadian Species at Risk Act (SARA) Schedule 1/Annexe 1 Status: SC (15Aug2006)
Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Special Concern (05May2005)

NatureServe Conservation Status Factors

Global Abundance Comments: "Locally common" along the northern shores of Lakes Michigan and Huron (Morton, 1979).

Estimated Number of Element Occurrences: 6 - 80
Estimated Number of Element Occurrences Comments: Fifty-three extant occurrences in Michigan, one in New York (Guire and Voss, 1963), numbers in Ontario unknown.

Global Short Term Trend: Stable (unchanged or within +/- 10% fluctuation in population, range, area occupied, and/or number or condition of occurrences)
Global Short Term Trend Comments: Gradual loss of habitat to development, fragmentation and activities that reduce dune activity.

Threats: Threats include loss of habitat to development, fragmentation and activities that reduce dune activity.

Solidago houghtonii faces threats from residential development, off-road vehicles, other human-related disturbances and dune destabilization caused by fluctuating lake levels. Disruption of the naturally-occurring dune formation cycle (through development of roads, retaining walls, etc.) may lead to habitat loss through succession. Fragmentation of populations may prevent the expansion and colonization capabilities. Right-of-way maintenance (pavement recycling, shoulder widening, herbicide application, shoulder grading, mowing, salting, etc.) continues to threaten populations.

Fragility Comments: Prefers open, moderately active sand dune regions.

Environmental Specificity Comments: Endemic to shoreline habitats.

Distribution

U.S. States and Canadian Provinces

State/Province Conservation Status

- SX: Presumed Extirpated
- SH: Possibly Extirpated
- S1: Critically Imperiled
- S2: Imperiled
- S3: Vulnerable
- S4: Apparently Secure
- S5: Secure
- Not Ranked/Under Review (SNR/SU)

Conservation Status Not Applicable (SNA)

- Exotic
- Hybrid without Conservation Value

U.S. & Canada State/Province Distribution	
United States	MI, NY
Canada	ON

Range Map
No map available.

Global Range Comments: Lakes Michigan and Huron, concentrated near the north tip of lower Michigan; peripheral range extends north to Canadian shores of Georgian Bay, also 1 disjunct site in New York. The New York population is probably not "true" S. houghtonii per NY's STAXCOM; Mike Penskar considers it to be S. houghtonii "in the broad sense" (pers. comm. to K. Maybury 9/96).

Natural heritage records exist for the following U.S. counties	
State	County Name (FIPS Code)
MI	Charlevoix (26029), Cheboygan (26031), Chippewa (26033), Crawford (26039), Emmet (26047), Kalkaska (26079), Mackinac (26097), Presque Isle (26141), Schoolcraft (26153)
NY	Genesee (36037)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	Watershed Name (Watershed Code)
04	Fishdam-Sturgeon (04030112)+, Manistee (04060103)+, Boardman-Charlevoix (04060105)+, Manistique (04060106)+, Brevoort-Millecoquins (04060107)+, Lake Michigan (04060200)+, St. Marys (04070001)+, Carp-Pine (04070002)+, Lone Lake-Ocqueoc (04070003)+, Au Sable (04070007)+, Lake Huron (04080300)+, Lower Genesee (04130003)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A perennial herb. Stems are frequently tufted or clumped, up to 7.5 dm high. Leaves become linear upwards on the stems. The inflorescence is a terminal, more-or-less flat-topped cluster of relatively few, large flower heads, each consisting of about 6-9 pale to bright yellow ray flowers and several yellow disk flowers. The branches of the inflorescence are smooth, but the stalks of the flower heads are finely but distinctly hairy. Blooms in August.
Habitat Comments: Primarily in damp, sparsely vegetated, sandy interdunal flats and hollows; sometimes on associated low dunes and beaches or cobbly shores, or in nearby fens, marl-bogs, and swales. Also found in limestone crevices and pavements, including seasonally wet alvars. Occurs along the northern shores of Lakes Michigan and Huron, where plants are typically situated to benefit from cool moist lake winds. Often associated with *Solidago ohioensis*, *Lobelia kalmii*, and other calciphiles; occasionally associated with two other rare species: Pitcher's thistle (*Cirsium pitcheri*) and dwarf lake iris (*Iris lacustris*). 100 - 400 m.

Economic Attributes

Management Summary

Stewardship Overview: Monitoring needs include the assessment of population stability over time, as well as the species' response to natural habitat changes. Surrounding land use practices as they pertain to existing habitat should also be monitored. Research should include basic life history information needs (pollinator identification, selfing rates, seed set success, vegetative reproduction success and requirements of seed germination and establishment). Biosystematic and electrophoretic research should be conducted to determine the true origin and closest affinities of S. houghtonii. Demography, reproductive biology and genetic variability needs to be research in order to determine minimum viable size estimates for extant populations. Effects of competing species on S. houghtonii should also be researched, and continued survey of potential habitat be made. Management needs center on the protection of the habitat, pollinators and dispersal mechanism of the species. Restrictions to ORV traffic, trampling and shoreline development should be set.
Restoration Potential: Of the 52 known occurrences of this species in Michigan, 21 are at least partially contained within state or federal lands or nature preserves (Penskar 1989). Currently, two sites occur on public land, one within the Hiawatha National Forest in Michigan and administered by the US Forest Service, and a second on an island in Chippewa County, Michigan, administered by the US Bureau of Land Management (USFWS 1988b). Roughly 17 additional sites in Michigan occur on State or Federal lands (Crispin and Penskar 1990). The Nature Conservancy protects a single population at its Grass Bay Preserve (USFWS 1987b). Several additional sites lie in Michigan Department of Transportation rights-of-way which have been designated protected areas (Crispin and Penskar 1990).

Solidago houghtonii can apparently survive transplantation, as evidenced by the inland population established via this methodology along a lake in Cheboygan County, Michigan (Penskar 1989). If adequate conditions exist, transplantation in order to enhance the survivability of the species may be warranted.
Preserve Selection & Design Considerations: In order to adequately protect occurrences of S. houghtonii, efforts must be centered around the protection of the habitat in which the species occurs (alvar or sand dune). Protection of the naturally-occurring dynamic lakeshore which serves to create open sand dunes and interdunal wetlands is a must. Off-shore structures designed to reduce wave and wind erosion should not be installed. Sufficient habitat buffer should be secured so that outside influences will have little impact on the survival of the species.
Management Requirements: The primary management needs for S. houghtonii center around the protection of its habitat, pollinators and dispersal mechanisms. These efforts should act to restrict ORV access and trampling onto extant sites and natural areas, and restrict shoreline development and dune stabilization efforts (Ewert pers. comm., USFWS 1988).

Protection of the habitat should be foremost in the long-range recovery of S. houghtonii. Restriction of ORV vehicles may be improved through the posting of signs, improving barriers and increasing the monitoring of sites by law enforcement officials (Penskar 1989).

Means of protecting existing habitat from practices that would serve to destroy or alter the natural habitat or habitat-forming processes should also be developed. Off-shore structures designed to reduce erosion should not be installed. Artificial or dune-stabilization plantings should not be placed within suitable habitat. Sufficient buffer areas should be obtained to further protect extant sites. Preserve designs should also allow for migration and dispersal of plants as water levels fluctuate over time (Ewert pers. comm.).
Monitoring Requirements: Monitoring should assess population stability over time as well as the species' response to fluctuating water levels (Ewert pers. comm.). Population re-establishment at newly forming lakeshore areas should also be monitored. Monitoring of the environmental parameters within all habitat types should also occur.

Monitoring of surrounding land use is a significant need for S. houghtonii. Impacts on lands adjacent to existing populations may significantly alter the habitat at extant sites by reducing recolonization capabilities, disturbing sand dune formation factors and introducing exotic species.

Determinations of damage from natural or artificial disturbance regimes should be made (Penskar 1989).

Randomly-placed permanent plots should provide detailed life history information while tracking the status of S. houghtonii individuals. Mapping and marking of individuals within each plot will provide a means of detailing and tracking the survival of individual plants. Within each population undergoing monitoring, counts of total individuals, flowering individuals, rosette size, flowering stalks and habitat occupancy may be made. Monitoring should be conducted at several sites in varying habitats (both alvar and sand dune).

Monitoring of populations should occur on protected as well as unprotected sites if possible. Periodic, less-detailed surveys of existing populations should be undertaken in order to monitor protection efforts and elucidate threats and track the status of the populations. Contacts with landowners regarding the importance of the species should also be initiated and continued through time.

Management Programs: No active management is being conducted for this species in Michigan (Ewert pers. comm.). Existing trails, however, are generally away from populations of this species on TNC preserves.
Monitoring Programs: The Michigan Natural Features Inventory has been monitoring populations at two sites (Sturgeon Bay, Emmet County and Grass Bay Preserve, Cheboygan County) for the last eight years (Penskar pers. comm., Ewert pers. comm., Penskar 1989). Tagged individuals within permanent plots have been followed through time in order to accumulate information on the demographics of the species (Penskar pers. comm.).
Management Research Programs: At present, outside of the demographic monitoring/research listed under MONIT-PROGS-COMM, no known research is being conducted on the species.
Management Research Needs: Nearly all aspects of biology and autecology of S. houghtonii will require study as a prerequisite for ascertaining minimal viable population numbers (Penskar 1989). These include research on the demography, reproductive biology and genetic variability within the species. Basic life-history information pertaining to S. houghtonii should also be obtained through monitoring.

Detailed biosystematic and electrophoretic research on S. houghtonii needs to be conducted on the species in order to determine the species' true origin and its closest affinities (Penskar 1989). In addition, this research should provide additional information concerning the level of genetic heterozygosity within the species.

Information pertaining to the breeding system of S. houghtonii is essential in maintaining viable populations (Penskar 1989). At present, very little information is known concerning the reproductive biology of the species. Research in this area should be centered around pollinator identification, the degree of selfing within the species, as well as the success of seed set and seed dispersal. The significance of reproduction via vegetative propagation, and the requirements for seed germination and establishment should also be studied (Penskar 1989).

Detailed, long-term monitoring studies are needed in order to elucidate the colonization requirements and population dynamics of S. houghtonii (Penskar 1989). The effects of competing species (native or exotic) on S. houghtonii should also be considered as a research need.

Detailed surveys of areas within the range of S. houghtonii (Ontario and Michigan) should be made (Penskar 1989). Aerial photography interpretation should be used to identify appropriate habitat. Field searches of potential habitat should be made in order to identify new populations. New occurrences should be mapped, with detailed site information recorded pertaining to habitat, aerial extent of the populations, specific locations and threats (Penskar 1989).

Population/Occurrence Delineation

Alternate Separation Procedure: Use the Habitat-based Plant Element Occurrence Delimitation Guidance (2004).
Date: 01Oct2004

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 24Oct1990
NatureServe Conservation Status Factors Author: Losey, J.; rev. by W.R. Ostlie (MRO) and S. Gottlieb, rev. Penskar/Maybury (1996)
Management Information Edition Date: 05Nov1990
Management Information Edition Author: WAYNE R. OSTLIE (1990)

Botanical data developed by NatureServe and its network of natural heritage programs (see Local Programs), The North Carolina Botanical Garden, and other contributors and cooperators (see Sources).

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Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)

Fact Sheet

PDF Version

The eastern prairie fringed orchid is a federally threatened species. Threatened species are animals and plants that are likely to become endangered in the foreseeable future. Endangered species are animals and plants that are in danger of becoming extinct. Identifying, protecting, and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's endangered species program.

Photo by Mike Redmer

What is the eastern prairie fringed orchid?

The eastern prairie fringed orchid is 1 of at least 200 North American orchid species.

- **Appearance** - This plant is 8 to 40 inches tall and has an upright leafy stem with a flower cluster called an inflorescence. The 3 to 8 inch lance-shaped leaves sheath the stem. Each plant has one single flower spike composed of 5 to 40 creamy white flowers. Each flower has a three-part fringed lip less than 1 inch long and a nectar spur (tube-like structure) which is about 1 to 2 inches long.
- **Habitat Requirements** - The eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, even bogs. It

requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. A symbiotic relationship between the seed and soil fungi, called mycorrhizae, is necessary for seedlings to become established. This fungi helps the seeds assimilate nutrients in the soil.

- **Life History** - This orchid is a perennial herb that grows from an underground tuber. Flowering begins from late June to early July, and lasts for 7 to 10 days. Blossoms often rise just above the height of the surrounding grasses and sedges. The more exposed flower clusters are more likely to be visited by the hawkmoth pollinators, though they are also at greater risk of being eaten by deer. Seed capsules mature over the growing season and are dispersed by the wind from late August through September.
- **Reproduction/Pollination** - Night flying hawkmoths pollinate the nocturnally fragrant flowers of this white orchid. Visiting hawkmoths inadvertantly collect pollen on their proboscises as they ingest nectar from the flower's long nectar spurs.

Why is the eastern prairie fringed orchid threatened?

- **Historic Decline** - Early decline was due to the loss of habitat, mainly conversion of natural habitats to cropland and pasture.
- **Current Decline** - Current decline is mainly due to the loss of habitat from the drainage and development of wetlands. Other reasons for the current decline include succession to woody vegetation, competition from non-native species and over-collection.

What is being done to prevent extinction of the eastern prairie fringed orchid?

- **Listing** - The eastern prairie fringed orchid was added to the U.S. List of Endangered and Threatened Species on September 28, 1989 which benefits the species by focusing attention and money on its conservation.
- **Recovery Plan** - In September 1999 a recovery plan was completed by the U.S. Fish and Wildlife Service which delineates reasonable actions needed to recover and/or protect this orchid. The purpose of the plan is to promote the conservation of the threatened eastern prairie fringed orchid by implementing

identified tasks.

- **Recovery Plan Actions** - Protect habitat, manage habitat, increase size and numbers of populations, conduct surveys on known populations, conduct research, and review progress.

What can I do to help prevent the extinction of species?

- **Learn** - Learn more about the eastern prairie fringed orchid and other endangered and threatened species. Understand how the destruction of habitat leads to loss of endangered and threatened species and our nation's plant and animal diversity. Tell others about what you have learned.
- **Join** – Join a conservation group; many have local chapters. Volunteer at a known orchid site to help with annual demographic data collection or to help with prescribed burns at these sites. Or volunteer at a local nature center, zoo, or wildlife refuge.
- **Protect** – Protect remaining wetland areas by not filling them for residential or commercial development. Protect native plant species: do not plant non-native invasive plant species in your gardens or landscape projects. Protect water quality by minimizing use of lawn chemicals (i.e., fertilizers, herbicides, and insecticides), recycling used car oil, and properly disposing of paint and other toxic household projects.

The **Eastern Prairie Fringed Orchid Recovery Plan** and additional species information can be found at http://midwest.fws.gov/endangered. Copies of the recovery plan may be purchased by contacting the Fish and Wildlife Reference Service at 5430 Grosvenor Lane, Suite 110, Bethesda, Maryland 20814, or by phone 1-800-582-3421 or 301-492-6403 or on the Internet at http://fa.r9.fws.gov/r9fwrs/.

For more information contact:

U.S. Fish & Wildlife Service
Chicago Illinois Field Office
1250 South Grove St., Ste. 103
Barrington, Illinois
847-381-2253
Federal Relay Service 1-800-877-8339
http://midwest.fws.gov/Chicago

Fact Sheet Revised April 2005

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Heartleaf Plantain

Plantago cordata

Photo credits: *Troy Weldy*

Scientific Name *Plantago cordata* Lam.

Family Name Plantaginaceae Plantain Family

Did you know?
New York has more populations of this plant than any other state. It was only known from the tidal marshes along the Hudson River until the 1990s when a population was found along a stream in western New York. During river flooding and high tides, these plants may be submerged completely for long periods of time. The specific name refers to its heart-shaped leaves.

Summary

Protection Threatened Species in New York State, not listed federally.

This level of state protection means: listed species are those with: 1) 6 to fewer than 20 extant sites, or 2) 1,000 to fewer than 3,000 individuals, or 3) restricted to not less than 4 or more than 7 U.S.G.S. 7 ½ minute topographical maps, or 4) listed as threatened by U.S. Department of the Interior.

Rarity G4, S3

A global rarity rank of G4 means: This species is apparently secure globally (typically with more than 100+ populations), though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3 means: This plant is rare in New York (typically 21-50 populations, limited number of individuals, or limited range).

State Ranking Justification

There are nearly 30 known populations and sub-populations scattered along the freshwater tidal areas of the Hudson River, with a few disjunct populations in western New York. Many of these populations have fewer than 40 individuals, but at least three have more than 1,000 plants. There are some threats associated with this plant, but none are expected to have immediate or severe impacts. New York and Missouri share the greatest responsibility in ensuring the long-term protection of this unique *Plantago*.

Conservation Issues

Threats

Some of the smaller populations may be threatened with changes in the shoreline from floods or wake erosion.

Management Considerations

There are no management needs at this time but marina and boat dock development and river traffic should be assessed periodically.

Research Needs

There are no research needs at this time.

Short Term Trends

Populations seem stable at this time.

Long Term Trends

Based on limited evidence, this plant at least appears to have a similar distribution and population abundance as it did in early colonial days. There is even some suggestion that it has increased in abundance due to the protection of various areas along the Hudson River.

Habitat

A plant of two different areas and habitats in New York. In the Hudson Valley, it is restricted to the edges of freshwater intertidal mudflats, sandy or rocky shorelines of tidal creeks and other waterways, edges of freshwater tidal marshes, and gravel shores along the freshwater tidal portions of the Hudson River. In western New York, it is found along gravelly streams through red maple-hardwood swamps of the Tonawanda Oak Orchard Swamp drainage (New York Natural Heritage Program 2004). Semi-aquatic, in marshes and along streams, especially on calcareous substrate (Gleason & Cronquist 1991). In and along streams and swampy woods (Fernald 1970).

Associated Ecological Communities

Freshwater Intertidal Mudflats
A sparsely vegetated community characterized by low rosette-leaved aquatics. This community occurs on exposed intertidal mudflats where the water is fresh (salinity less than 0.5 ppt). This community is best developed where mudflats are nearly level so that broad expanses are exposed at low tide. The plants are completely submerged in 0.9 to 1.2 m (3 to 4 ft) of water at high tide and they are usually coated with mud.

Freshwater Intertidal Shore
A community of the intertidal gravelly or rocky shores of freshwater tidal rivers and creeks, sometimes occurring at the base of cliffs. The vegetation may be very sparse.

Freshwater Tidal Creek

The aquatic community of a shallow, tidally flooded freshwater creek with submerged areas averaging less than 2 m (6 ft) deep at low tide.

Freshwater Tidal Marsh
A marsh community that occurs in shallow bays, shoals, and at the mouth of tributaries of large tidal river systems, where the water is usually fresh (salinity less than 0.5 ppt), and less than 2 m (6 ft) deep at high tide. Typically there are two zones in a freshwater tidal marsh: a low-elevation area dominated by short, broadleaf emergents bordering mudflats or open water, and a slightly higher-elevation area dominated by tall grass-like plants.

Marsh Headwater Stream
The aquatic community of a small, marshy perennial brook with a very low gradient, slow flow rate, and cool to warm water that flows through a marsh, fen, or swamp where a stream system originates. These streams usually have clearly distinguished meanders (i.e., high sinuosity) and are in unconfined landscapes.

Other Probable Associated Communities

Red maple-hardwood swamp

Associated Species

Red Maple (*Acer rubrum var. rubrum*)
Silver Maple (*Acer saccharinum*)
Broad-leaved Water-plantain (*Alisma subcordatum*)
Waterhemp Pigweed (*Amaranthus cannabinus*)
False Indigobush (*Amorpha fruticosa*)
American Hogpeanut (*Amphicarpaea bracteata*)
Maryland Bur-marigold (*Bidens bidentoides*)
Nodding Beggar-ticks (*Bidens cernua*)
Broad Waterweed (*Elodea canadensis*)
Common Sneezeweed (*Helenium autumnale*)
Yellowseed False Pimpernel (*Lindernia dubia*)
Cardinal Flower (*Lobelia cardinalis*)
Marsh Seedbox (*Ludwigia palustris*)
Fringed Loosestrife (*Lysimachia ciliata*)
Golden Club (*Orontium aquaticum*)
Green Arrow-arum (*Peltandra virginica*)
Springs Clearweed (*Pilea fontana*)
Canada Clearweed (*Pilea pumila*)
Pickerelweed (*Pontederia cordata*)
Native Blackeyed Susan (*Rudbeckia hirta*)
Grassleaf Arrowhead (*Sagittaria graminea*)
Broadleaf Arrowhead (*Sagittaria latifolia*)
Water Chestnut (*Trapa natans*)
Riverbank Grape (*Vitis riparia*)
Eastern Wild Rice (*Zizania aquatica*)

Range

The map shows the known locations for heartleaf plantain (black dots) based on the New York Natural Heritage Program database . A general approximation of the potential range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)

Best Places to See

Rogers Island Wildlife Management Area (Columbia County)
Schodack Island State Park (Greene County)
Stockport Creek Flats (Columbia County)

New York State Distribution

With the exception of a few populations in the Tonawanda Creek drainage of western New York, all known and historical populations are located along the Hudson River. There are historical records from New York City to the Castleton Bridge. Today, extant populations along the Hudson River are only known within freshwater tidal areas from the Rondout Creek mouth northward towards Troy.

Global Distribution

Heartleaf plantain is characterized by a widespread geographical range within which it is highly localized. A high proportion of the populations are located along the Hudson River, but populations range from New York, south to Virginia, North Carolina, Georgia, and Alabama. It is disjunct inland to Ohio, southern Ontario, Wisconsin, and south through the Mississippi Valley.

Identification Comments

This is a short plant, under 30 cm, with compact clumps of many large, shiny-green, strongly-veined, heart-shaped leaves up to 25 cm long and 20 cm wide. The leaves arch out on long stalks from the center of the clump and are often covered with a fine layer of mud from being submerged during high tide. The thick pink flower stalks arise from the center of the clump in early spring and are topped by a spike covered with many tiny greenish flowers with stamens that stick out. These mature into small, green, egg-shaped fruits.

Identifying Characteristics

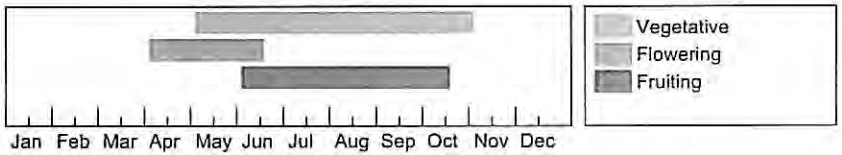
A plant of wet soils with several long, fleshy roots that are 0.5-1.3 cm thick. One of these roots will often become horizontal. The leaves are large and heart-shaped when mature. The main lateral veins tend to arise from the midrib within the blade The lower 2-4 lateral ribs are scattered, but confluent with the midrib. The inflorescence axis is exposed between the flowers.

Best Life Stage for Identifying This Species

A plant with flowers or fruits and expanded leaves is best for proper identification. At a minimum, one needs fully expanded leaves along with a habitat description.

The Best Time to See

This plantain flowers from April (starting before the leaves come out) through July with mature fruits present in August and September. The ideal survey period is mid-May to early October.



The time of year you would expect to find Heartleaf Plantain in New York.

Similar Species

Common plantain (*Plantago major*) has slender fibrous roots, solid stems, and lower lateral leaf ribs approximate to the midrib but not confluent with it.

Bald Eagle

Bald Eagle

Photo credits: *U.S. Fish and Wildlife Service*

Scientific Name *Haliaeetus leucocephalus* (Linnaeus, 1766)

Family Name Accipitridae
Hawks, Kites, Eagles

Did you know?
The word "bald" in bald eagle is shortened from the word "piebald" which means spotted or patched, especially in black and white. Piebald is a fitting description for the bald eagle because of its dark body and white head and tail (Cornell Lab of Ornithology 2003).

Summary

Protection Threatened Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species likely to become an endangered species within the foreseeable future in New York. 2) Any species listed as threatened by the U.S. Department of the Interior.

Rarity G5, S2B,S2N

A global rarity rank of G5 means: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S2B,S2N means: Typically 6 to 20 breeding occurrences or very limited breeding acreage in New York State and typically 6 to 20 non-breeding (usually winter residents) occurrences in New York State.

State Ranking Justification

In 2007, there were approximately 122 occupied bald eagle nest sites of which 34 failed (did not fledge young). There are many sites on public land. During the non-breeding season, Bald Eagles are found throughout the state, but they tend to concentrate at wintering areas and roosts at about four open water sites in the state. While breeding and wintering populations are increasing in New York they are still faced with many threats including development, human disturbances, contaminated food base, collision with high speed trains, towers, wind generators, and electrical lines.
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

While Bald Eagle breeding and non-breeding populations are increasing in New York, there are still significant threats to the persistence of this species in the state. Habitat loss or alterations are probably the most significant threats. Many parts of New York are under high development pressure. This species prefers relatively undisturbed, wooded areas near wetlands or large bodies of water with abundant prey (fish). Areas with development or other human disturbances would likely be unsuitable for nesting and wintering Bald Eagles. Habitat destruction has been more extensive in the Bald Eagle wintering range (Nye 1994). Disturbance to wintering birds can be especially detrimental because it may deplete the birds' energy reserves. Bald Eagles spend most of the winter sedentary (approximately 99%); energy is reserved for foraging, feeding, thermoregulation, and other essential activities (Nye 1994). Depleted energy may result in a drop in an individual's reproductive rate for the year, or death (Nye 1994). In addition, if a feeding bald eagle is disturbed it may abandon its food and most likely will not return to the area for the rest of the day. Banning DDT has greatly increased the reproductive health of bald eagles, but there are many other contaminants that continue to affect the reproductive success of adult pairs such as lead, mercury, and PCBs. Other threats include vehicular collisions (such as high speed trains), and collisions with towers, wind generators, and electrical lines (McGowan and Corwin 2008 and Nye 2005).

Management Considerations

Human disturbances should be minimized at breeding and wintering sites. Pedestrians can be more disturbing to Bald Eagles than some motorized vehicles (Nye 1994). A 500 meter buffer around the nest may be adequate (NatureServe 2005). A minimum buffer of 250-300 meters is recommended for perch and feeding sites; others have recommended a greater distance (Nye 1994). It may be beneficial to post signs and restrict access to areas when breeding or wintering Bald Eagles are present. Vegetative buffer zones may help minimize some disturbances associated with development (Nye 1994). Avoid the addition of new, tall structures such as wind-generators, towers, and electrical lines near breeding and wintering locations.

Research Needs

Determine the essential Bald Eagle breeding and wintering habitats through field observations and radio telemetry. Collect more data about site fidelity, familial relationships to habitat use, migratory patterns/pathways, and home ranges of breeding and wintering Bald Eagles in New York. Sample for contaminant loads periodically (Nye 2005).

Short Term Trends

The number of breeding and wintering Bald Eagles has been increasing since the 1970s when the population was at one breeding pair. The pair often failed at nesting attempts apparently because of thin egg shells (Nye 1982). The population increase in recent years has been accomplished through protection and active management, as well as through enhanced reproduction after the DDT ban. The Department of Environmental Conservation started a reintroduction program that involved egg transplants, fostering, and hacking (hand rearing and releasing older nestlings in the absence of adult birds). Hacking proved to be the most successful in 1976 and 1988. A total of 198 nestlings were released at four sites in the state. Thirty-two of those birds did not survive; 16 were illegally shot (Levine 1998). In 1980 two hacked birds nested in Jefferson County. In 2007, there were 122 active breeding pairs and a total of 151 young fledged in the state (Nye 2007). In addition, there are many immatures and non-breeding adults that reside in New York during the spring and summer months. Between 2002 and 2007, 324-442 wintering birds were counted at the four main areas where the birds concentrate. The numbers likely vary based on the severity of winter weather. It is not certain how stable the Bald Eagle population is in New York at this time. The trends are mostly dependant on how much Bald Eagles will be affected by habitat loss and alterations due to development. Confirmed breeding was reported from two blocks during the first Breeding Bird Atlas. A dramatic increase is noted with the second Breeding Bird Atlas with 124 blocks with confirmed breeding (Andrle and Carroll 1988, McGowan and Corwin 2008). Breeding Bird Survey trend data is not available for Bald Eagles.

Long Term Trends

The earliest records of nesting Bald Eagles are from the late 1800s when breeding was documented in Essex, Erie, Jefferson, and Dutchess counties, although Bald Eagles were most likely present in New York before then. Between 1860 and 1960 there were 72 verified Bald Eagle nest sites in New York. Of the 72 nests, some were alternate nest sites and not all of the nests were occupied each year (Andrle and Carroll 1988). The population decline began before World War II for a number of reasons including habitat loss, increased human disturbances, and illegal shootings (Levine 1998). In 1946, DDT, an agricultural pesticide, was in widespread use. At the onset of DDT use the Bald Eagle breeding population was at approximately 20 pairs (Levine 1998). Runoff from areas sprayed with DDT made its way into the aquatic ecosystem. DDT accumulated in the tissues of fish and eventually poisoned Bald Eagles. DDT and its breakdown products caused egg shell thinning in Bald Eagles and many other raptor species. As a result, birds incubating eggs often broke the egg shells before the eggs hatched. By 1972, when DDT use was banned in the United States, only one breeding pair remained in New York and the pair rarely fledged young. Since then Bald Eagle populations have been recovering with 122 known active breeding pairs in New York in 2007. Breeding Bird Survey trend data is not available for Bald Eagles (Sauer et al. 2007). There is some uncertainty on what

the future holds for this species in New York because of various anthropogenic factors (McGowan and Corwin 2008 and Nye 2005).

Habitat

Bald Eagles are typically found near large bodies of water, such as bays, rivers, and lakes, that support a healthy population of fish and waterfowl, their primary food source. Generally, Bald Eagles tend to avoid areas with human activities. They will perch in either deciduous or coniferous trees. Large, heavy nests are usually built near water in tall pine, spruce, fir, cottonwood, oak, poplar, or beech trees. Non-breeding adults and wintering birds are known to have communal roost sites. During the winter, the roost sites may be farther away from food sources. This may be due to the need for a more sheltered, warmer area. Feeding areas during the winter months usually have a high concentration of fish and waterfowl and open water (NatureServe 2005).

Associated Ecological Communities

Acidic Talus Slope Woodland
An open to closed canopy woodland that occurs on talus slopes (slopes of boulders and rocks, often at the base of cliffs) composed of non-calcareous rocks such as granite, quartzite, or schist.

Allegheny Oak Forest
A hardwood forest that occurs on well-drained sites in the unglaciated portion of southwestern New York. This is a forest of mixed oaks with a diverse canopy and richer ground flora than other oak communities in the state.

Appalachian Oak-hickory Forest
A hardwood forest that occurs on well-drained sites, usually on ridgetops, upper slopes, or south- and west-facing slopes. The soils are usually loams or sandy loams. This is a broadly defined forest community with several regional and edaphic variants. The dominant trees include red oak, white oak, and/or black oak. Mixed with the oaks, usually at lower densities, are pignut, shagbark, and/or sweet pignut hickory.

Black Spruce-tamarack Bog
A conifer forest that occurs on acidic peatlands in cool, poorly drained depressions. The characteristic trees are black spruce and tamarack; in any one stand, either tree may be dominant, or they may be codominant. Canopy cover is quite variable, ranging from open canopy woodlands with as little as 20% cover of evenly spaced canopy trees to closed canopy forests with 80 to 90% cover.

Calcareous Talus Slope Woodland
An open or closed canopy community that occurs on talus slopes composed of calcareous bedrock such as limestone or dolomite. The soils are usually moist and loamy; there may be numerous rock outcrops.

Chestnut Oak Forest
A hardwood forest that occurs on well-drained sites in glaciated portions of the Appalachians, and on the coastal plain. This forest is similar to the Allegheny oak forest; it is distinguished by fewer canopy dominants and a less diverse shrublayer and groundlayer flora. Dominant trees are typically chestnut oak and red oak.

Floodplain Forest
A hardwood forest that occurs on mineral soils on low terraces of river floodplains and river deltas. These sites are characterized by their flood regime; low areas are annually flooded in spring, and high areas are flooded irregularly.

Hemlock-northern Hardwood Forest
A mixed forest that typically occurs on middle to lower slopes of ravines, on cool, mid-elevation slopes, and on moist, well-drained sites at the margins of swamps. Eastern hemlock is present and is often the most abundant tree in the forest.

Oak-tulip Tree Forest
A hardwood forest that occurs on moist, well-drained sites in southeastern New York. The dominant trees include a mixture of five or more of the following: red oak, tulip tree, American beech, black birch, red maple, scarlet oak, black oak, and white oak.

Red Maple-hardwood Swamp
A hardwood swamp that occurs in poorly drained depressions, usually on inorganic soils. Red maple is usually the most abundant canopy tree, but it can also be codominant with white, green, or black ash; white or slippery elm; yellow birch; and swamp white oak.

Red Maple-tamarack Peat Swamp
A swamp that occurs on organic soils (peat or muck) in poorly drained depressions. These swamps are often spring fed or enriched by seepage of mineral-rich groundwater resulting in a stable water table and continually saturated soil. The dominant trees are red maple and tamarack. These species usually form an open canopy (50 to 70% cover) with numerous small openings dominated by shrubs or sedges.

Rich Mesophytic Forest
A hardwood or mixed forest that resembles the mixed mesophytic forests of the Allegheny Plateau south of New York but is less diverse. It occurs on rich, fine-textured, well-drained soils that are favorable for the dominance of a wide variety of tree species. A canopy with a relatively large number of codominant trees characterizes this forest. Canopy codominants include five or more of the following species: red oak, red maple, white ash, American beech, sugar maple, black cherry, cucumber tree, and black birch.

Spruce-fir Swamp
A conifer swamp that typically occurs in a drainage basin but also can occur at the edge of a lake or pond or along gentle slopes of islands. These swamps are usually dense, with a fairly closed canopy (80 to 90% cover). The dominant tree is usually red spruce. Codominant trees include balsam fir and red maple. In the Catskills, balsam fir may be absent, and in the Adirondacks, black spruce or white spruce may replace red spruce as a dominant tree.

Spruce-northern Hardwood Forest
A mixed forest that occurs on lower mountain slopes and upper margins of flats on glacial till. This is a broadly defined community with several variants; it is one of the most common forest types in the Adirondacks. Codominant trees are red spruce, sugar maple, American beech, yellow birch, and red maple, with scattered balsam fir.

Other Probable Associated Communities

Beech-maple mesic forest
Maple-basswood rich mesic forest
Pine-northern hardwood forest
Pitch pine-oak-heath rocky summit
Shale talus slope woodland

Range

The map shows the known locations for bald eagle (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

As the Bald Eagle is a sensitive species, no sites are listed. Contact local raptor centers to find out if they have any indivi

New York State Distribution

Bald Eagles breed throughout New York State, usually in areas with large bodies of water that support high fish populations. They are absent from Long Island, where they were known historically, at this time. Wintering areas are concentrated in four main areas: the Upper Delaware River, the Saint Lawrence River, the Lower Hudson River, and the Sacandaga River.

Global Distribution

Breeding: Bald Eagles breed near water from Alaska throughout Canada and in scattered areas throughout the United States. Within the United States, they are very local breeders in the Great Basin and prairie and plains regions in interior North America, where the breeding range recently has expanded to include Nebraska and Kansas. Small numbers of breeding pairs have been found in Mexico. Non-breeding: Generally, non-breeding Bald Eagles are found throughout the breeding range except in the far north (AOU 1983 cited in NatureServe 2005, Sibley and Monroe 1990 cited in NatureServe 2005). Most commonly they are found from southern Alaska and southern Canada southward. The Chilkat Bald Eagle Preserve in Alaska supports the largest wintering population anywhere (Ehrlich et al. 1992 cited in NatureServe 2005). Winter concentrations occur in British Columbia-northwestern Washington, along the Missouri and Mississippi rivers, and in northern Arkansas. One of the largest fall (mid-October to mid-December) migrant concentrations (200-300 birds at any one time, close to a thousand individuals through the season) occurs at Hauser Lake near Helena, Montana.

Identification Comments

Identifying Characteristics

Adult bald eagles can easily be identified by their white head, white tail, and large, bright yellow bill. The plumage is otherwise dark. Immature bald eagles are dark with variable amounts of light splotching on the body, underwing coverts, flight feathers, and tail base. They have a grey bill. Adult plumage and a yellow bill are attained at four to five years of age. The average size of an adult is 79-94 cm (31-37 inches) long with a wingspan of 178-229 cm (70-90 inches) (National Geographic Society 1987). Bald eagle nests are built near the top of sturdy, tall trees. The nest is a flat-topped mass of sticks that is lined with fine vegetation such as rushes, grasses, and mosses. Each year, the breeding pair adds to the nest resulting in a massive nest that can be seven to eight feet across and weigh up to several tons. Eggs are slightly smaller than a domestic goose egg and are dull white. Their call has been described as a harsh cackle, kleek-kik-ik-ik-ik or a lower kak-kak-kak.

Behavior

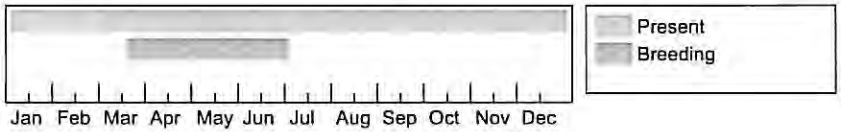
At approximately 5 years of age, Bald Eagles reach sexual maturity. They typically mate for life, but exceptions are noted. Courtship displays can be observed late winter to early spring and involve elaborate aerial displays; the pair will dive with locked talons. Males and females build nests together and continue to add sticks each breeding season. In addition, the pair incubates and cares for young together. However, the female takes on most of this responsibility. After the breeding season, Bald Eagles are often found at communal roosts and feeding areas.

Diet

The Bald Eagle's primary food sources are fishes, injured waterfowl and seabirds, various mammals, and carrion. They are opportunistic feeders; they will hunt live prey, scavenge, and pirate food from other birds.

The Best Time to See

Concentrations of Bald Eagles can be found in New York during the winter months. In southeastern New York, Bald Eagles begin arriving on the wintering area in early November and are most abundant in February. During late February to early March, Bald Eagles are moving to their breeding territories.



The time of year you would expect to find Bald Eagle in New York.

Similar Species

Osprey(Pandion haliaetus): Ospreys have a white head like the Bald Eagle, but unlike the Bald Eagle, they have a prominent dark eye stripe. Ospreys are white below and dark brown above. When in flight, ospreys' long, narrow wings are bent back at the wrist.

Golden Eagle(Aquila chrysaetos): Immature Bald Eagles differ from immature Golden Eagles in that the Golden Eagle has feathered legs and white is limited to the flight feathers. Also, Golden Eagles soar with the outer part of the wings lifted in a slight dihedral.

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Birds (Aves)
└ **Order** Raptors (Falconiformes)
└ **Family** Accipitridae (Hawks, Kites, Eagles)

Conservation Issues

Threats

Current State and Federal regulations (i.e., the Migratory Bird Treaty Act) appear to offer adequate protections to the birds themselves, though habitat protections such as the New York State Wetlands Law, and Section 404 of the Clean Water Act are not adequate to prevent all wetland habitat losses (Holst 2005). Loss, degradation, isolation, and fragmentation of wetlands via drainage for agriculture and/or urbanization are often considered to be the the primary factors for the decline of this species and other freshwater marshbirds. For example, in Canada nearly half of the wetlands along the St. Lawrence River were destroyed between 1945-75, and a similar pattern occurred on the U.S. side (Novak 1992). This has left many localized marshes that were too small themselves, or were not part of larger wetland complexes, unsuitable because Black Terns are an area-dependent species (Brown and Dinsmore 1984). Water level management on Lake Ontario and the St. Lawrence Seaway has undoubtedly negatively affected lakeshore marsh habitat by allowing succession to proceed, leading to the dominance of wetlands by single species monocultures such as Typha and/or Phragmites. Since the mid-1980s, virtually all of the Black Tern colonies in lakeshore marshes in Monroe/Wayne and Oswego/Jefferson/St. Lawrence Counties have either disappeared entirely or dramatically declined so that today virtually all Black Terns nest on inland marshes on public lands which have the ability to manipulate water levels. Lake Ontario/ St. Lawrence Seaway water level stabilization, implemented primarily for shipping interests, has curtailed dramatic annual water level fluctuations on these commercial waterways leading to compositional changes in marsh vegetation, diminishing their quality as tern nesting habitat (McGowan and Corwin In press). Because the Black Tern is sensitive to water level fluctuations it has been adopted as a performance indicator species by the International Joint Commission Lake Ontario - St. Lawrence River Study (www.losl.org). At inland marshes, siltation and run-off from intensive agricultural practices and urbanization leads to the eutrophication and chemical contamination of wetlands, affecting habitat quality and diminishing the invertebrate prey base. One study in the northern Great Plains found that wetland invertebrate and seedling emergence was greatly reduced by agricultural sediment loads, hampering successional changes and severely impacting nearly all key ecological functions of wetlands (Gleason et al. 2003). The highly intensive agricultural practices (i.e., large monocultures needing heavy inputs of synthetic chemicals and use of heavy machinery) adopted especially since the 1980s have been implicated not only in the severe decline of Black Terns in Europe (Bientema 1997), but also in the general decline of a whole suite of agricultural and wetland birds in the St. Lawrence Valley (Jobin et al. 1996), as well in the entire central and eastern U.S. (Murphy 2003). In certain other cases, lack of stochastic flushing events (i.e., flooding) promotes the establishment of large monotypic stands of emergent vegetation (cattails) as well as exotic invasive plants like purple loosestrife and phragmites which can become too dense and crowd out native emergent plants which provide more favorable nesting cover for nesting Black Terns and other marshbirds (Holst 2005). In addition to diminishing the insect and fish prey base and causing dietary problems for Black Terns (Bientema 1997), chemical contaminants, including organochlorines (PCBs, DDT, DDE, Dieldrin) have been detected in Black Tern eggs in Canada (Weseloh et al. 1996) and the U.S. Severe contaminant concentrations, and very poor reproductive success at a site in Monroe County was reported by Firstencel (1987). The levels of contaminants she found were about two times higher than in Black Tern eggs in Ontario and Quebec (Weseloh et al. 1996), likely causing decreases in

Black Tern

Black Tern in breeding plumage

Scientific Name *Chlidonias niger* (Linnaeus, 1758)

Family Name Laridae
Skuas, gulls, terns, and skimmers

Did you know?
This species is most appropriately considered a tropical marine bird since it spends nearly two-thirds of the year on salt water in the southern hemisphere, coming north only to breed on freshwater marshes for a brief period in the summer (Nisbet 1997).

Summary

Protection Endangered Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species in imminent danger of extirpation or extinction in New York. 2) Any species listed as endangered by the United States Department of the Interior.

Rarity G4, S2B

A global rarity rank of G4 means: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S2B means: Typically 6 to 20 breeding occurrences or very limited breeding acreage in New York State.

State Ranking Justification

Black Terns were listed as an endangered species in New York State in 2000 and have been declining since the mid-1960s. Prior to 1980, the tern population was comprised of over 50 different colonies with four containing more than 100 pairs each. By 2007 only 12 different marshes supported colonies, with the largest having fewer than 50 pairs (McGowan and Corwin In Press). The range contraction within New York parallels a wider regional contraction on the species' range margin in the northeastern U.S. and Canada. The causes of this decline are unresolved and ongoing.
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

This type of management strategy requires at least three nearby marsh impoundments to be managed on a staggered 3 year management cycle, with one of the impoundments being drained, disced, and re-flooded each year. Such a strategy is time and labor intensive, costly, and necessitates a large wetland mosaic amenable to intensive management with heavy machinery to disc up marsh vegetation (Shambaugh 1996). Since many managed areas will not have the resources and area available to implement such an intensive strategy (which also is beneficial to other marshbirds and waterfowl) other, less costly strategies have been attempted in the northern Great Plains (Linz et al. 1994; Linz and Blixt 1997). Because these management strategies involved the application of potentially dangerous herbicides to reduce cattail growth, the authors themselves recommended that manual methods were preferred, and that herbicides be used only as a last resort (Linz and Blixt 1997). Water level control measures, discing, and healthy muskrat populations could potentially all be used in concert to control dense monotypic stands of vegetation and promote the hemi-marsh stage (a 50:50 ratio of well interspersed vegetation and open water) (Zimmerman et al. 2002).

Black Terns use different wetlands or different locations within a wetland mosaic from year to year because suitability varies with yearly fluctuations of water levels and resulting vegetational changes. The presence of Black Terns is related to the total area of wetlands in the surrounding landscape; thus wetland complexes must be maintained because they are more likely to have at least some wetland components with water and plant regimes favorable for nesting. Areas of suitable habitat >10 ha that have equal proportions of well-interspersed emergent vegetation and open water, with stable water levels (> 30 cm depth) throughout the breeding season (May-June). Maintaining stable water levels during the nesting season decreases the probability of nest destruction and decreases the chances of nest predation (Zimmerman et al. 2002).

Research Needs

Nisbet (1997) summarized important research needs for Black Terns: 1) improve ecological understanding on the wintering grounds; 2) monitoring population trends in the main range in the prairie states and provinces; 3) measure factors limiting productivity; 4) study foraging, diet, and nutrition in relation to habitat quality, water quality, and prey populations; 5) study behavioral ecology, including nocturnal incubation, mate fidelity, spacing behavior, coloniality, dispersal, and post-fledging parental care; 6) study the demography of metapopulation dynamics; and 7) implement comparative studies across regions.

In New York specifically, determining the cause of the decline is paramount so that steps can be taken to mitigate limiting factors. Two hypotheses have generally emerged: 1) productivity problems related to contaminant effects on the birds themselves and/or their prey base, or 2) habitat alterations associated with wetland loss and modifications. Declines of this species in Europe (Bientema 1997) have essentially tied these factors together such that land use changes associated with intensive agriculture and urbanization have led to the eutrophication and contamination of wetlands, which in turn collapses the prey base and lowers productivity below that which can sustain the population. This hypothesis has also been invoked to explain ongoing declines in other agricultural avifauna in both Europe and North America (Murphy 2003).

eggshell thickness and nest failure. Because contaminant concentrations in sediments were low, Firstencel suggested that the high levels of contaminants were coming from fish (greater bioaccumulation than insects) which the terns feed to their young. Because many banned pesticides are still used in South America where the birds spend most of the year feeding on fish, exposure on the wintering grounds must also be be considered to be high. Nevertheless, strong circumstantial evidence suggests that the high levels of contamination reported by Firstencel (1987) in western New York may be at least partially responsible for the complete elimination of Black Terns from this (more industrialized) region of the State. The loss of the pre-migratory staging area at the mouth of the Niagara River, another highly polluted waterway, also lends some support to the deleterious role that chemical contamination has played in the severe decline of the Black Tern in New York. Nisbet (1997) reported that population declines in Europe were more pronounced in more highly degraded habitats than in more natural ones. Various types of human disturbance have often been cited as potential threats to nesting Black Terns. Excessive boat traffic as well as waves caused by boat wakes can swamp nests, but boat traffic did not appear to have overtly visible effects on nesting terns at four different colonies in New York (Novak 1992). Canoes moving through areas where terns are nesting produces mobbing behavior by the adults and may increase the likelihood of nest abandonment, predation or exposure to inclement weather (Novak 1992). Shealer et al. (2000) demonstrated that Black Terns have a high tolerance for intensive disturbance (repeated nest visits for trapping and banding) but that these nests suffered high (47%) mortality rates mostly due to predation. Likewise Heath and Servello (2008) documented the importance of nest predation to chick survival, but were unable to identify the predator species. Many different birds and mammals have been implicated as Black Tern nest predators (Heath and Servello 2008), but extreme caution should be taken when high nest mortality rates are provided by researchers visiting nests because both bird and mammal predators can follow human scent trails looking for prey.

Management Considerations

A review of management actions at the Iroquois/Tonawanda/Oak Orchard wetland complex in western New York showed a consistent pattern of response by nesting Black Terns (Hickey and Malecki 1997). After the drawdown of water levels in an impoundment, the terns recolonized the wetland the year following re -flooding, reaching peak numbers in the second and third years after the drawdown. In the first year post-inundation, vegetation responded, the muskrat population grew and Black Tern nesting was likely limited by the lack of suitable nest substrates. In the second and third years, muskrat (Ondatra zibethicus) feeding and house-building activities removed vegetation from the marsh, improving the interspersion of vegetation to water (50:50 ideal) and providing nesting substrates. Because muskrat structures are heavily used as nesting substrates, especially in marshes dominated by less persistent emergents such as bur-reed, their population dynamics (including the effects of trapping), suggests that muskrat ecology is an important feature to Black Tern nesting success (Hickey and Malecki 1997). Thus, a 4-6 year cycle of drawdown should be used, with re-flooding during years 2-5. Water levels should be maintained higher than normal in the first year following re-flooding in order to allow muskrat populations to recover. Removal of vegetation by muskrat herbivory benefits Black Terns by improving the interspersion of vegetative cover and open water and by increasing the availability of nesting substrates (Zimmerman et al. 2002). Because nest substrates are often limiting, the placing of artificial nest platforms, especially in the first year after drawdown, may enhance productivity (Hickey 1997).

Short Term Trends

Since 1989 the state-wide population has been monitored semi-annually (Mazzocchi and Roggie 2004) and has declined at an annual rate of 2.2%. At the beginning of the monitoring program, Black Terns bred in 28 different marshes (44% of those monitored), while in 2007 only 12 different marshes supported breeding colonies (13% of those monitored) and only about half of those were of substantial size. Breeding colonies appear to be coalescing into fewer large wetland complexes on publicly managed lands, with the smaller outlying sites becoming extirpated. In particular, the birds have disappeared entirely from the Lake Ontario Plains in Wayne and Monroe counties in western NYS, which supported over 40 pairs as recently as the late 1980s. Nevertheless, the overall number of breeding pairs throughout the state apparently bottomed out around 2000, and by 2007 had climbed to over 200 pairs for the first time since the late 1990s.

Long Term Trends

Black Terns have nested in New York since at least the early 1900s and while turn-of -the century records are few, Eaton (1910) mentioned 150 pairs at what is now Lakeview WMA in 1903, a site that supported only 2 pairs in 2007. Prior to 1980, the statewide tern population was comprised of over 50 different colonies with four containing more than 100 pairs each. By 2007 only 12 different marshes supported colonies, with the largest having less than 50 pairs (McGowan and Corwin In Press). Montezuma NWR also had a large turn of the century colony and this wetland complex has a fairly complete set of population estimates beginning in the early 1940s; it is likely illustrative of popualtion trends throughout the state. Unpublished data (NYS DEC Files) gathered by Refuge staff show a marked population increase from the 1940s to about 1951. During the 1950s the breeding population fluctuated wildly from over 1200 pairs in some years to less than 100 pairs in other years. Beginning in the late 1960s the population crashed to below 150 pairs, again fluctuating quite dramatically from year to year until about 1980 when another crash occurred. Since the early 1980s the breeding population has remained low bottoming out during the 1990s when no terns nested at all in Montezuma; by 2007 18 pairs were counted.

Habitat

Black Terns breed in productive freshwater marshes, typically in sites with mixtures of emergent vegetation and open water. In western New York Hickey and Malecki (1997) found that Black Terns nest primarily in sparse to moderately dense bur-reed about 26-50 cm tall in areas with a 50:50 open water/vegetation ratio, and water depths of about 50 cm. These findings were consistent with other general habitat descriptions throughout the range including in northern New York. Muskrat structures were used heavily and may reflect the vegetation type and processes that foster nest substrate formation. In marshes with less persistent emergents such as bur-reed, nest substrate formation may depend heavily on muskrat activities. Where terns nest in cattail dominated marshes, such as in northern New York (Mazzocchi et al. 1997), muskrats may not be as important since floating vegetation mats and rootstalks may form more often in marshes dominated by these more persistent emergents (also bulrushes). Exposed perches such as floating logs, fallen trees, and standing dead trees and shrubs are used as stations for resting, copulation and feeding recently fledged young (Novak 1992).

Black Terns are an area dependent species and in addition to marsh size, proximity to other wetlands is a critical factor in habitat selection. Terns favor marshes > 20 ha, but they will nest in marshes between 5-11 ha only if they are part of a larger wetland complex (Brown and Dinsmore 1984; Novak 1992). Characteristics of entire landscapes must be considered in habitat assessments because wetlands that do not correspond to landscape-scale habitat requirements may not be suitable despite favorable local conditions. Suitable nest sites occur within regenerating or degenerating wetlands where vegetation structure, rather than species of vegetation, dictates suitability (Naugle et al. 2000).

Associated Ecological Communities

Deep Emergent Marsh
A marsh community flooded by waters that are not subject to violent wave action. Water depths can range from 6 in to 6.6 ft (15 cm to 2 m). Water levels may fluctuate seasonally, but the substrate is rarely dry, and there is usually standing water in the fall.

Impounded Marsh
A marsh (with less than 50% cover of trees) in which the water levels have been artificially manipulated or modified, often for the purpose of improving waterfowl habitat.

Shallow Emergent Marsh
A marsh meadow community that occurs on soils that are permanently saturated and seasonally flooded. This marsh is better drained than a deep emergent marsh; water depths may range from 6 in to 3.3 ft (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the soil is exposed during an average year.

Associated Species

American Bittern (*Botaurus lentiginosus*)
American Coot (*Fulica americana*)
Common Moorhen (*Gallinula chloropus*)
Least Bittern (*Ixobrychus exilis*)
Pied-Billed Grebe (*Podilymbus podiceps*)
Virginia Rail (*Rallus limicola*)

Range

The map shows the known locations for black tern (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Iroquois/Tonawanda/Oak Orchard complex (Genesee County)
Perch River WMA (Jefferson County)
Salmon River Mouth (Oswego County)

New York State Distribution

New York forms the southeastern edge of this species' range in North America. Currently it is restricted primarily to a handful of managed inland freshwater marshes in Jefferson (Dexter Marsh WMA, Lakeview WMA, Perch River WMA, Point Peninsula marsh, White Swamp, Wilson Bay marsh) Oswego (Renshaw Bay, Salmon River mouth) and St. Lawrence (Upper & Lower Lakes WMA) Counties. Breeding colonies also occur on Montezuma NWR in Seneca County and the Iroquois NWR and Oak Orchard/Tonawanda WMA wetland complex in western NY. As recently as the 1980s it occurred much more extensively on marshes throughout the Lake Ontario Plain, both inland and along the shoreline, but has since experienced a severe range contraction, especially on lakeshore marshes in central and western New York (McGowan and Corwin In press). Two pre-migratory (fall) staging areas have also both declined dramatically. One at the mouth of the Niagara River had over 5000 birds in 1965, but the terns have apparently not staged there since the late 1980s (Carroll 1988); while at Point Peninsula on Lake Ontario in

Jefferson County about 500 birds were counted in 1991, but fewer than 30 in 2001 (Mazzocchi and Roggie 2004).

Global Distribution

Black Terns have a Holarctic distribution, breeding throughout the northern hemisphere. In North America they breed from the Yukon and Northwest Territories through British Columbia and northern Saskatchewan east to Nova Scotia, south locally to southern California, Colorado, Nebraska, southern Illinois, Ohio, Pennsylvania, northern New England (formerly to Missouri and Kentucky). Sirois and Fournier (1993) suggested that a possible recent range extension northward into the Northwest Territories could be related to increases in the ice-free season related to global warming. The current center of distribution is the northern prairie states and provinces of the U.S and Canada and in Old World (C.n. niger) from northern Europe, Russia, and Siberia south to the Mediterranean, Asia Minor, Turkestan, and Caspian and Aral Seas.

In the Americas, Black Terns winter along both coasts from Mexico and Panama south to Peru, Surinam, and French Guiana; rare in Brazil, Uruguay, and Argentina (Dunn and Agro 1995).

Identification Comments

Identifying Characteristics

The total length of adults is 23-26.5 cm (9-10.5 inches). In breeding plumage the head and body are black, fading to gray on the rump while the undertail coverts are white. The upper surface of the wings and tail are dark gray, and wing linings are pale gray. The bill is black and feet are a dark reddish-purple. Females are somewhat duller than males, but this difference is often difficult to distinguish in the field. The postbreeding molt begins in late June when eggs begin to hatch. White feathers appear first around eyes and cheeks, then on forehead, neck, throat and breast, and finally on the abdomen. Heavily molting adults take on a peculiar, piebald appearance. The prebasic molt is completed during fall migration.

In winter plumage, the underparts are pure white except for a small, dark patch on each side of the breast and the back becomes a shade of gray similar to the wings and tail. A blackish cap joins black ear coverts on the otherwise white head. The juvenile plumage is similar to the winter plumage, but the feathers of the back are darker and the wing coverts and cap are barred and scalloped brown.

VOCALIZATIONS: shrill, somewhat metallic alarm notes, described as "kik" or "keek", depending upon intensity and level of motivation, and a complex of contact calls described as "kyew", followed by one to four additional syllables, as "kyew-dik", "kyew-dik-ik". The "kik" call commonly serves as a signal of impending danger in the nesting area. It may also be given during the ascent portion of the courtship flight. The "keek" call is similar to, but more shrill and forceful than the "kik" call, and is given during aggressive attacks on enemies in close proximity to the nest. The frequency of repetition increases as the terns become more aggressive. The "kyew" calls are given as parents approach and leave the nest, during foraging flights, by adults accompanied in flight by young, by parents calling to young at or near the nest, by parents at the nest during incubation, brooding and feeding,

and during the courtship flights.

EGGS: ovate, ground color varies from dark olive to light buff with markings of dark brown and gray. Markings vary from small dots and scrawls to very large blotches and are often particularly heavy around the larger end of the egg. The average dimensions for 122 eggs in the U.S. National Museum were 34 x 24 mm (Bent 1921).

Nests are typically located in shallow water, close to open water or openings in stands of emergent vegetation. Nests are placed on heaps of floating vegetation, on old muskrat house, old grebe or coot nest, or on floating wood (Novak 1990). Floating mats of muck or algae, mud flats, and mud mounds and islands also have been used. The nest consists of a small gathering of aquatic vegetation with a simple, cup-like bowl (Weller and Spatcher 1965, Bailey 1977).

Characteristics Most Useful for Identification

The overall dark coloration, highly acrobatic flight, and petite size (9-10", wingspan 2 ft.) distinguish this bird from other gull and tern species.

Best Life Stage for Identifying This Species

Adults in breeding plumage.

Behavior

Black Terns are gregarious throughout the year and are considered a semi-colonial nesting species (Cuthbert 1954, Bergman et al. 1970). Nests may be clumped closely in favorable habitat or more widely scattered in less favorable areas. As is typical of colonial nesting gulls and terns, Black Terns will join together to defend the nesting area from intruders (Cuthbert 1954).

Breeding colonies commonly change their locations if conditions become unfavorable (i.e., slight water level changes). Return rates may vary considerably among specific sites. Stern et al. (1985) found that 67% of recaptured terns nested within the same primary wetlands, while Bailey (1977) and Dunn (1979) reported return rates of 40% and 27% for marshes in Wisconsin and Ontario, respectively. These return rates, which are low in comparison with other gulls and terns, may be the result of the relative instability of their preferred habitat (McNicholl 1975). Conspicuous aerial courtship displays characterize the courtship period, which begins soon after arrival at the breeding site. In the "high-flight", a group of 2-20 terns ascend together to a great height then split into smaller groups of two or three and descend in rapid glides (Baggerman et al. 1956). During the "fish-flight", a male tern carries a small fish or large insect in its bill and is closely followed by a female as the two fly about the marsh. At the close of this aerial display the male follows the female to a perch and feeds her (Baggerman et al. 1956). Similar to some other marsh-nesting birds (i.e., Pied-billed Grebes), brooding Black Terns appear to leave their nest at night, leaving the eggs totally abandoned (Faber and Elbert 1996), or else the males incubate while females and non-breeding males spend the night at communal roosts up to 2-3 km away (Custer and Custer 1996). Eggs in abandoned nests had high levels of Organochlorine contaminants in them suggesting this may have played a role in this behavior. Black Terns' overall low reproductive rate (< 1 chick fledged/pair), and low nest success rates (<50%)

are often attributed to nest predation, but in some ways may be related to this nocturnal brooding behavior. In order to compensate for such low reproductive rates, Black Terns are relatively long-lived for a bird (~8 yr.) and adults have comparatively high annual survival rates (Dunn and Agro 1995).

Diet

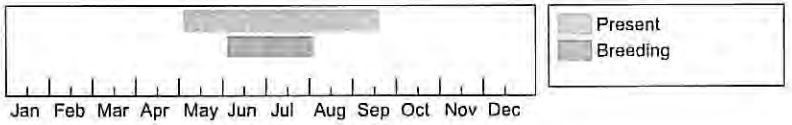
On the breeding grounds Black Terns are primarily insectivorous, although small crustaceans, spiders and small fishes are also regular food items (Bent 1921). The diet may vary depending on habitat and food availability. Fishes may be an especially important food item especially in terms of biomass. Small fish appear to be critical for chick development since chicks cannot develop on insects alone and fish are a key source of calcium. In waters devoid of adequate fish prey calcium deficiency leads to malformation and death in chicks (Bientema 1997). In Maine, Gilbert and Servello (2005) found that chicks could develop normally on insects and/or fish alone, but that the availability and choice of food may affect adults more so than chicks. Because of their higher biomass and nutritional value, adults primarily feeding fish to chicks may have to spend less time and energy feeding the young with positive consequences for their own condition, survival, and future breeding success. The capability to use both fish and insects may reduce potential variability in food availability during the breeding season (Gilbert and Servello 2005).

In wetlands, food is captured in the air, at or just below the water surface, and from the surface of emergent vegetation (Goodwin 1960). In the prairies, much of the food is obtained from plowed land and fields of grain but foraging over agricultural land near marshes has rarely been observed in New York (Novak 1992). In a sample of 376 feedings of young in different nests at North Pond in New York, Goodwin (1960) found that 41% of the items brought by parents were minnows and 59% were insects, including 45% damselflies. Insects comprised 93.6% of 602 feedings to chicks in Michigan while fishes accounted for just 4.9% (Cuthbert 1954). Although many of the insects could not be identified, damselflies, dragonflies, and mayflies were important food items. One study reported that 46 damselflies per hour were fed to chicks (Dunn and Agro 1995).

The Best Time to See

Black terns typically arrive from their South American wintering grounds in early May and begin actively searching for suitable nesting marshes. June is the prime nesting season, but nesting often extends into mid-July. Young of the year are in the air and feeding with adults in late July and August, and the birds begin departing by September. In the northeastern U.S., egg laying begins in late May, but may be initiated as late as the middle of July. Nests with eggs were observed at one site in western New York from 24 May to 12 July (Firstencel 1987). During a 1989 survey of colonies throughout New York, nests with eggs were observed as early as 25 May and as late as 18 July (Novak 1990). Black Terns are not known to be double brooded so later nests probably represent renesting attempts; and they can renest up to 40 km away (Muller and Roggie 2001).

Spring arrival seems to have advanced by about a month since the turn of the century. Eaton (1910) reported that Black Terns typically arrived around the first of June and nested in July.



The time of year you would expect to find Black Tern in New York.

Similar Species

Common Tern(Sterna hirundo): The Common tern is much lighter in overall coloration with a heavier orange (not dark) bill and larger size.

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Birds (Aves)
└ **Order** Gulls, Plovers, and Shorebirds (Charadriiformes)
└ **Family** Laridae (Skuas, gulls, terns, and skimmers)

Additional Resources

Links

The Birds of North America
http://bna.birds.cornell.edu/bna/species/147/articles/introduction
NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=CHLIDONIAS+NIGER
Google Images
http://images.google.com/images?q=CHLIDONIAS+NIGER

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species in the Atlas."
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

The most significant threat to Henslow's Sparrows is the loss of suitable grassland habitat. Economic factors have affected the viability of farms in New York. Many farmers have intensified their farming practices, converted hayfields to row crops, or abandoned farming altogether (Andrle and Carroll 1988, Post 2004, McGowan and Corwin 2008). Remaining hayfields are often mowed earlier and more frequently to increase production. As a result, the mortality rate of young in those fields is high and sometimes adults are killed during mowing. As farms are abandoned they are lost to development or the land reverts to shrublands and forests. Grasslands are becoming more scattered and isolated, reducing connectivity (Post 2004). Wetland loss is also a threat because this species often nests in nearby damp or wet meadows. As wetlands are drained for development any associated wet meadows are also lost (Andrle and Carroll 1988).

Management Considerations

Identify public lands with Henslow's Sparrow populations where management may be more easily implemented. Develop education and outreach programs in areas where Henslow's Sparrows persist that are aimed at grassland management and preservation. Implementing a program in New York similar to the Conservation Reserve Program, would likely be beneficial to Henslow's Sparrow populations.

Research Needs

The effects of certain farming practices on breeding populations should be evaluated. For instance, it would be beneficial to determine how different mowing frequencies and how different intensities of grazing affect Henslow's Sparrow populations. It would also be beneficial to know how mowing versus prescribed burning affects populations.

Short Term Trends

As with most grassland birds in the last few decades, Henslow's Sparrow populations have been significantly declining. Analyzed Breeding Bird Survey data from New York showed that the population may have declined by as much as 18.7% per year between 1980 and 2006 (Sauer et al. 2007). During the first Breeding Bird Atlas (1980-1985), Henslow's Sparrows were found in 348 blocks. Two-hundred thirteen of those blocks were reported with probable or confirmed breeding (Andrle and Carroll 1988). The second Breeding Bird Atlas reported 70 blocks with Henslow's Sparrows. Probable or confirmed breeding was reported in 57 of those blocks (McGowan and Corwin 2008). Areas in New York where Henslow's Sparrows are persisting rely on human disturbances to maintain the grassland habitat. For example, farming practices and military practices at the Fort Drum Military Reservation have maintained the grassland habitat in Jefferson County. However, there

Henslow's Sparrow

Henslow's Sparrow

Photo credits: *Patricia L. Nelson*

Scientific Name *Ammodramus henslowii* (Audubon, 1829)

Family Name Emberizidae
New World Sparrows and Old World Buntings

Did you know?
John James Audubon named the Henslow's Sparrow in honor of his good friend John Stevens Henslow, a professor of botany at Cambridge and teacher of Charles Darwin.

Summary

Protection Threatened Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species likely to become an endangered species within the foreseeable future in New York. 2) Any species listed as threatened by the U.S. Department of the Interior.

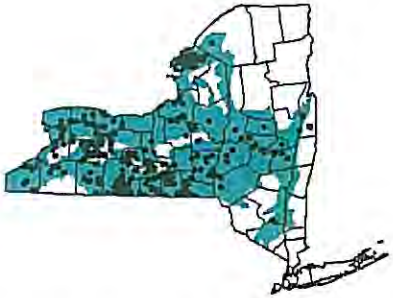
Rarity G4, S3B

A global rarity rank of G4 means: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3B means: Typically 21 to 100 breeding occurrences or limited breeding acreage in New York State.

State Ranking Justification

There is evidence of a significant decline across the species' range and there has been a loss of grassland habitats in New York State in recent years. Breeding Bird Survey data show a possible decline of 18.7% per year between 1980 and 2006 in New York (Sauer et al. 2007). When comparing data from the first and second breeding bird atlases, an 80% decrease is noted with Henslow's sparrows reported in 348 blocks (Andrle and Carroll 1988) and 70 blocks (McGowan and Corwin 2008), respectively. McGowan and Corwin (2008) describe this decline as "the largest proportional decline in any formerly common

Range



The map shows the known locations for henslow's sparrow (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Dog Hill Road near Perch River Wildlife Management Area (Jefferson County)

New York State Distribution

In New York State, Henslow's Sparrow populations occur in central and western New York and in a few locations in the Hudson River Valley. Currently, the largest populations are found in Jefferson County. During the first Breeding Bird Atlas (1980-1985), Henslow's sparrows were reported as probable or confirmed breeders in 213 blocks. The Breeding Bird Atlas 2000 reported probable and confirmed breeding in 57 blocks (McGowan and Corwin 2008), indicating a sharp decline in breeding birds. According to Breeding Bird Atlas 2000 data and the New York Natural Heritage Database, Henslow's sparrows are no longer found in the following counties: Broome, Cortland, Delaware, Fulton, Herkimer, Madison, Oneida, Onondaga, Otsego, Saratoga, Schenectady, Schoharie, St. Lawrence, Tioga, and Wayne (McGowan and Corwin 2008, New York Natural Heritage Program 2005).

are areas where Henslow's Sparrows are no longer found, indicating possible habitat changes range wide (McGowan and Corwin 2008). Even with the recent declines, it is possible that Henslow's Sparrows are more abundant and widespread in New York now than they were in the early 1900s (Levine 1998).

Long Term Trends

Henslow's Sparrows were first documented in New York in 1844 on Long Island. It is not known if Henslow's Sparrows were found in New York prior to European settlement but, there were probably areas with suitable habitat such as wet meadows (Levine 1998). After European settlement, the landscape of New York began to change with forests being logged and cleared for farming. In the early 1900s, they were considered a local breeder that was uncommon or rare in the state. Between the 1920s and 1940s Henslow's Sparrow populations appeared to be increasing as they were reported from many new locations. Then, as early as the 1950s, reports became less frequent and they were no longer found on the south shore of Long Island (Andrle and Carroll 1988). Analysis of Breeding Bird Survey data from 1966-2006 for New York show that Henslow's Sparrow populations appear to be decreasing at a rate of approximately 12.1% per year (Sauer et al. 2007).

Habitat

The Henslow's Sparrow is a grassland species, preferring tall, dense, grassy fields without woody vegetation. Wet grasslands are also used. Peterson (1983) found them in large, ungrazed fields with a variety of moisture regimes and without woody invasion. They were often found on hilltops. Bull (1974) described their habitat preference in New York as "grassy fields and meadows with scattered bushes and herbaceous plants, both in wet and dry situations." They can tolerate lightly to moderately grazed pastures (NatureServe 2005).

Associated Ecological Communities

Pastureland
Agricultural land permanently maintained (or recently abandoned) as a pasture area for livestock.

Successional Old Field
A meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned or only occasionally mowed.

Other Probable Associated Communities

Hempstead Plains grassland
Maritime grassland
Sedge meadow

Similar Species

Grasshopper Sparrow(Ammodramus savannarum): Young Henslow's Sparrows practically lack breast streaks thus the similar appearance to adult Grasshopper Sparrows.

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Birds (Aves)
└ **Order** Perching Birds (Passeriformes)
└ **Family** Emberizidae (New World Sparrows and Old World Buntings)

Additional Resources

Links

Google Images
http://images.google.com/images?q=AMMODRAMUS+HENSLOWII
NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=AMMODRAMUS+HENSLOWII

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Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: the Imperiled and Extinct Birds

Global Distribution

Breeding: Henslow's Sparrows breed locally from southeastern South Dakota (at least formerly), across the Great Lakes region of the eastern U.S. (southeastern Minnesota, north-central Wisconsin, northern Michigan) and southern Canada (southern Ontario, formerly southern Quebec) to New England and New York, south to central Kansas, northeastern Oklahoma, southwestern and central Missouri, southern Illinois, northern Kentucky, central West Virginia, eastern Virginia, northern Tennessee, and central and eastern North Carolina. Formerly the breeding range included eastern Texas.
Non-breeding: Outside of the beeding season Henslow's Sparrows are found in coastal states from South Carolina south to Florida, west to Texas, casually north to Illinois, Indiana, New England, and Nova Scotia (Smith 1992 cited in NatureServe 2005, AOU 1998 cited in NatureServe 2005).

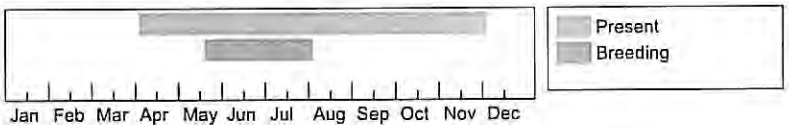
Identification Comments

Identifying Characteristics

Henslow's Sparrows can be identified by the large, flat head, large gray bill, and short tail. Wings are reddish. The head, nape, and most of the central crown are olive-colored. Sexes are similar, but can be determined in hand during the breeding season by the cloacal protuberance in males and brood patch in females. Henslow's Sparrows fly low and jerkily with a twisting motion of the tail. Juveniles are clay-colored above and their head and back are streaked with black. They are a faint yellow below with traces of buff on the throat and chin. Typically, the sides of the throat are unstreaked, but streaking can be found on some individuals. Nests are found on or near the ground and can be either open or dome-shaped. When nests are built off the ground, they are attached to grasses or forbs. Nests are loosely woven with dead grass and lined with finer grasses and hair. Vocalizations are described as a short, quiet "see-lick" or a hiccupping "tsi-lick." Calls can sometimes be heard on quiet summer nights. Henslow's sparrows are shy and secretive. Typically, they are heard rather than seen. Therefore, it is important to be able to identify this species by its song, especially for census and survey work.

The Best Time to See

Henslow's Sparrows are most often observed or heard during the peak of their breeding season between mid-June and mid-July. They are more likely to be heard rather than seen. Sometimes they are heard calling on quiet summer nights.



The time of year you would expect to find Henslow's Sparrow in New York.

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

Grasshopper Sparrow Fact Sheet

Grasshopper Sparrow

Ammodramus savannarum

New York Status: Special Concern
Federal Status: Not Listed

Description

©*Jeff Nadler Photography*

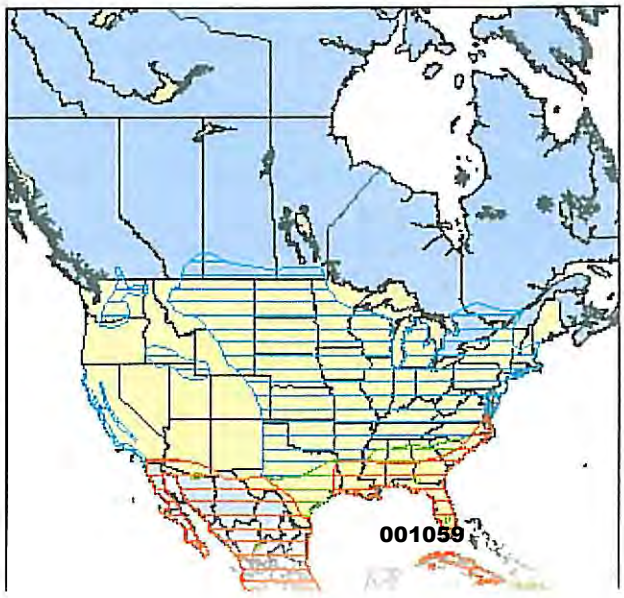
The grasshopper sparrow gets its name not so much from its diet but from its song which is one or two chips followed by a buzzy insect-like trill. This secretive grassland sparrow is more often heard than seen and remains hidden in dense grass cover. It perches on vegetative stalk or shrub while singing. It is a small, stocky sparrow (10 - 14 cm) with a flat head, relatively large bill, and white eye ring. Sexes are similar with gray to brown coloring above, buff colored sides and breast, and a short tail. The dark crown has a pale to white stripe down the center. It is the only grassland sparrow that lacks wing bars and streaking on its breast or sides although the juvenile shows these markings. This species forages for insects while walking or running along the ground.

Life History

A late spring migrant, the grasshopper sparrow returns to breeding grounds in the northeastern states in mid to late May. Because it is a nocturnal migrant, it is rarely seen during migration. Males arrive on breeding grounds 3 to 5 days before females. Once females arrive, pair bonds form and nest construction by the female begins immediately. The nest is built on the ground at the base of a clump of vegetation and consists of a deep cup of stems and grasses with over-hanging vegetation creating a dome with a side entrance. Pairs will raise 2 to 3 broods per year and will construct a new nest each time. Incubation is carried out by the female while the male defends the nest from predators and the territory from intruders. Parents will not fly directly to or from the nest but walk along the ground when leaving or arriving. Clutch size is 3 to 6 eggs for the first brood with subsequent broods having fewer eggs. Nestlings hatch after 10 to 12 days and are cared for by both parents as well as non-parent females. Young leave the nest after 9 to 10 days but are unable to fly. They run or walk along the ground in dense cover to avoid disturbance. Young of the first brood will leave their natal territories once adults begin feeding nestlings of the second brood.

Distribution and Habitat

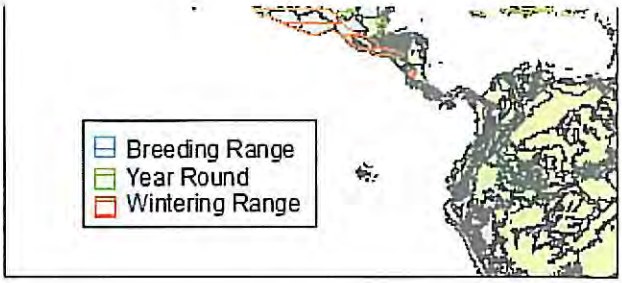
A common local breeder throughout much of the United States and southern Canada. Breeding range extends from southern Maine and New England south to northern Georgia, west to Texas and north to Montana, Idaho, and eastern Washington. The grasshopper sparrow depends on dense grasses for foraging and nesting cover. In New York it remains locally common where grassland habitat is available. Upland meadows, pastures, hayfields, and croplands are primary habitats for the grasshopper sparrow.



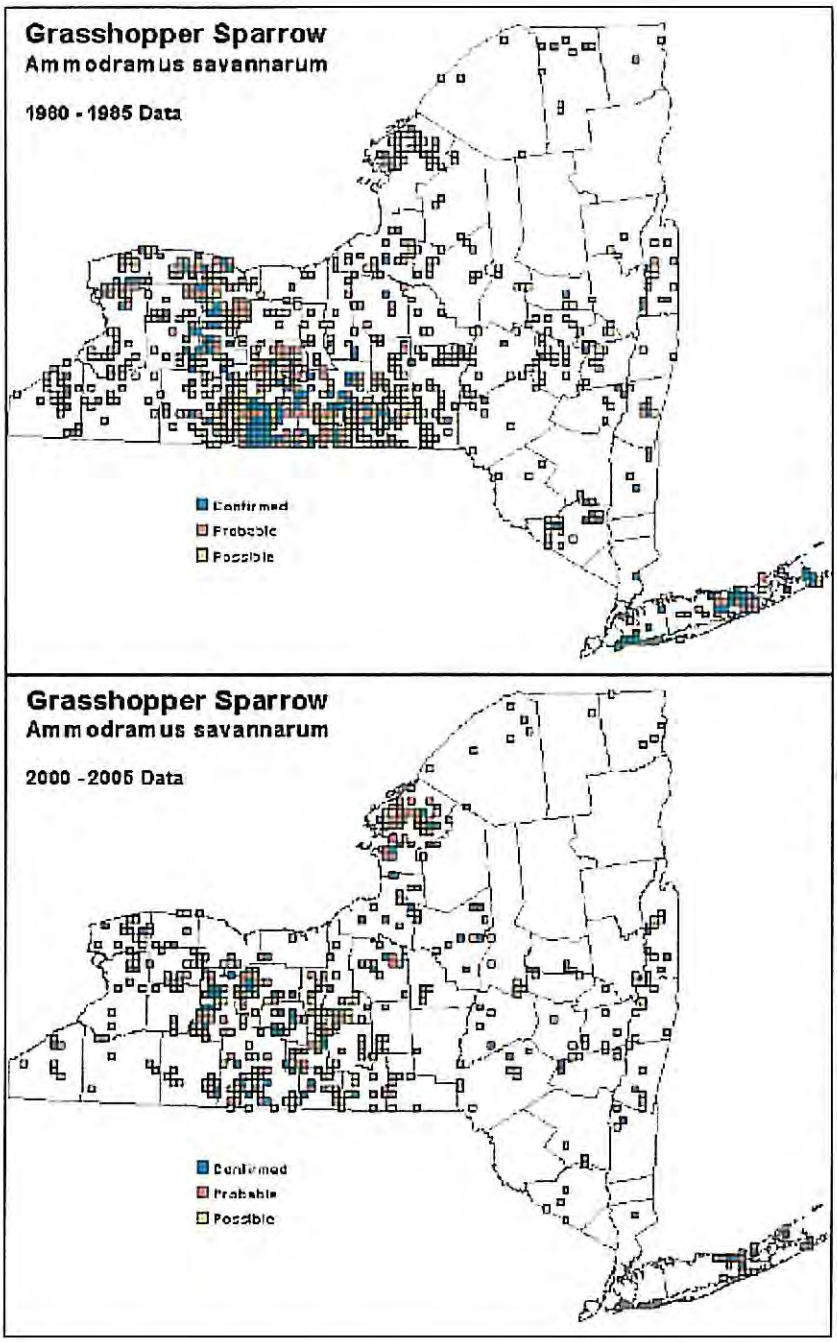
Status

In the eastern United States, the historic distribution of the grasshopper sparrow was restricted to natural grasslands resulting from fires or flooding. The growth of agriculture in the late 19th and early 20th centuries created more breeding habitat and facilitated the spread of the grasshopper sparrow's range in the northeast. By the mid 1900s,

however, loss of lands used for agriculture paired with the growth of development began to take its toll on grasshopper sparrow populations. In New York populations have declined considerably with the loss of grassland and agricultural habitat due to suburban land development and natural plant succession.



Grasshopper Sparrow Range



Distribution of Grasshopper Sparrow in New York from 1st and 2nd NYS Breeding Bird Atlas Records

Management and Research Needs

Threats to the grasshopper sparrow population in New York include loss of nests due to mowing of fields during the nesting season, the use of pesticides by farmers, and the loss of grassland habitat resulting from development or plant succession. Management practices for preserving and restoring grasshopper sparrow habitat include prescribed burning, mowing and grazing of grasslands and agricultural areas. Management practices at airports have been successful where mowing is postponed until the end of the breeding season. Further research is needed on the winter ecology, distribution, and habitat use of migratory populations.

Additional References

Arbib, R. 1988. Grasshopper sparrow. *Ammodramus savannarum*. Pages 448-449 in Andrle, R. F. and J. R. Carroll, eds. *The Atlas of Breeding Birds in New York State*. Cornell Univ. Press, Ithaca, NY.

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Vickery, P. D. 1996. Grasshopper Sparrow (*Ammodramus savannarum*). *In* The Birds of North America, No. 239 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

Wetland habitat loss, degradation, and drainage as a result of agricultural practices and development are the most critical threats for the King Rail, followed by accidental take in furbearer traps, predation, and striking manmade objects during migration. The King Rail is a game bird but is rarely hunted and the effects of hunting on populations is largely unknown. In states where it is severely threatened, including New York, the season is closed. (Meanly 1969, 1992, Eddleman et al. 1988)

Management Considerations

Manage waterfowl areas that have known king rail nesting sites in ways that are compatible with rail species by maximizing cover for nesting. Avoid altering natural features that could be potential nesting habitat. Remove invasive species such as purple loosestrife if it is severely degrading the habitat. Wetland draining in the northern range, if necessary, should occur before nest establishment. Different areas of wetlands where king rails are known to nest should be flooded or drained in different years to maintain optimal habitat. In states where King Rails are still hunted, monitor the harvest and consider closing the season if populations severely decline. (Eddleman et al. 1988)

Research Needs

Additional research is needed on population dynamics and the effects of land management practices on King Rails, specifically in relation to waterfowl management. More refined census techniques with careful documentation of breeding is a high priority. Determination of winter status and distribution is also needed. (Eddleman et al. 1988)

Short Term Trends

Over the past 30 years, the King Rail has been rapidly declining in the northern part of its range, particularly in New York where it is at the northern limit of its range (Levine 1998, Sauer et al. 2007). Very few breeding records are reported annually. A comparison of data from the first New York Breeding Bird Atlas of 1980-1985 with the second atlas of 2000-2005 shows a slight increase in the number of atlas blocks (two to four respectively) reporting probable breeding King Rails, which could be explained by more intensive searches for this species. It is generally overlooked in surveys because of its secretive nature.

Long Term Trends

During the early half of the 1900s, King Rails were fairly common, especially in the Midwest (Eddleman et al 1988, Meanly 1992). Now they are considered rare in several states and restricted to pockets of emergent marshes throughout their range. Wetland habitat loss is the likely cause for this decline.

King Rail

King Rail

Photo credits: *Jim Rathert*

Scientific Name *Rallus elegans* Audubon, 1834

Family Name Rallidae
Rails, Gallinnules, and Coots

Did you know?
John James Audubon first called the King Rail the Freshwater Marsh Hen because of its preference for freshwater marshes. It is the largest of the North American rails. (Meanly 1969)

Summary

Protection Threatened Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species likely to become an endangered species within the foreseeable future in New York. 2) Any species listed as threatened by the U.S. Department of the Interior.

Rarity G4, S1B

A global rarity rank of G4 means: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S1B means: Typically 5 or fewer breeding occurrences and very limited breeding acres, making it especially vulnerable in New York State.

State Ranking Justification

A rapid decline of King Rail populations has been noted in the northern portion of their range including in New York State where the species is considered a rare breeder. Habitat loss and degradation are the main reasons for the decline. Currently there are seven known breeding locations, mostly in the western and central portions of the state, with one record from southern Westchester County (New York State Natural Heritage Program 2007). There have also been several winter sightings in the central and western portions of the state. King Rails were observed nesting on Long Island in the early to middle 1900s but have not been observed nesting there during recent surveys, although several recent sightings have occurred during the winter (Hamilton 1925a, b, Kuerzi 1926, Gochfeld 1975, Levine 1998, New York State Breeding Bird Atlas 1985 and 2005).
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty

Range

The map shows the known locations for king rail (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Iroquois National Wildlife Refuge (Genesee County)
Montezuma National Wildlife Refuge (Seneca County)
Oak Orchard Wildlife Management Area (Genesee County)
Tonawanda Wildlife Management Area (Genesee, Niagara Counties)

New York State Distribution

New York is the northern limit of the King Rail's range. Now and historically, King Rails are considered to be a very uncommon breeder in the state. Scattered breeding has been reported from extensive marshes in western New York, the Hudson River Valley, and Long Island. During the winter, King Rails have been reported from several localities on Long Island. Most of the reports have been from the coastal areas where specimens have been taken from muskrat traps set in salt marshes. There have also been few reports of wintering King Rails from central and western New York. (Hamilton 1925a,b, Kuerzi 1926, Levine 1998)

Habitat

During the breeding season, the King Rail inhabits fresh and brackish marshes in the southwestern and southeastern portions of the state that are fairly shallow (0-25 cm of water) and have well developed areas of emergent vegetation. During the winter months, King Rails can be spotted in the coastal salt marshes in the lower Hudson Valley and around Long Island. (Eddleman et al. 1988, Levine 1998)

Associated Ecological Communities

Freshwater Intertidal Mudflats
A sparsely vegetated community characterized by low rosette-leaved aquatics. This community occurs on exposed intertidal mudflats where the water is fresh (salinity less than 0.5 ppt). This community is best developed where mudflats are nearly level so that broad expanses are exposed at low tide. The plants are completely submerged in 0.9 to 1.2 m (3 to 4 ft) of water at high tide and they are usually coated with mud.

Freshwater Intertidal Shore
A community of the intertidal gravelly or rocky shores of freshwater tidal rivers and creeks, sometimes occurring at the base of cliffs. The vegetation may be very sparse.

Freshwater Tidal Marsh
A marsh community that occurs in shallow bays, shoals, and at the mouth of tributaries of large tidal river systems, where the water is usually fresh (salinity less than 0.5 ppt), and less than 2 m (6 ft) deep at high tide. Typically there are two zones in a freshwater tidal marsh: a low-elevation area dominated by short, broadleaf emergents bordering mudflats or open water, and a slightly higher-elevation area dominated by tall grass-like plants.

Freshwater Tidal Swamp
A forested or shrub-dominated tidal wetland that occurs in lowlands along large river systems characterized by gentle slope gradients coupled with tidal influence over considerable distances. The swamp substrate is always wet and is subject to semidiurnal flooding by fresh tidal water (salinity less than 0.5 ppt).

Shallow Emergent Marsh
A marsh meadow community that occurs on soils that are permanently saturated and seasonally flooded. This marsh is better drained than a deep emergent marsh; water depths may range from 6 in to 3.3 ft (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the soil is exposed during an average year.

Other Probable Associated Communities

Inland salt marsh
Tidal river

Associated Species

Sora (*Porzana carolina*)
Virginia Rail (*Rallus limicola*)
Clapper Rail (*Rallus longirostris*)

Global Distribution

King Rails breed locally from Kansas, eastern Nebraska, Iowa, and Minnesota east across the northern United States and southern Ontario to southern New England, south to southern Texas, southern Louisiana, central Mississippi, central Alabama and southern Florida; Cuba; and the interior of Mexico. The greatest densities occur in the Atlantic and Gulf coast marshes, and in the rice belts of Louisiana, Arkansas, and Texas (Meanley 1969). The King Rail winters along the Gulf and Atlantic coasts from Mexico to New York and in the lower Mississippi Valley (Meanly 1969, 1992).

Identification Comments

Identifying Characteristics

The King Rail is a large (15-19 inches), chicken-sized rail with a slightly down-curved bill. Its wingspan is approximately 20 inches and it weighs between 10 and 13 ounces. It has tawny edges on the black-centered back feathers and tawny wing coverts. The head is slate colored with brown or grayish cheeks and buffy eyebrows. The underparts are cinnamon and the flanks are strongly barred black and white. Juveniles are darker above and paler below. The nest has been described as a round, elevated platform with a saucer-shaped depression. It usually has a round or cone-shaped canopy and a ramp. The eggs are pale buff with brown spots or blotches. King Rails have a distinctive call of a series of fewer than 10 kek-kek-kek notes that are fairly evenly spaced. (Meanley 1969, 1992)

Behavior

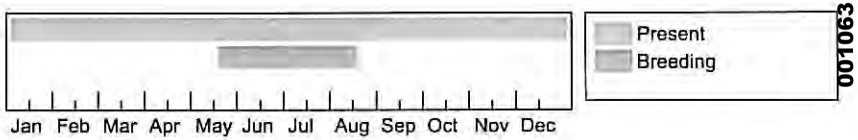
The King Rail is a very secretive bird, creating well-concealed nests in the shallow parts of marshes on tussoks or clumps of grass. Between 9 and 14 eggs are laid during May and early August with incubation lasting 21-23 days. Both parents tend to the young. King Rails aggressively defend their nests and will chase away any species that comes close. They become solitary after the breeding season and prefer to migrate alone at night. (Meanly 1969, 1992)

Diet

The majority of the King Rail's diet comes from crustateans and aquatic insects but various grains and seeds are also consumed, especially in winter (Meanly 1969).

The Best Time to See

King Rails begin to migrate to their breeding grounds in April, with courtship and egg laying occurring in late April to mid-July. The eggs hatch between June and early August. Non-resident birds (in the northern portion of the range) begin their migration to wintering areas in September. King Rails seen during the winter in New York may be local year-round residents. (Andrle et al. 1988, Meanly 1992, Levine 1998)



The time of year you would expect to find King Rail in New York.

Similar Species

Clapper Rail(Rallus longirostris): The king rail and clapper rail are almost identical in appearance and vocalization, with the clapper rail being slightly smaller and more grayish in color on top than the king rail. Both species have been known to occur in in the same breeding areas and may hybridize with each other. (Meanly 1969, Levine 1998).

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** birds (Aves)
└ **Order** Rails and Cranes (Gruiformes)
└ **Family** Rallidae (Rails, Gallinnules, and Coots)

Additional Resources

Links

Google Images
http://images.google.com/images?q=RALLUS+ELEGANS
NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=RALLUS+ELEGANS

References

American Ornithologists' Union (AOU). 1983. Check-list of North American Birds, 6th edition. Allen Press, Inc., Lawrence, Kansas. 877 pp.

Andrle, Robert F. and Janet R. Carroll, editors. 1988. The atlas of breeding birds in New York State. Cornell University Press. 551 pp.

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Brewer, R., G.A. McPeek, and R.J. Adams, Jr. 1991. The Atlas of Breeding Birds of Michigan. Michigan State University Press, East Lansing, Michigan. xvii + 594 pp.

Bull, John. 1974. Birds of New York State. Doubleday, Garden City, New York. 655 pp.

Least Bittern

Least Bittern

Photo credits: *Sandy Muller, Irene Mazzocchi*

Scientific Name *Ixobrychus exilis* (Gmelin, 1789)

Family Name Ardeidae
Herons, Bitterns, and Egrets

Did you know?
When Least Bitterns are alarmed, instead of flying away they often freeze and point their bill upward to blend with the surrounding vegetation.

Summary

Protection Threatened Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species likely to become an endangered species within the foreseeable future in New York. 2) Any species listed as threatened by the U.S. Department of the Interior.

Rarity G5, S3B,S1N

A global rarity rank of G5 means: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3B,S1N means: Typically 21 to 100 breeding occurrences or limited breeding acreage and typically 5 or fewer non-breeding (usually winter residents) occurrences in New York State.

State Ranking Justification

The first Breeding Bird Atlas (1980-1985) reported 142 blocks and the second Breeding Bird Atlas (2000-2005) reported 129 blocks (Andrle and Carroll 1988 and McGowan and Corwin 2008). It appears that populations have declined by about 9% when comparing the two atlases. One of the most significant threats to this species is loss of appropriate habitat. New York State has lost over half of its wetlands since colonization (Tiner 1984 cited in NatureServe 2003).
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

New York State has lost over half of its wetlands since colonization (Tiner 1984 cited in NatureServe 2003). More recently, losses of wetlands in the Lake Plains portion of the state have been offset as agricultural lands revert back to wetlands, although net losses of wetlands in the Hudson Valley continue. Emergent marshes, which constitute only five percent of the state's 2.5 million acres, have declined overall. Equally important, the quality of remaining habitat is often degraded by fragmentation, exotic plants, and nutrient enrichment (Riexinger, personal communication, October 31, 2003). Run-off from development and agricultural practices may also negatively impact prey. Water level management of Lake Ontario may also change the quality of habitat for Least Bitterns (King 2005). Unnaturally high densities of predators may also pose a threat.

Management Considerations

Large wetlands (>12 acres) with abundant emergent vegetation need preservation, protection, and improvement (Gibbs and Melvin 1992). Prevent chemical contamination, siltation, eutrophication, and other forms of pollution in marsh habitats. Control invasive species (such as purple loosestrife) and predators at breeding sites. When managing large wetland complexes for waterfowl, consider retaining areas with cattails and bulrush.

Research Needs

Population distribution, size, and trend studies are needed. Additional studies are needed on the species' breeding biology and movements. Evaluate the effects of invasive species such as common reed and purple loosestrife on breeding populations.

Short Term Trends

The first Breeding Bird Atlas (1980-1985) reported a total of 142 blocks with 62 of those blocks as probable or confirmed breeding (Andrle and Carroll 1988). The second Breeding Bird Atlas reported Least Bitterns from a total of 129 blocks. Seventy-two of those blocks were reported as probable and confirmed breeding (Andrle and Caroll 1988 and McGowan and Corwin 2008). A comparison of the two atlases shows a 9% decline in blocks in the state (McGowan and Corwin 2008). Least Bitterns are likely overlooked during breeding bird surveys because they rarely vocalize and so, are often not heard. Least Bittern data from the Breeding Bird Survey (BBS) are too few to assess population trends in New York (Sauer et al. 2007).

Long Term Trends

Historically, Least Bitterns were considered locally common in marshes of the Great Lakes Plain, the Coastal Lowlands, and the Hudson Valley, and possibly breeding in the Champlain Valley (Eaton 1910). In the southern and western portions of the state, Least Bitterns were considered uncommon and local (Bull 1974). Generally, this species is absent from high elevations. It is difficult to determine long term trends.

Habitat

In New York, Least Bitterns tend to breed in shallow or deep emergent marshes, freshwater tidal marshes (lower Hudson River), or brackish tidal marshes (Long Island). They prefer stands of cattails or bulrush with bur-reed, sedges, or common reed. Stands of cattails are often interspersed with pools of open water or slow-moving channels and some woody vegetation. Large marshes are important breeding areas for this species. Open habitats such as mats of emergent vegetation are rarely used (Frederick et al. 1990 cited in NatureServe 2003).

Associated Ecological Communities

Brackish Tidal Marsh
A marsh community that occurs where water salinity ranges from 0.5 to 18.0 ppt, and water is less than 2 m (6 ft) deep at high tide. The vegetation in a brackish tidal marsh is dense and dominated by tall grass-like plants.

Deep Emergent Marsh
A marsh community flooded by waters that are not subject to violent wave action. Water depths can range from 6 in to 6.6 ft (15 cm to 2 m). Water levels may fluctuate seasonally, but the substrate is rarely dry, and there is usually standing water in the fall.

Freshwater Tidal Marsh
A marsh community that occurs in shallow bays, shoals, and at the mouth of tributaries of large tidal river systems, where the water is usually fresh (salinity less than 0.5 ppt), and less than 2 m (6 ft) deep at high tide. Typically there are two zones in a freshwater tidal marsh: a low-elevation area dominated by short, broadleaf emergents bordering mudflats or open water, and a slightly higher-elevation area dominated by tall grass-like plants.

Shallow Emergent Marsh
A marsh meadow community that occurs on soils that are permanently saturated and seasonally flooded. This marsh is better drained than a deep emergent marsh; water depths may range from 6 in to 3.3 ft (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the soil is exposed during an average year.

Associated Species

American Bittern (*Botaurus lentiginosus*)
Marsh Wren (*Cistothorus palustris*)
Virginia Rail (*Rallus limicola*)

Range

The map shows the known locations for least bittern (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Constitution Marsh- New York State Important Bird Area (Putnam County)
Lake View Wildlife Management Area (Oswego County)
Tonawanda Wildlife Management Area (Genesee, Niagara, Orleans Counties)

New York State Distribution

Least Bitterns are largely restricted to the Lake Ontario and St. Lawrence River plains, and the Lower Hudson River Valley with scattered records from Long Island, Lake Champlain, the Finger Lakes, and the Mohawk Valley. They are generally absent from the Appalachian Highlands and mountainous parts of New York State (Andrle and Carroll 1988, Gibbs and Melvin 1992). On rare occasions birds have been reported mid-winter along the coast.

Global Distribution

The breeding range of the Least Bittern extends from North America to South America. In North America, the breeding range extends from southern Manitoba and north-central United States to southeastern Canada (Ontario and Quebec), eastern Maine, and southern New Brunswick south to western and southern Texas, the Gulf coast, Florida, and Greater Antilles and west to central Montana, Utah (Great Salt Lake, formerly), eastern Colorado,

and south-central New Mexico. Least Bitterns also breed in western North America in southern Oregon, interior and southern coastal California, central Baja California, and southern coastal Sonora. In Latin America, breeding Least Bitterns can be found in Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Mexico, and elsewhere. The Least Bittern breeding range extends widely across South America including central Colombia, coastal Peru, and east of the Andes from Venezuela south to northern Argentina and southern Brazil (AOU 1983, Gibbs and Melvin 1992).

Identification Comments

Identifying Characteristics

Small size, yellow color, and a dark crown are characteristics that distinguish Least Bitterns from all other bitterns and herons (Hancock and Kushlan 1984 cited in Nature Serve 2003). Diagnostic field characteristics include a vivid, greenish-black crown, back, and tail; brownish and white neck, sides, and underparts; and chestnut-colored wings with conspicuous, contrasting, pale-colored wing patches. No other small heron has large buffy patches on the upper side of the otherwise dark wings. Sexes are similar in size, but sexes are dimorphic. Females have a purple-chestnut crown and back and the neck is darkly streaked. Males have a black crown and back. Juveniles are similar to females, but the crown is more brown and paler and the breast and throat are browner and more heavily streaked. Nests are usually built over shallow water 0.3-3.3 ft (0.1-1.0 m) deep (Palmer 1962, Kushlan 1973, Aniskowicz 1981 cited in NatureServe 2003) and tend to be less than 33 ft (10 m) from open water (Weller 1961 cited in NatureServe 2003). A nesting platform with a canopy is made by pulling down and crimping surrounding emergent vegetation, such as cattail or bulrush (Weller 1961 cited in NatureServe 2003). Eggs are elliptical, pale blue or pale green, smooth and non-glossy, averaging 1.2 by 1 in (31 by 24 mm) (Bent 1926, Harrison 1978 cited in NatureServe 2003). The male's advertisement call, most frequently heard in spring, is a dove-like cooing characterized as "uh-uh-uh-uh-uh-oo-oo-oooo-oo-ooah" (Palmer 1962 cited in NatureServe 2003). Females may respond with "ticking" calls (Hancock and Kushlan 1984 cited in NatureServe 2003). When alarmed, three calls may be uttered: a loud, shrieking "quoh," a hissing "hah," or a cackling "tut-tut-tut" (Palmer 1962, Hancock and Kushlan 1984 cited in NatureServe 2003).

Behavior

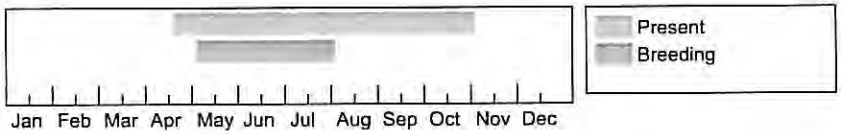
Least Bitterns spend nearly all their time in dense, grass-like vegetation. During the breeding season, the home range of Least Bitterns varies from 4.5-88.2 acres (1.8-35.7 hectares) with an average of 24 acres (9.7 hectares) in New York (Bogner and Baldassarre 2002).

Diet

The Least Bittern diet consists of small fishes, salamanders, tadpoles, frogs, leeches, slugs, crayfishes, dragonflies, and occasionally shrews and mice.

The Best Time to See

Least Bitterns are rarely seen in New York before late April and after September. The best time to see or hear adults is between May and July. This species is often heard and not seen. On rare occasions birds are reported during mid-winter along the coast.



The time of year you would expect to find Least Bittern in New York.

Similar Species

Green Heron(Butorides virescens): The Green Heron is similar in height but wider than the Least Bittern and lacks buff color on the head and wings. Green Herons are often found perched in trees.

American Bittern(Botaurus lentiginosus): The American Bittern is much larger and has rich brown underparts set off by black neck streaks.

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Birds (Aves)
└ **Order** Herons, Ibises, and Storks (Ciconiiformes)
└ **Family** Ardeidae (Herons, Bitterns, and Egrets)

Short-eared Owl

Short-eared owl (Asio flammeus)

Photo credits: *A.J. Hand*

Scientific Name *Asio flammeus* (Pontoppidan, 1763)

Family Name Strigidae
Typical Owls

Did you know?
The short-eared owl is unique within its family (Strigidae) in the way it builds a ground nest. The female makes a small scrape in the ground with her body and lines it with nearby material (NatureServe 2003).

Summary

Protection Endangered Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species in imminent danger of extirpation or extinction in New York. 2) Any species listed as endangered by the United States Department of the Interior.

Rarity G5, S2

A global rarity rank of G5 means: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S2 means: Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably make it very vulnerable in New York State.

State Ranking Justification

The Short-eared Owl population is declining in New York, as it is throughout much its range. The second Breeding Bird Atlas reported probable or confirmed breeding in 13 blocks (McGowan and Corwin 2008). In comparison, the first Breeding Bird Atlas (1980-1985) reported probable or confirmed breeding in 14 blocks (Andrle and Carroll 1988). The number of reported possible breeding blocks declined from 22 during the first Atlas to 11 during the second Atlas. It appears that Long Island has lost nearly all breeding locations for Short-eared Owls with one block reported during the second Atlas compared to nine during the first Atlas. Breeding may no longer occur in the lower Hudson Valley as well as a number of other historically known breeding sites in the state. Wintering Short-eared Owl populations are variable, depending on rodent populations and snow cover.
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

The most significant threat to short-eared owls is habitat loss due to development, reforestation, wetland loss, and changes in farming practices such as conversion of hayfields to row crops or more frequent mowing of hayfields (Post 2004). As a ground-nesting bird, eggs and unfledged young are at risk of depredation by mammalian predators such as foxes, raccoons, and skunks. There is also increased risk of depredation by domestic and feral cats and dogs in areas with some development. A limiting factor for short-eared owls is their dependency on microtine rodent populations. Poisoning may be a threat in areas where humans are attempting to control rodent populations. As with many raptors, short-eared owls have been subjected to shooting by humans.

Management Considerations

Large areas of open habitat in breeding and wintering areas need to be maintained in order to ensure the persistence of this species in New York. Potential management practices include burning, mowing, and plowing of fields after the breeding season. Use Landowner Incentive Program funds to conserve privately-owned grasslands. Coordinate conservation efforts with other agencies and organizations and initiate an outreach program (Post 2004).

Research Needs

Population monitoring standards need to be developed and implemented to better estimate the local population status (distribution, abundance, and trends) during the breeding and non-breeding seasons. Current methods, such as flushing sitting females or roadside counts, are either labor and time intensive or result in under-estimating population sizes. More could be learned about nocturnal movements, migration patterns, adult and juvenile mortality, and the relationship between rodent abundance and territory size. Studies are needed on the effects of habitat management (i.e. burning, mowing, and plowing) on grassland birds (Post 2004) as well as small mammal populations.

Short Term Trends

Currently, it appears that populations are continuing to decline, although it may be difficult to determine trends due to the lack of precise location data from historical records (Schneider 2003). During the first Breeding Bird Atlas (1980-1985), there were five confirmed breeding records, nine probable breeding records, and 22 possible breeding records (Andrle and Carroll 1988). Data from the second Breeding Bird Atlas seems to indicate a decline with four blocks with confirmed breeding, nine blocks with probable breeding, and 11 blocks with possible breeding (McGowan and Corwin 2008). During the first Atlas, Short-eared Owls were recorded in nine blocks on Long Island, compared to one block during the second Atlas. Breeding may no longer occur in the lower Hudson Valley as well as a number of other historically known breeding sites in the state. Some records may be a single breeding event in an area with unusually high rodent populations. Overall, the distribution in New York is largely unchanged except for the reduction of reports on Long Island. Breeding Bird Survey data is too sparse in New York to determine trends. Wintering populations are variable depending on snow cover and rodent populations. It is difficult to determine winter population trends as few sites are surveyed on a regular basis.

Long Term Trends

During the early 20th century, Eaton (1914) reported short-eared owls as one of our most common owls outnumbering all other owls found in lowlands and marshes, especially in the winter. Approximately 60 years later, Bull (1974) described short-eared owl populations as declining with localized breeding reported.

Habitat

Open areas such as grasslands (hayfields, fallow farm lands, and pastures) and fresh and salt water marshes are typically used during the Short-eared Owl breeding season in New York. They tend to prefer habitats with some water which may be due to the habitat preference of voles, their primary prey. Day roosts are typically on the ground, but also may be under low shrubs, in conifers, or low open perches. During the winter months, Short-eared Owls use habitats similar to the those of the breeding season. They also can be found at old dumps where rodent populations may be high. They may move further south during winters with deep snow cover.

Associated Ecological Communities

Cropland/field Crops
An agricultural field planted in field crops such as alfalfa, wheat, timothy, and oats. This community includes hayfields that are rotated to pasture.

High Salt Marsh
A coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide up to the limit of spring tides. It is periodically flooded by spring tides and flood tides. High salt marshes typically consist of a mosaic of patches that are mostly dominated by a single graminoid species.

Low Salt Marsh
A coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide down to mean sea level or to about 2 m (6 ft) below mean high tide. It is regularly flooded by semidiurnal tides. The mean tidal range of low salt

marshes on Long Island is about 80 cm, and they often form in basins with a depth of 1.6 m or greater.

Successional Old Field
A meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned or only occasionally mowed.

Other Probable Associated Communities

Dwarf shrub bog
Salt panne
Successional blueberry heath
Successional fern meadow

Associated Species

Northern Harrier (*Circus cyaneus*)

Range

The map shows the known locations for short-eared owl (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995)

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Fort Edward Grasslands (Winter) (Washington County)
Gilgo Beach Marshes (Sping/Summer) (Suffolk County)
Jones Beach/Tobay (Spring/Summer) (Nassau County)
Point Peninsula (Winter) (Jefferson County)

New York State Distribution

New York is the southern edge of the Short-eared Owl breeding range with the exception of some scattered breeding records as far south as Virginia (New York State Department of Environmental Conservation 2003). The breeding range in the state is generally limited to the St. Lawrence and Lake Champlain valleys, the Great Lakes Plains, and marshes along the south shore of Long Island. Between the fall and spring, the number of Short-eared Owl observations increases as northern populations migrate south, possibly in search of food. Significant numbers of wintering owls are in the Finger Lakes and the Lake Ontario plains, especially in Jefferson County, at scattered locations in the Hudson Valley, and the south shore of Long Island.

Global Distribution

Breeding: In North America, Short-eared Owls are found from northern Alaska to northern Labrador, south to California, Utah, Colorado, Missouri, Illinois, Ohio, and Virginia. They are more numerous in western and central North America than in eastern North America. Breeding has been recorded in small numbers in every province and territory in Canada (NatureServe 2003). Currently, in the northeastern United States, nesting is known in Vermont, New York, Massachusetts, and Pennsylvania (Tate 1992). Breeding has also been documented in the Hawaiian Islands, Caroline Islands (Ponape), and Greater Antilles (Cuba, Hispaniola, Puerto Rico) (AOU 1983). In Eurasia, Short-eared Owls are found from Iceland, British Isles, Scandinavia, northern Russia, and northern Siberia south to southern Europe, Afghanistan, northern Mongolia, the northern Kurile Islands, and Kamchatka. Non-breeding: Outside of the breeding season, Short-eared Owls are more common from the southern parts of most of the Canadian provinces south to southern Baja California, southern Mexico, the Gulf Coast, and Florida. Short-eared Owls reside on all the main islands of Hawaii and can be found in the Greater Antilles, but are uncommon in Puerto Rico, including Isla Culebra. In the Old World, non-breeding birds are found from areas within the breeding range south to northwestern Africa, the Mediterranean region, Ceylon, southern China, and Japan (AOU 1983).

Identification Comments

Identifying Characteristics

Short-eared Owls are a small to medium-sized owl. They are characterized by their barely visible ear tufts and a whitish facial disk with a dark area around bright yellow eyes. The back and upper wings are tawny brown to buff colored with some streaking. The ventral surface is much lighter with bold vertical streaking on the breast and a pale belly that is lightly streaked. Wings are long with a buffy patch beyond the wrist. They have a distinct black carpal bar. There is a dark patch at the base of the primaries. Legs and feet are feathered. Sexes are similar. Generally, females are darker than males; young birds are darker than older birds. Juveniles have a dark facial disk that lightens with age. They have full adult plumage by October of the first year. Short-eared Owl flight is described as "moth or bat-like". Wing beats are unhurried and irregular. They fly low over grasslands or mashes. Females make a simple nest by creating a small depression in the ground and lining it with grass, leaves, twigs, or feathers. Eggs are white, short, elliptical, smooth, and non-glossy. Short-eared Owls are generally silent, but do occassionally vocalize. Males will make a muffled "poo, poo, poo" sound. Both sexes have an alarm call that is described as nasal barks and wheezy notes ("cheef, cheef, cheef" and "cheewaay"). Young owls have a food-begging call ("pssssip"). Both adults and young will clack their bills when annoyed or in defense. In flight, Short-eared Owls will clap their wings making the sound similar to that of a cracking whip.

Behavior

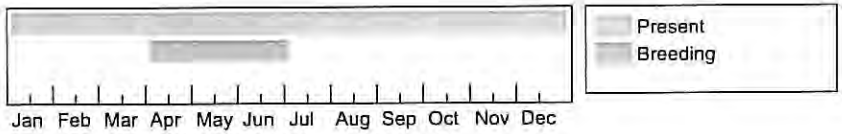
Short-eared Owls detect prey by coursing open areas while flying low to the ground. They may briefly hover over prey before taking it. At times, they hunt from a perch. Short-eared Owls were observed caching prey during the winter in Jefferson County (G.A. Smith, pers. Comm. cited in NatureServe 2003). There are three displays most commonly observed during the breeding season: wing-clapping, exaggerated wing-beats, and skirmishing. These behaviors are usually performed in territorial defense or courtship. Skirmishes can be aggressive in nature. The male Short-eared Owl courtship display is in flight and involves vocalization, a spiraling flight, and wing-clapping (NatureServe 2003).

Diet

Microtine rodents are the preferred prey. However, Short-eared Owl prey also includes other small mammals and sometimes birds. Young may also take insects (NatureServe 2003).

The Best Time to See

During the breeding season, the best time to observe Short-eared Owls would be between March and April when courtship and territorial defense begin. There is an increased likelihood of observing birds during the fall and early winter while birds are migrating to their wintering grounds in the state. Short-eared Owls are found on their wintering grounds from early winter to late winter or early spring.



The time of year you would expect to find Short-eared Owl in New York.

Similar Species

Northern Harrier(Circus cyaneus): Northern Harriers have an owl-like facial disk which may cause some confusion when initially trying to distinguish them from Short-eared Owls. Short-eared Owls lack the distinctive white rump patch of Northern Harriers.

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Birds (Aves)
└ **Order** Owls (Strigiformes)
└ **Family** Strigidae (Typical Owls)

Additional Resources

Links

NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=ASIO+FLAMMEUS
Google Images
http://images.google.com/images?q=ASIO+FLAMMEUS
New York State Department of Environmental Conservation
http://www.dec.ny.gov/animals/7080.html

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Andrle, Robert F. and Janet R. Carroll, editors. 1988. The atlas of breeding birds in New York State. Cornell University Press. 551 pp.

Banfield, A. W. F. 1947. A study of the winter feeding habits of the Short-eared Owl in the Toronto region. Canadian Journal of Research 25:45-65.

Northern Harrier

Northern Harrier (Circus cyaneus)

Photo credits: *Jeff Nadler*

Scientific Name *Circus cyaneus* (Linnaeus, 1766)

Family Name Accipitridae
Hawks, Kites, Eagles

Did you know?
Unlike most hawks, harriers can use their sense of hearing to help locate prey. Harriers have an owl-like facial disk to help with directional hearing and soft feathers for a quieter flight.

Summary

Protection Threatened Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species likely to become an endangered species within the foreseeable future in New York. 2) Any species listed as threatened by the U.S. Department of the Interior.

Rarity G5, S3B,S3N

A global rarity rank of G5 means: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3B,S3N means: Typically 21 to 100 breeding occurrences or limited breeding acreage and typically 20 to 100 non-breeding (usually winter residents) occurrences in New York State.

State Ranking Justification

There were 354 probable and confirmed breeding blocks identified during the second Breeding Bird Atlas (McGowan and Corwin 2008) and 355 probable and confirmed breeding blocks identified during the first New York State Breeding Bird Atlas (1980-1985) (Andrle and Carroll 1988). However, these numbers could be deceptive since they are cumulative over several years and the birds occupy large breeding territories (i.e. individuals reported in more than one block). They are widespread in winter, but numbers are highly variable. There is concern about the status of Northern Harrier populations in New York because of the loss of farmland and wetlands throughout the state.
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act,

taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

One of the most significant threats to Northern Harrier populations in New York is the loss of suitable grassland habitat. Economic factors have affected the viability of farms in New York. Many farmers have intensified their farming practices, converted hayfields to row crops, or abandoned farming altogether (Andrle and Carroll 1988, Post 2005). Remaining hayfields are often mowed earlier and more frequently to increase production. As a result, the mortality rate of young in those fields is high and sometimes adults are killed during mowing. As farms are abandoned they are lost to development or the land reverts to shrublands and forests. Grasslands are becoming more scattered and isolated thereby reducing connectivity (Post 2005). Another significant threat to Northern Harriers is the loss of wetland habitat by draining, dredging, and filling marshes (Evers 1992 cited in NatureServe 2003). New York State has lost over half of its wetlands since colonization (Tiner 1984 cited in NatureServe 2003). More recently, losses of wetlands in the Lake Plains portion of the state have been offset as agricultural lands revert back to wetlands, although net losses of wetlands in the Hudson Valley continue. Emergent marshes, which constitute only five percent of the state's 2.5 million acres, have declined overall. Equally important, the quality of remaining habitat is often degraded by fragmentation, exotic plants, and nutrient enrichment (Riexinger, personal communication, October 31, 2003). Ditching of salt marshes for mosquito control may have negative effects on breeding populations (Serrentino and England 1989).

Management Considerations

Large areas of open habitat in breeding and wintering areas need to be maintained in order to ensure the persistence of this species in New York. Potential management practices include burning, mowing, and plowing of fields after the breeding season. Use Landowner Incentive Program funds to conserve privately-owned grasslands. Coordinate conservation efforts with other agencies and organizations and initiate an outreach program (Post 2005). It may also be possible to design a management plan that would include other threatened species with similar habitat requirements, such as the Short-eared Owl.

Research Needs

Implement accurate and standardized survey methods to determine the population size in New York. Data should be collected on hunting habitat and roost site selection in various habitats such as salt marshes, freshwater wetlands, agricultural habitats, and maritime heaths. Determine the sizes of hunting ranges of birds during the breeding and non-breeding season at sites with varying densities and habitat types. Determine the causes of breeding failure and mortality in young and adults. Conduct studies on the techniques used to maintain early successional habitats. Comparisons between treatments and the cost-effectiveness of each treatment are especially needed. Determine the amount and type of disturbances that breeding Northern harriers will tolerate. In coastal areas, determine the effect of salt marsh ditching on populations and their major prey species.

Short Term Trends

Northern Harrier populations vary with rodent populations, peaking about every five years. Breeding populations appear to be fairly stable when comparing the two breeding bird atlases of New York. During the first Breeding Bird Atlas (1980-1985), 355 probable or confirmed blocks were reported (Andrle and Carroll 1988). During the second Breeding Bird Atlas, probable or confirmed breeding was reported in 354 blocks (McGowan and Corwin 2008). Since Northern Harriers have a large home range, it is possible that individuals were reported in more than one block. Declines were noted by McGowan and Corwin (2008) in the Adirondacks, Coastal Lowlands, St. Lawrence Plains, and Tug Hill Plateau, while the number of reported blocks increased in the Champlain Valley to the northern Hudson Valley, Mohawk Valley, and Appalachian Plateau (McGowan and Corwin 2008). Breeding Bird Survey data show a possible decline of 3.8% per year between 1980 and 2006. Although, these findings were not found to be statistically significant (Sauer et al. 2007). Non-breeding populations appear to be their highest during spring and fall migration (Levine 1998). Wintering populations fluctuate with prey abundance and snow cover, but appear to be fairly stable.

Long Term Trends

Until about the 1950s, breeding Northern Harriers were considered common throughout the state. Between the 1950s and 1960s the population started to decline for unknown reasons (Andrle and Carroll 1988, Levine 1998). The downward trend may be attributed to habitat loss ranging from reforestation and filling of wetlands to urban and industrial development (Serretino 1992). Although it is not certain, pesticide use may have also played a role in the population decline (Levine 1998). Breeding Bird Survey data show a possible decline of 3.0% per year from 1966 to 2006. Although, these findings were not determined to be statistically significant (Sauer et al. 2007). Wintering populations appear to be fairly stable. Northern Harriers have been known to winter in areas where they are locally extirpated as breeders (Serrentino 1992).

Habitat

Northern Harriers use a wide range of open grasslands, shrubland, and salt and freshwater marshes (Andrle and Carroll 1988, McGowan and Corwin 2008). Nests are placed on the ground, usually in dense cover.

Associated Ecological Communities

Brackish Meadow
A moist, moderately well-drained brackish (salinity 0.5-18 ppt) perennial grassland with occasional isolated shrubs that is typically situated in a belt at the upper edge of salt marshes bordering sandy uplands, but may occupy large portions of interdunal basins. The community usually develops in areas with a unique combination of soils and hydrology, on deep deposits of periodically windblown or overwashed gleyed sands that are usually flooded only during spring tides and during major coastal storms, approximately two to three times per year.

Brackish Tidal Marsh
A marsh community that occurs where water salinity ranges from 0.5 to 18.0 ppt, and water is less than 2 m (6 ft) deep at high tide. The vegetation in a brackish tidal marsh is dense

and dominated by tall grass-like plants.

Deep Emergent Marsh
A marsh community flooded by waters that are not subject to violent wave action. Water depths can range from 6 in to 6.6 ft (15 cm to 2 m). Water levels may fluctuate seasonally, but the substrate is rarely dry, and there is usually standing water in the fall.

Dwarf Pine Plains
A woodland community dominated by dwarf individuals of pitch pine and scrub oak that occurs on nearly level outwash sand and gravel plains in eastern Long Island. The soils are infertile, coarse textured sands that are excessively well-drained.

Freshwater Tidal Marsh
A marsh community that occurs in shallow bays, shoals, and at the mouth of tributaries of large tidal river systems, where the water is usually fresh (salinity less than 0.5 ppt), and less than 2 m (6 ft) deep at high tide. Typically there are two zones in a freshwater tidal marsh: a low-elevation area dominated by short, broadleaf emergents bordering mudflats or open water, and a slightly higher-elevation area dominated by tall grass-like plants.

Hempstead Plains Grassland
A tall grassland community that occurs on rolling outwash plains in west-central Long Island. This community occurs inland, beyond the influence of offshore winds and salt spray.

High Salt Marsh
A coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide up to the limit of spring tides. It is periodically flooded by spring tides and flood tides. High salt marshes typically consist of a mosaic of patches that are mostly dominated by a single graminoid species.

Low Salt Marsh
A coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide down to mean sea level or to about 2 m (6 ft) below mean high tide. It is regularly flooded by semidiurnal tides. The mean tidal range of low salt marshes on Long Island is about 80 cm, and they often form in basins with a depth of 1.6 m or greater.

Maritime Grassland
A grassland community that occurs on rolling outwash plains of the glaciated portion of the Atlantic coastal plain, near the ocean and within the influence of offshore winds and salt spray.

Maritime Shrubland
A shrubland community that occurs on dry seaside bluffs and headlands that are exposed to offshore winds and salt spray.

Medium Fen
A wetland fed by water from springs and seeps. These waters are slightly acidic (pH values generally range from 4.5 to 6.5) and contain some dissolved minerals. Plant remains in these fens do not decompose rapidly and thus the plants in these fens usually grow on

older, undecomposed plant parts of woody material, grasses, and mosses.

Salt Panne
A shallow depression in a salt marsh where the marsh is poorly drained. Pannes occur in both low and high salt marshes. Pannes in low salt marshes usually lack vegetation, and the substrate is a soft, silty mud. Pannes in a high salt marsh are irregularly flooded by spring tides or flood tides, but the water does not drain into tidal creeks. After a panne has been flooded the standing water evaporates and the salinity of the soil water is raised well above the salinity of sea-water.

Shallow Emergent Marsh
A marsh meadow community that occurs on soils that are permanently saturated and seasonally flooded. This marsh is better drained than a deep emergent marsh; water depths may range from 6 in to 3.3 ft (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the soil is exposed during an average year.

Shrub Swamp
An inland wetland dominated by tall shrubs that occurs along the shore of a lake or river, in a wet depression or valley not associated with lakes, or as a transition zone between a marsh, fen, or bog and a swamp or upland community. Shrub swamps are very common and quite variable.

Successional Old Field
A meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned or only occasionally mowed.

Successional Shrubland
A shrubland that occurs on sites that have been cleared (for farming, logging, development, etc.) or otherwise disturbed. This community has at least 50% cover of shrubs.

Other Probable Associated Communities

Alvar grassland
Calcareous pavement barrens
Dwarf shrub bog
Inland salt marsh
Salt shrub
Successional northern sandplain grassland

Associated Species

Short-Eared Owl (*Asio flammeus*)

Range

The map shows the known locations for northern harrier (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Fort Edward Grasslands (Washington County)
Galeville Grasslands (Orange, Ulster Counties)
Point Peninsula (Jefferson County)

New York State Distribution

Northern Harriers are confirmed breeders in the western Great Lakes plain, open habitats of the Adirondacks, western Finger Lakes, Long Island, and the Hudson, Saint Lawrence, and Lake Champlain valleys. The winter range is similar depending on prey abundance and snow cover.

Global Distribution

Breeding: In North America, the breeding range of the Northern Harrier ranges from northern Alaska to northern Saskatchewan and southern Quebec; south to northern Baja California, southern Texas, southern Missouri, West Virginia, southeastern Virginia, and North Carolina (and formerly Florida). They breed rarely or erratically south of the North American breeding range (MacWhirter and Bildstein 1996 cited in NatureServe 2003). In Eurasia, Northern Harriers can be found from the British Isles, Scandinavia, northern

Russia and Siberia south to the Mediterranean region, southern Russia, Turkestan, Amurland, Ussuriland, Sakhalin, and the Kurile Islands (AOU 1983 cited in NatureServe 2003). The breeding range is large but often highly discontinuous.
Non-breeding: During the non-breeding season, Northern Harriers are found in North America from southern Canada or the northern contiguous United States south through the United States, Middle America, and the Antilles to northern Columbia, Venezuela, and Barbados. They are considered casual or accidental in Hawaii (AOU 1983 cited in NatureServe 2003, MacWhirter and Bildstein 1996 cited in NatureServe 2003). In North America, Northern Harriers winter in the largest numbers in the Great Basin and central and southern Great Plains (Root 1988 cited in NatureServe 2003). The coastal areas of New York, New Jersey, Delaware, Maryland, and Virginia support the highest number of wintering birds in the Northeast (National Audubon Society 1971-74, 1982-83, 1985-87 cited in NatureServe 2003). In Eurasia, they are found from the British Isles, southern Scandinavia, and southern Japan south to northwestern Africa, Asia Minor, India, Burma, eastern China, and the Ryukyu Islands (AOU 1983 cited in NatureServe 2003).

Identification Comments

Identifying Characteristics

The Northern Harrier is a slim, medium-sized hawk with long, broad wings and long legs and tail. There are two features that are useful in identifying this species: a facial ruff that gives them an owl-like appearance and a white rump that is visible when in flight. Northern Harriers are known to fly low over fields and to hover in flight over prey. Sexes are dimorphic. Adult females are dark brown above and buffy below. There is some streaking in the underparts. The tail is barred. Males differ in that they are gray above and white below. Underparts have reddish spots. Wingtips are black. Males have brown dorsal markings until three to four years of age. Immature harriers are similar in appearence to females except they have a cinnamon-colored breast and the back and wings are darker brown. Immature plumage is retained until the following spring or summer. When laid, eggs are pale blue, but turn white after a few days. Some eggs have brown markings. Nests are built of grasses and sticks on the ground in thick vegetation of grassland or marshes. Northern harriers have a few vocalizations that are used in various situations. In general, the call is a weak, nasal whistle ("pee, pee, pee"). A "wailing squeal" is used by females to males and young to adults when begging for food. The same call can be heard during courtship. Incubating females may use a "quip, quip, quip" call.

Behavior

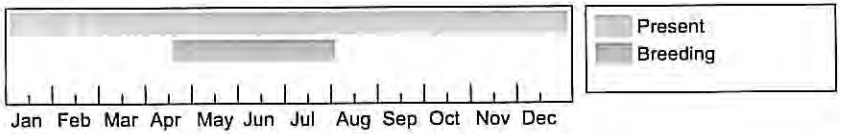
During the breeding season, males hunt farther away from the nest site than females. Northern Harriers are known to congregate during the winter months in open habitats with high rodent populations. They usually abandon wintering grounds with deep snow cover. They are known to share wintering grounds with other bird species, such as Short-eared Owls and Rough-legged Hawks.

Diet

Northern Harriers prey upon rodents and small birds.

The Best Time to See

Northern Harriers are found in New York throughout the year. During the breeding season, the best time to look for Northern Harriers is May through June. Concentrations of birds may be found in suitable habitat with abundant prey during the winter months.



The time of year you would expect to find Northern Harrier in New York.

Similar Species

Rough-Legged Hawk(Buteo lagopus): Northern Harriers and Rough-legged Hawks are found in similar habitats during the winter. Rough-legged Hawks are larger and have a white tail with dark bands. They lack the white rump patch that is present on Northern Harriers. Northern Harriers also have an owl-like facial ruff. Both species are known to hover in flight.

Short-Eared Owl(Asio flammeus): Northern Harriers have an owl-like facial disk which may cause some confusion when initially trying to distinguish them from Short-eared Owls. Short-eared Owls lack the distinctive white rump patch of Northern Harriers.

Taxonomy

Kingdom Animalia
- **Phylum** Craniata
  - **Class** Birds (Aves)
    - **Order** Raptors (Falconiformes)
      - **Family** Accipitridae (Hawks, Kites, Eagles)

Additional Common Names

Marsh Hawk

Pied-billed Grebe

Pied-billed Grebe (fall plumage)

Photo credits: *Lee Karney, USFWS*

Scientific Name *Podilymbus podiceps* (Linnaeus, 1758)

Family Name Podicipedidae
Grebes

Did you know?
Both sexes build a large sodden, floating nest of rotting and green plant material and mud. The decomposition of plant material generates substantial quantities of heat, up to 11-13C higher than the surrounding water, providing enough heat to incubate the eggs in the adults' absence (Davis et al. 1984). Like other grebe species (Nuechterlein and Buitron 2002) this may afford the adults the ability to roost comunally at night to minimize predation risk.

Summary

Protection Threatened Species in New York State, protected federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species likely to become an endangered species within the foreseeable future in New York. 2) Any species listed as threatened by the U.S. Department of the Interior.

Rarity G5, S3B,S1N

A global rarity rank of G5 means: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3B,S1N means: Typically 21 to 100 breeding occurrences or limited breeding acreage and typically 5 or fewer non-breeding (usually winter residents) occurrences in New York State.

State Ranking Justification

The pied-billed grebe was recorded as a probable or confirmed breeder in 150 USGS topographical quads during the second New York State Breeding Bird Atlas (2000-2005), and as a possible breeder in an additional 115 quads. Overall, the species is considered a rare to uncommon, local breeding species with many of the records clustered in areas of large wetland complexes. Although it was recorded in significantly more quads during the Atlas 2000 project in comparison with the first New York State Breeding Bird Atlas in the mid-1980's, Breeding Bird Survey records indicate a - 2.0% annual trend between 1980 and 2002 (New York State Department of Environmental Conservation 2006) and the

species is state listed as Threatened. Loss of wetlands and other factors continue to pose threats to the species although a number of excellent occurrences are on protected state and federal wetland complexes.
This species is protected under the Migratory Bird Treaty Act. The Migratory Bird Treaty Act implements various treaties and conventions between the U. S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under this Act, taking, killing, or possessing migratory birds, including nests or eggs, is unlawful unless specifically permitted by other regulations.

Conservation Issues

Threats

Currently, the greatest threat to this species is the ongoing alteration and loss of wetlands through draining, dredging, filling, pollution, invasive species and siltation from agricultural practices and roads. These threats lead to the degradation, isolation, and fragmentation of wetlands and have left many marshes that were too small, or were not part of larger marsh complexes, unsuitable for grebes and other marshbirds (New York State Department of Environmental Conservation 2006). Pollution and environmental contamination degrades the food web of wetland ecosystems and can impair the reproductive capacity of pied-billed grebes through the process of biomagnification. Popular organophosphate pesticides used heavily for agriculture have been directly implicated in the death of this species and elevated mercury levels have been detected in some individuals (Gibbs and Melvin 1992). Siltation and runoff from development and agriculture may also negatively impact populations of important prey species. Water level management on Lake Ontario and other large water bodies can alter marsh habitat and decrease the quality of historically utilized sites. In other cases, lack of stochastic events that produce a flushing effect may negatively impact marshbirds by promoting large monotypic stands of emergent vegetation. Invasive aquatic plants such as purple loosestrife crowd out native emergents and form stands too dense, and lacking sufficient open water interspersion, for some marshbird species including pied-billed grebes. Small, localized breeding populations are extremely vulnerable to stochastic events, such as storms, habitat loss, or human disturbance. (New York State Department of Environmental Conservation 2006). Grebes are sometimes mistaken for ducks by hunters and are accidentally shot. Television and cell towers pose an extreme danger to nocturnally migrating individuals, for example 65 pied-billed grebes died at a television tower in Florida between 1955 to 1980 (Muller and Storer 1999).

Management Considerations

Restoration of wetland habitat, improvement of water level control at managed wetlands, promotion of the Farm Bill Landowner Incentive Program to manage and restore appropriate habitat, reducing the spread of invasive exotic species, and controlling invasive species where they occur at sites occupied by grebes and other rare marshbirds, are all identified as important management actions beneficial to pied-billed grebes (New York State Department of Environmental Conservation 2006). Because pied-billed grebes will readily colonize wetland impoundments managed primarily for waterfowl, there is ample opportunity to make minor alterations to existing management schemes to improve nesting and foraging habitat for grebes. Since other secretive, rare marshbird species such as American bitterns, least bitterns, and black terns share habitat preferences with pied-billed grebes, management strategies could benefit multiple species of management concern. The conservation of relatively large (5-75 ha) wetlands with roughly a 50/50 interspersion

of moderately shallow emergent vegetation and open water (the "hemi-marsh") is the most urgent management need for pied-billed grebes and other marsh-nesting birds. Dense stands of vegetation therefore need to be periodically opened up to retard succession. Properly managed muskrat populations often fulfill this role, but the process may need to be augmented by cutting, burning or flooding. Herbicide treatments are not recommended. Manipulation of water levels provides a cost-effective method for establishing moderately dense stands of emergent vegetation while retaining open water areas preferred by grebes. However, water levels need to be maintained at a stable level during the nesting season to prevent flooding of nests and predator access. Complete drawdown should be avoided so as not to destroy major fish and odonate food items. The floating nests of grebes are easily washed over and capsized by wave action, so large motorized boats should be excluded from occupied marshes, and nesting areas should be protected from heavy recreational use to prevent disturbance of incubating birds (Gibbs and Melvin 1992). In general, pied-billed grebe's high reproductive potential (large clutch size, ability to re-nest following nest loss), in addition to its tolerance of a wide range of freshwater marsh habitats, suggests that management potential is high.

Research Needs

A number of research needs have been identified including: 1) Evaluation of habitat characteristics at multiple scales to better understand micro and macro habitat features important for nest site selection; 2) Conducting controlled experiments to see which management actions are effective locally in producing suitable habitat; 3) Conduct demographic studies at selected sites to identify source and sink populations; 4) Determine major migration stop-over sites and conduct studies of habitat use, prey availability, and diet at migratory staging and molting areas, as well as wintering grounds, to asses possible threats and limiting factors, 5) Investigate aspects of behavioral ecology, such as mate selection, mate fidelity, spacing behavior, coloniality, dispersal, and post fledging parental care; 6) Periodically monitor the levels of contaminants in birds and eggs to assess trends and determine effects on eggshell thinning, behavioral modification, chick development, nesting success, and juvenile survival; 7) Refinement of standardized survey techniques and implementation of programs to monitor population trends; 8) Conduct studies of the structural composition of wetland vegetation, water levels and quality, and wetland area and occupancy relationships during nesting and migration; 9) Evaluate the effects of invasion of non-native invasive marsh plants on grebe habitat suitability (Gibbs and Melvin 1992, New York State Department of Environmental Conservation 2006) .

Short Term Trends

Although Breeding Bird Survey data for 12 survey routes in New York between 1966-1989 showed a non-significant 0.6% decrease in abundance (Gibbs and Melvin 1992) another analysis shows a - 2.0 % annual trend from 1980-2002 (New York State Department of Environmental Conservation 2006). An increase in the number of Breeding Bird Atlas blocks where the species was either a probable or confirmed breeder from the first Atlas to the second (86 to 184) Atlas could reflect population increases, range expansion, or increased surveys efforts for marshbird species.

Long Term Trends

There is little data on which to base a long-term trend. However, considering the massive loss of wetlands in New York State over the past 100 years it seems that pre-European population sizes must have been substantially higher. Heavy historical exploitation by humans, namely shooting for feathers and egg collecting, have abated since the turn of the 20th century. In the late 1800's large numbers were shot and sold to milliners and furriers who fashioned ear-muffs and hat ornaments from the silver-white breast and abdomen feathers (Bent 1919).

Habitat

Pied-billed grebes inhabit quiet marshes, marshy shorelines of ponds, shallow lakes, or marshy bays and slow moving streams with sedgy banks or adjacent marshes; rarely in brackish marshes with limited tidal fluctuation. Although plant species in breeding marshes may vary, a 50/50 combination ("hemi- marsh") of emergent vegetation interspersed with open water is desirable (Andrle and Carroll 1988). Grebes avoid dense emergent vegetation, and muskrats appear to play an important role in opening up dense cattail stands and providing cut stalks for nest construction. Ideal water depths for nesting range from 25 to 50 cm (Seyler 2003). Grebes set up breeding territories more commonly in wetlands impounded by beavers or humans than in those of glacial origin, and individual pairs appear to favor wetlands of intermediate size (0.6 - 7.0 ha) over very large or small wetlands (Gibbs and Melvin 1992).

Associated Ecological Communities

Backwater Slough
The aquatic community of quiet to stagnant waters in sloughs that form in embayments and old meanders that are cut off from an unconfined river or marsh headwater stream only at the upstream end by deposition of a levee.

Deep Emergent Marsh
A marsh community flooded by waters that are not subject to violent wave action. Water depths can range from 6 in to 6.6 ft (15 cm to 2 m). Water levels may fluctuate seasonally, but the substrate is rarely dry, and there is usually standing water in the fall.

Impounded Marsh
A marsh (with less than 50% cover of trees) in which the water levels have been artificially manipulated or modified, often for the purpose of improving waterfowl habitat.

Marsh Headwater Stream
The aquatic community of a small, marshy perennial brook with a very low gradient, slow flow rate, and cool to warm water that flows through a marsh, fen, or swamp where a stream system originates. These streams usually have clearly distinguished meanders (i.e., high sinuosity) and are in unconfined landscapes.

Shallow Emergent Marsh
A marsh meadow community that occurs on soils that are permanently saturated and seasonally flooded. This marsh is better drained than a deep emergent marsh; water depths may range from 6 in to 3.3 ft (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the soil is exposed during an average year.

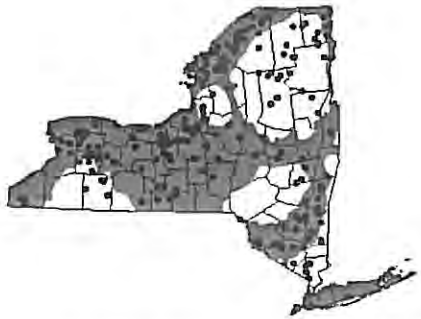
Other Probable Associated Communities

Shrub swamp

Associated Species

American Bittern (*Botaurus lentiginosus*)
Black Tern (*Chlidonias niger*)
American Coot (*Fulica americana*)
Common Moorhen (*Gallinula chloropus*)
Least Bittern (*Ixobrychus exilis*)

Range



The map shows the known locations for pied-billed grebe (black dots) based on the New York Natural Heritage Program database and the first New York Breeding Bird Atlas. A general approximation of the potential breeding range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)
- The New York Breeding Bird Atlas

Best Places to See

Salmon River Mouth (Oswego County)
Tonawanda Wildlife Management Area (Genesee County)

New York State Distribution

As a breeding species, the pied-billed grebe occurs statewide, with concentrations on the Lake Ontario Plain and St. Lawrence Valley. It is more sparsely distributed in the Adirondacks, Catskills, Allegheny uplands, and on Long Island. It is a rare but regular winter visitor, more common on the coast, but also lingering fairly regularly in open water areas on the Allegany and Oswego Rivers, and at Dunkirk Harbor in Chautauqua County (Levine 1998).

Global Distribution

BREEDING: southeastern Alaska through southern Canada to Nova Scotia, south locally through North America, Middle America, West Indies, and South America to central Chile and southern Argentina (AOU 1983). Breeding populations in the northeastern U.S. are more localized and less abundant than in other regions of the U.S. or Canada (Gibbs and Melvin 1992). NON-BREEDING: southern British Columbia, western and southern U.S. south through South America. Areas of high winter concentrations include southern and central Texas, Great Salt Lake (Utah), Lake Mead (Nevada-Arizona), and the San Joaquin Valley (California) (Root 1988). The highest overall counts of wintering grebes occurs on the Tennesse River in northeastern Alabama (Gibbs and Melvin 1992).

Identification Comments

Identifying Characteristics

Pied-billed grebes are small, stocky, poorly buoyant waterbirds, about 31-38 cm in length, with small, narrow wings, and feet placed far back, with a blunt-ended posterior. During the non-breeding period, the bill is unmarked, the throat is white, and the white rear becomes more conspicuous. As adults, the sexes are alike, whereas juveniles are distinguished by the lack of a white orbital ring, an unmarked bill, darker brown sides of the head and neck, and a whiter underbelly (Palmer 1962). Downy chicks have a zebra-like pattern of black and white stripes, interspersed with reddish-brown spots (Palmer 1962). VOCALIZATIONS: Territorial males have a distinctive prolonged call, a loud "cow-cow-cow-cow-cow-cowp...cowp...cowp...". Several other calls are also produced during the breeding season, but during the non-breeding season they are mostly silent. NEST: Grebes build sodden, floating nests of rotting and green plant material and mud averaging 38 cm in diameter (Glover 1953), often anchored to growing emergent plants. EGGS: Elliptical to subelliptical, approximately 44 x 30 mm, smooth and nonglossy (Harrison 1978). Although white or tinted bluish when laid, the eggs gather a heavy, brown stain from the wet, organic matter in the nest.

Best Life Stage for Identifying This Species

Mature adults are easiest to identify and the sexes are similar. However, the downy chicks of pied-billed grebes have a striking, zebra-like pattern of black and white stripes, interspersed with reddish-brown spots, that makes them readily identifiable as well.

Behavior

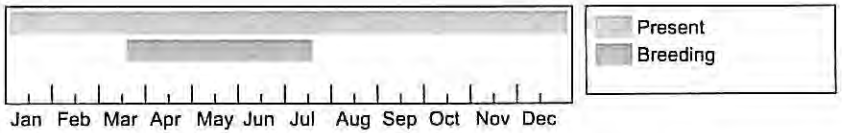
Grebe's are very secretive birds that will slowly submerge underwater with only their eyes and nostrils showing in order to escape danger. Downy chicks ride on the adults back, even when they dive underwater. Adults consume their own feathers and also feed them to young, presumably to protect the stomach and trap fish bones. Hard indigestible items are felted together with feathers and regurgitated as pellets. Grebes migrate nocturnally, landing before dawn at the nearest waterbody and are more social outside the breeding season. During breeding pied-billed grebes are an aggressive, highly territorial bird, threatening, chasing and attacking conspecifics and other species. They are reluctant to take flight, needing a long running start across open water to become airborne. Seasonally monagamous, both sexes build the nest and add plant material and mud as the season progresses and the nest slowly sinks. Air-pockets and trapped gases generated by the fermenting and rotting vegetation give buoyancy to the nest. The floating, rotting nest generates substantial quantities of heat (Davis et al. 1985) and may allow the adults to abandon the nest at night to avoid predation risk (Nuechterlein and Buitron 2002). The young are precocial, making their first successful catches of food (fish, insects) at 10-12 days post-hatching and they are capable of flight only 35 days after hatching.

Diet

Pied- billed grebes are opportunistic carnivores, the diet being dominated by crayfish (31% by volume), insects (46%), primarily Odonates (dragonflies), Heteroptera (true bugs), Coleoptera (beetles) and fish (24%), including catfish, eels, perch, sunfish, suckers, carp, sciulpins, killifish, sticklebacks, and minnows. There is a strong seasonal shift in the diet, fish being most important during the nonbreeding season, while dragonfly nymphs constituted 34% of the diet in late summer and are an important food item for chicks (Muller and Storer 1999). The diet also includes smaller amounts of snails, small frogs, tadpoles, aquatic worms and leeches. In wetlands where fish are not prevalent, Ambystomatid salamander adults and larvae play a key role in the diet (Osnas 2003).

The Best Time to See

In New York, the pied-billed grebe is a rare to uncommon local breeder; a fairly common migrant, more numerous in the fall; and a rare but regular winter visitant (Levine 1998). Migratory grebes usually arrive on the nesting grounds by early March, shortly after ice out, and courtship commences in early April with nesting activity initiated by mid-April. The peak vocalization period for pied-billed grebes at study sites in western New York was from late-April through mid-May with breeding activity vocalizations dropping off through June (Lor and Maleki 2002).



The time of year you would expect to find Pied-billed Grebe in New York.

Similar Species

Common Moorhen(Gallinula chloropus): The moorhen's call can be mistaken for a pied-billed grebe's, but is more nasal. This species has a reddish forehead shield, yellow tipped bill, with a white streak on its flanks.

American Coot(Fulica americana): Coots have an all black body and pale bill extending onto the forehead.

Conservation Comments

Grebes are a family of diving birds with no living relatives. They may have once been related to Loons (Cotter and Spencer 1996).

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Birds (Aves)
└ **Order** Grebes (Podicipediformes)
└ **Family** Podicipedidae (Grebes)

Additional Common Names

Hell Diver
Water Witch

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

Horned Lark Fact Sheet

Horned Lark

Eremophila alpestris

New York Status: Special Concern
Federal Status: Not Listed

Description

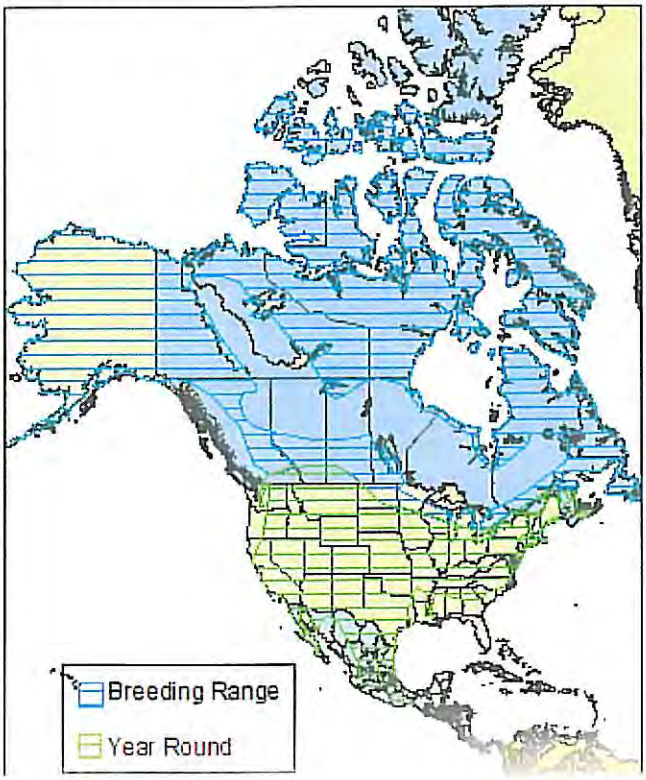
The horned lark is a small (16 - 20 cm) songbird named for its horn like feather tufts which are most often visible on male. They are easily distinguished by their dominant black lores, cheek patches, and breast patch. These contrast strikingly with the white to yellow eyebrow stripe, ear patches, and chin. Males are slightly larger and darker than females with color variations throughout North America relating to habitat moisture. The back, rump, nape, and dorsal side of the tail feathers are a brownish gray with the breast and belly light brown to white. Juveniles are distinguished from adults by dusky facial features, lighter overall coloration, a buff yellow bill, and flesh colored legs and feet.

© David Seibel Photography

Life History

The horned lark is the earliest nesting, native bird species in New York State with nesting reported as early as late February. Nests are constructed on the ground with the site selected by the female. The nest is typically in a small depression and is made of grasses, roots, and hair. It is often lined by small by pebbles on its outer rim. Incubation is done entirely by the female and begins after the last egg is laid. Young typically hatch on the same day and are covered in a buff colored down which offers some protection from the elements and helps camouflage them from predators. Two or more clutches a season are common for much of this species range. Both the male and female feed nestlings and fledging occurs at 8 to 10 days. They primarily feed on invertebrates and seeds.

Distribution and Habitat

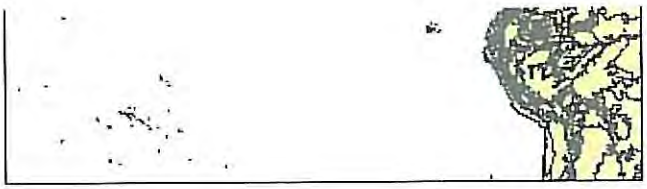


The breeding range for this species is vast extending north to south from the arctic islands to central Mexico. This species is found year round throughout much of its range with northern populations migrating to central or southern parts of the breeding range during the winter months. It was likely uncommon in the northeast before the settlement and clear cutting that took place in the 19th century. Occupies areas with short grasses and/or barren ground. Tolerates disturbance and agricultural practices well. Commonly nests in row crops, hayfields, short grass prairie, and deserts.

Status

In New York, the horned lark occupies low land areas across the state including the Great Lakes Plains, Appalachian Plateau, and the Costal Lowlands. The second atlas results yielded a 37 percent decline in detection for this species. While it continues to occupy the same areas, its distribution within these areas has become patchy with the most notable loses in the Appalachian Plateau and Costal Lowlands. This species is experiencing declines throughout much of its range and is listed as a Threatened species in Connecticut.

Horned Lark



Horned Lark Range

Management and Research Needs

The horned lark would benefit from grassland management efforts. Research assessing this species response to habitat restoration at disturbed locations (ie reclaimed mines) may also be beneficial. Research on geographic variations of the species is also needed.

Additional References

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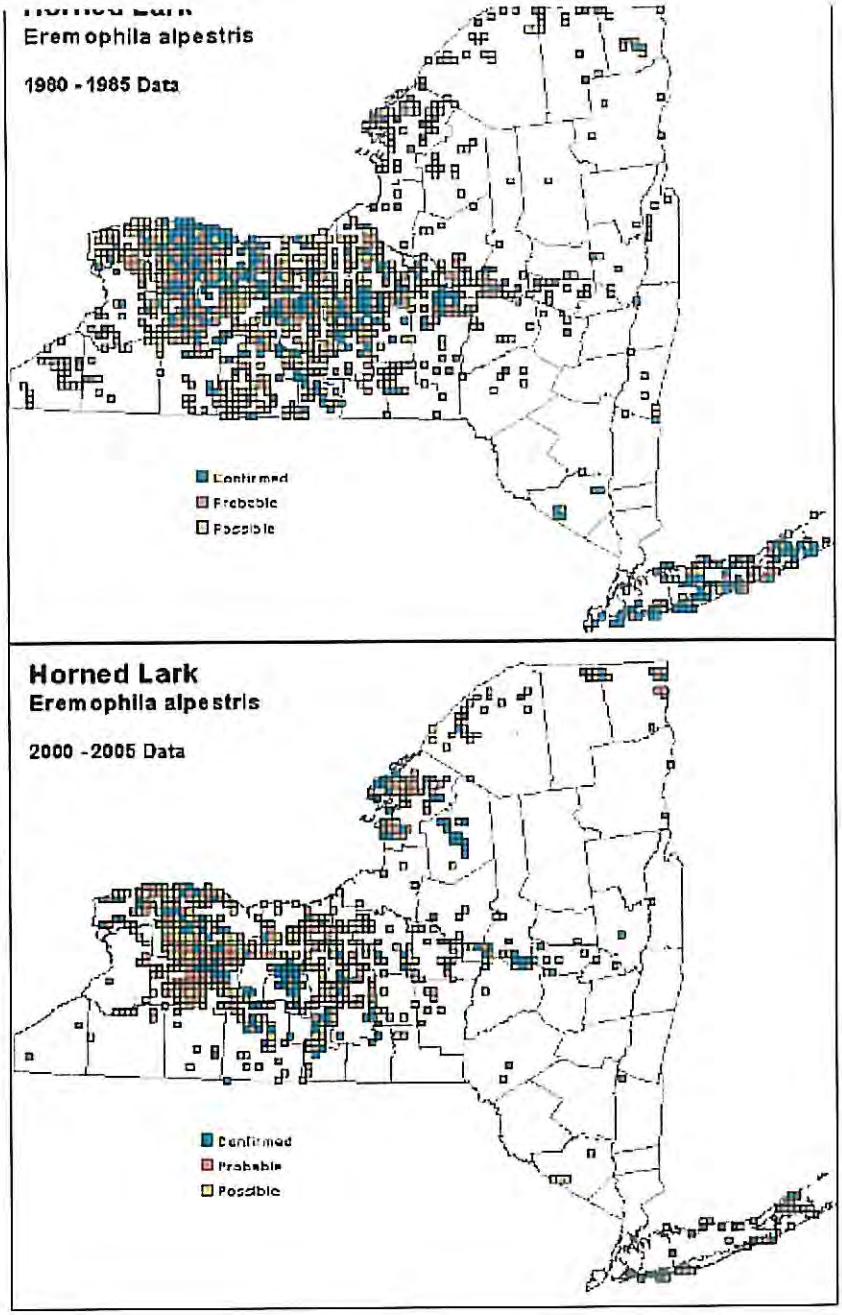

Distribution of Horned Lark in New York from 1st and 2nd NYS Breeding Bird Atlas Records

Horned Lark

Eremophila alpestris | ORDER: PASSERIFORMES | FAMILY: ALAUDIDAE

IUCN Conservation Status: Least Concern

Similar Species Related Species Go to: Horned Lark

© Marie Read

The only true lark native to North America, the Horned Lark is a common, widespread bird of open country.

Identification | Life History | Sound | Video

Visit Birds of North America for more on this species

At a Glance

Habitat	Food	Nesting	Behavior	Conservation
Grassland	Seeds	Ground	Ground Forager	Least Concern

Cool Facts

- Adult Horned Larks eat primarily weed and grass seeds, but they feed insects to their young.
- The use of mowed areas around airstrips has allowed the Horned Lark to colonize regions where no other suitable habitat may exist nearby, such as heavily forested areas.

Measurements

Both Sexes

Length
6.3–7.9 in
16–20 cm

Wingspan
11.8–13.4 in
30–34 cm

Weight
1–1.7 oz
28–48 g

Habitat

Grassland

Open, barren country. Prefers bare ground to short grasses.

Other Names

- Shore Lark (British)
- Alouette hausse-col, L'Alouette cornue, Alouette bilophe (French)
- Alondra cornuda (Spanish)

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Food

Seeds

Seeds, some insects.

Range Map

Horned Lark
Eremophila alpestris

Map by Cornell Lab of Ornithology
Range data by NatureServe

View dynamic map of eBird sightings

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Nesting

Nest Description

Nest a basket woven of fine grass or other plant materials, lined with finer material, placed in depression or cavity in ground.

Nesting Facts

Clutch Size
2–5 eggs

Egg Description
Pale gray with brown spots

Condition at Hatching
Helpless and covered in buffy down.

Nest Placement

Ground

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Behavior

Ground Forager

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Conservation

status via IUCN

Declining in most of range.

Least Concern

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Credits

- Beason, R. C. 1995. Horned Lark (*Eremophila alpestris*). *In* The Birds of North America, No. 195 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

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Multimedia
Round Robin
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Register

State Ranking Justification

While more than 20 extant populations are currently known in New York, significant threats to these populations exist. Many of the populations are comprised of few individuals and the habitats that support them are often small in size. While additional bog turtle sites will probably be discovered, some of these may be determined to be part of existing metapopulations and most new sites are expected to have at least some threats.

Conservation Issues

Threats

A spotty distribution and specialized habitat requirements make this species vulnerable to local extirpation. Declines are primarily due to loss, degradation, and fragmentation of habitat. Road mortality, an increase in subsidized predators, natural succession, and the expansion of invasive exotic vegetation are associated with these primary threats. Illegal collecting for the pet trade is also a direct threat to populations.

Management Considerations

The control of exotic species and natural succession is warranted at a number of sites. The control of subsidized predators may be desirable if predation of eggs and juveniles is unusually high.

Research Needs

Additional research on population size, intra-habitat use, and inter-habitat movements and migration is needed.

Short Term Trends

Survey efforts have recently been aimed at marking individual turtles at multiple sites to obtain population data and it is too early to determine short-term trends. The best populations are likely to contain fewer than 100 individuals and most are likely to have far fewer individuals. Twelve populations have between 10 and 92 individuals documented from them and it is probable that an unknown number of additional turtles are also present. Far fewer individuals are known from the remaining 73 populations. Four populations are known to be extirpated and it is likely that many of the populations with records from the 1970s or earlier are extirpated as well.

Bog Turtle

Bog turtle

Photo credits: *Jesse W. Jaycox*

Scientific Name *Glyptemys muhlenbergii* (Schoepff, 1801)

Family Name Emydidae

Did you know?
The bog turtle is one of the smallest turtles in North America. Bog turtles in the northern part of the range are generally less than 100 millimeters (4 inches) in length, while turtles father south reach sizes of up to 115 millimeters (4.5 inches) (USFWS 2001).

Summary

Protection Endangered Species in New York State, listed as Threatened federally.

This level of state protection means: any species which meet one of the following criteria: 1) Any native species in imminent danger of extirpation or extinction in New York. 2) Any species listed as endangered by the United States Department of the Interior.

This level of federal protection means: this species is formally listed as threatened.

Rarity G3, S2

A global rarity rank of G3 means: Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or vulnerable to extinction throughout its range because of other factors.
A state rarity rank of S2 means: Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably make it very vulnerable in New York State.

Habitat

In New York, bog turtles occur in open-canopy wet meadows, sedge meadows, and calcareous fens. The known habitat in the Lake Plain region of the state includes large fens that may include various species of sedges, such as slender sedge (*Carex lasiocarpa*), bog buckbean (*Menyanthes trifoliata*), mosses (*Sphagnum* spp.), pitcher plants (*Sarracenia* sp.), scattered trees, and scattered shrubs. In the Hudson River Valley, bog turtle habitats may be isolated from other wetlands or they may exist as part of larger wetland complexes. These wetlands are often fed by groundwater and the vegetation always includes various species of sedges. Other vegetation that is frequently found in southern New York bog turtle sites includes shrubby cinquefoil (*Potentilla fruticosa*), grass-of-parnassus (*Parnassia glauca*), mosses (*Sphagnum* spp.), horsetail (*Equisetum* sp.), scattered trees such as red maple (*Acer rubrum*), red cedar (*Juniperus virginianus*), and tamarack (*Larix laricina*), and scattered shrubs such as willows (*Salix* spp.), dogwood (*Cornus* spp.), and alder (*Alnus* spp.).

Associated Ecological Communities

Marl Fen
A wetland that occurs on a bed of marl. Marl is a whitish substance that is deposited from water that has a lot of calcium dissolved in it. The whitish substance is calcium carbonate, people used to harvest marl to lime agricultural fields. The marl substrate is always saturated, may be flooded, and has a very high pH, generally greater than 7.5. The main source of water is always groundwater. The plants are often sparse and stunted. Marl fens may occur as small patches within a rich graminoid fen.

Medium Fen
A wetland fed by water from springs and seeps. These waters are slightly acidic (pH values generally range from 4.5 to 6.5) and contain some dissolved minerals. Plant remains in these fens do not decompose rapidly and thus the plants in these fens usually grow on older, undecomposed plant parts of woody material, grasses, and mosses.

Red Maple-hardwood Swamp
A hardwood swamp that occurs in poorly drained depressions, usually on inorganic soils. Red maple is usually the most abundant canopy tree, but it can also be codominant with white, green, or black ash; white or slippery elm; yellow birch; and swamp white oak.

Red Maple-tamarack Peat Swamp
A swamp that occurs on organic soils (peat or muck) in poorly drained depressions. These swamps are often spring fed or enriched by seepage of mineral-rich groundwater resulting in a stable water table and continually saturated soil. The dominant trees are red maple and tamarack. These species usually form an open canopy (50 to 70% cover) with numerous small openings dominated by shrubs or sedges.

Rich Graminoid Fen
A wetland of mostly grasses usually fed by water from highly calcareous springs or seepage. These waters have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. Plant remains do not decompose rapidly and these grasses usually grow on older, undecomposed plant parts.

Rich Shrub Fen
A wetland with many shrubs that is usually fed by water from springs and seeps. These

waters have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. Plant remains in these fens do not decompose rapidly and thus the plants in these fens usually grow on older, undecomposed woody plant parts.

Rich Sloping Fen
A small, gently sloping wetland that occurs in a shallow depression on a slope composed of calcareous glacial deposits. Sloping fens are fed by small springs or groundwater seepage. Like other rich fens, their water sources have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. They often have water flowing at the surface in small channels or rivulets.

Sedge Meadow
A wet meadow community that has organic soils (muck or fibrous peat). Soils are permanently saturated and seasonally flooded. The dominant herbs must be members of the sedge family, typically of the genus Carex.

Other Probable Associated Communities

Black spruce-tamarack bog
Dwarf shrub bog

Associated Species

Spotted Turtle (*Clemmys guttata*)
Wood Turtle (*Clemmys insculpta*)

Global Distribution

The bog turtle occurs in twelve states in the United States and has a discontinuous distribution throughout its range. The northern portion of the range includes central and eastern New York, western Massachusetts, western Connecticut southward to Pennsylvania, New Jersey, Maryland, and northern Delaware. The southern part of the species range includes southeastern Virginia, western and central North Carolina, extreme western Tennessee, and western South Carolina and Georgia. There is a large hiatus of about 250 miles between the northern population and the southern population. Bog turtles occur from sea level to 4,200 feet in elevation in the Appalachians, although populations are usually found below 800 feet in the north. Bog turtles are believed to be extirpated in western Pennsylvania and in the Lake George region of New York.

Identification Comments

Identifying Characteristics

This is a small turtle with adult carapace (upper shell) lengths ranging from 3 to 4.5 inches in length. The carapace is light brown to black, may have a faint yellowish or reddish pattern visible on the large scutes, and is strongly sculptured with growth lines visible, except in very old adults where the growth lines may be worn smooth. An inconspicuous keel is also present along the dorsal midline of the carapace. The plastron (lower shell) is mainly dark brown to black and may also have large yellowish or reddish blotches present. The head is black with two large orange or yellow blotches above and behind the tympanum (ear) on each side of the head.

Characteristics Most Useful for Identification

The small size and normally orange (sometimes yellow) head blotches are split into two parts and are characteristic of the species.

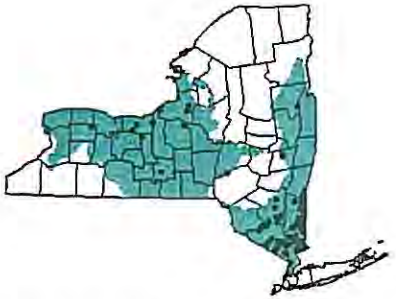
Diet

The diet of the bog turtle has been reported to include insects, plants, frogs, and carrion (Bury 1979). Fecal samples from Massachusetts have contained spiders (Aracnida), beetles (Coleoptera), millipedes (Diplopoda), flies (Diptera), snails (Gastropoda), ants (Hymenoptera), moths (Lepidoptera), dragonflies (Odonata), caddisflies (Trichoptera), and plant fragments (Klemens 1993). Slugs (Arion subflavus) have been reported as food items in southeastern New York, while slugs and crayfish have been reported as food items in North Carolina (USFWS 2001).

The Best Time to See

Bog turtles are diurnal and are normally active during the early morning to mid-day hours, often in the direct sun. This species hibernates communally and shows site-fidelity to hibernacula.

Range



The map shows the known locations for bog turtle (black dots) based on the New York Natural Heritage Program database . A general approximation of the potential range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)

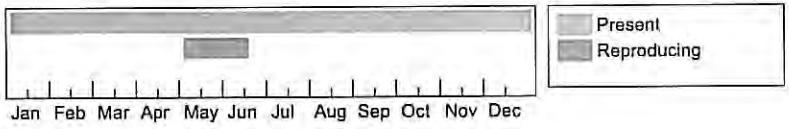
Best Places to See

As this species is vulnerable to illegal collection, no naturally occuring populations are listed.

Bog turtles are currently on display at Cold Spring Harbor Fish Hatchery and Aquarium in Cold Spring Harbor, New York (http://w (Nassau County)
Bog turtles are currently on display at the Rosamond Gifford Zoo at Burnet Park in Syracuse, New York (http://www.rosamondgiff (Onondaga County)
Bog turtles are currently on display at the Seneca Park Zoo in Rochester, New York (http://senecaparkzoo.org/). (Monroe County)

New York State Distribution

Although historical records come from a larger area of the state, extant populations are known from small portions of six counties in the lower Hudson River Valley (Columbia, Dutchess, Putnam, Ulster, Orange, and Sullivan). There are a few records of bog turtles in Westchester County from the 1990s, but it is not known if any extant populations remain in this county. Extant bog turtle populations are also known from a small portion of Oswego County and single locations in Seneca County and Wayne County.



The time of year you would expect to find Bog Turtle in New York.

Similar Species

Spotted Turtle(Clemmys guttata): Some individual spotted turtles may lack the characteristic yellow spots on their shells. This is rarely the case, however, and this species can always be distinguished from bog turtles by the many yellow spots that are present on their heads and necks (Conant and Collins 1998).

Taxonomy

Kingdom Animalia
└ **Phylum** Craniata
└ **Class** Turtles (Chelonia)
└ **Order** Turtles (Cryptodeira)
└ **Family** Emydidae

Synonyms

Clemmys muhlenbergii ((Schoepff, 1801))

Additional Resources

Links

Google Images
http://images.google.com/images?q=CLEMMYS+MUHLENBERGII
NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=CLEMMYS+MUHLENBERGII
New York State Department of Environmental Conservation
http://www.dec.ny.gov/animals/7164.html

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Sistrurus catenatus catenatus - (Rafinesque, 1818)
Eastern Massasauga
Related ITIS Name(s): *Sistrurus catenatus catenatus* (Rafinesque, 1818) (TSN 209510)
Unique Identifier: ELEMENT_GLOBAL.2.105543
Element Code: ARADE03011
Informal Taxonomy: Animals, Vertebrates - Reptiles - Snakes


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View image report from CalPhoto

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Reptilia	Squamata	Viperidae	Sistrurus

Genus Size: B - Very small genus (2-5 species)

Check this box to expand all report sections: ☐

Concept Reference

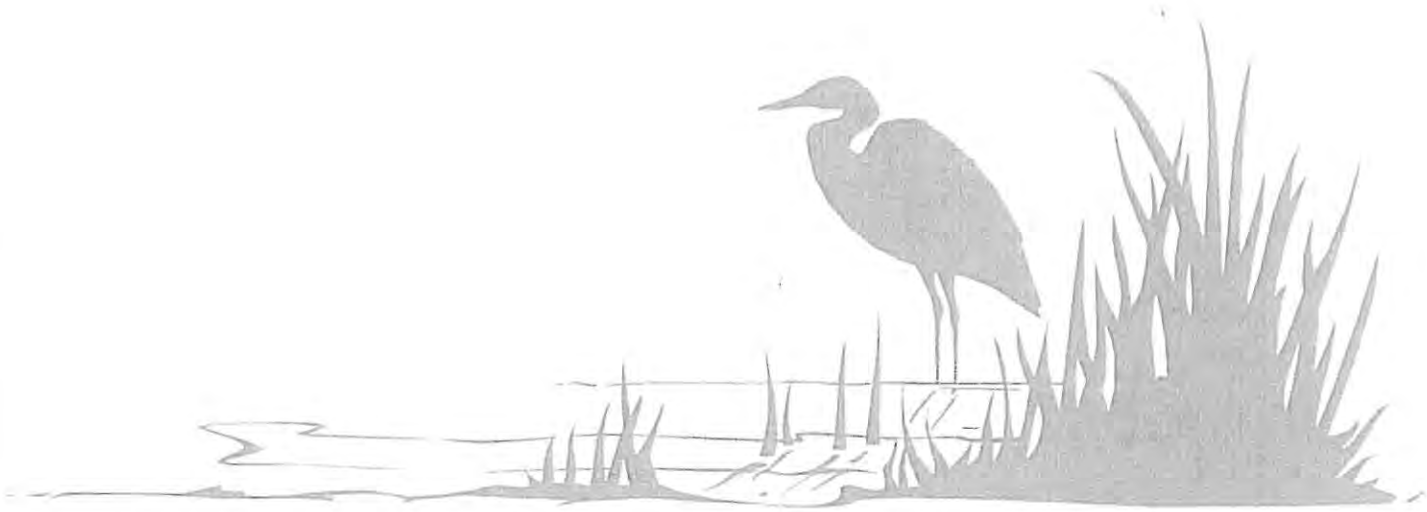
Concept Reference: Collins, J. T. 1990. Standard common and current scientific names for North American amphibians and reptiles. 3rd ed. Society for the Study of Amphibians and Reptiles. Herpetological Circular No. 19. 41 pp.
Concept Reference Code: B90COL01NAUS
Name Used in Concept Reference: *Sistrurus catenatus catenatus*
Taxonomic Comments: The nominal subspecies of *Sistrurus catenatus* are of questionable validity; they appear to be arbitrary segments in a pattern of continuous morphological and ecological variation (Crother et al. 2000). Without mentioning their sources, USFWS (2004) stated that preliminary genetic data indicate that eastern populations of *S. catenatus* (i.e., those north and east of the Missouri River) are distinctive and may warrant recognition as a species separate from the species represented by populations farther west.

Conservation Status

NatureServe Status

Global Status: G3G4T3T4Q
Global Status Last Reviewed: 30Nov2005
Global Status Last Changed: 27Sep2005
Rounded Global Status: T3 - Vulnerable
Reasons: Occurs in the southern Great Lakes region and Midwest; much habitat has been lost as a result of human activities and natural succession, resulting in population reduction and fragmentation.
Nation: United States
National Status: N3N4
Nation: Canada
National Status: N3

Alabama STAMP



ATTACHMENT B

Reproduction Call Playback Survey Data Forms

Project Site: STAMP
Date: 3/16/10
Location: Site A Parcel 8

Project Code: WQMID
Time: 7.25 am
Species: SeOw

Surveyor: T. Somerville, C. Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

Other species
- N. Cardinal
- Crow
- Canada Goose
- titmouse
- Red wing blackbird
- Rusty blackbird
- Song sparrow
- wood duck

Project Site: STAMP
Date: 3/16/10
Location: Site A Parcel 8

Project Code: W9A10
Time: 7:40 AM
Species: SeOw

Surveyor: T. Somerville, C. Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

Project Site: STAMP
Date: 3/16/10
Location: Site A Parcel 8

Project Code: NSAID
Time: 7:40 AM
Species: Horned Lark

Surveyor: T. Somerville, C. Stallone

Call Back Response Survey 1:	**Positive**	**Negative**
Call Back Response Survey 2:	**Positive**	**Negative**
Call Back Response Survey 3:	**Positive**	**Negative**

Notes:

- No call back conducted, however, 2 birds were active in fields (calling)

Project Site: STAMP
Date: 3/16/10
Location: Site B Parcel 1

Project Code: W9AM0
Time: 8:18 AM
Species: Harrier

Surveyor: Somerville, C. Stallone

Call Back Response Survey 1: **Positive** **Negative**

Call Back Response Survey 2: **Positive** **Negative**

Call Back Response Survey 3: **Positive** **Negative**

Notes:

- observed 1 male & 1 female flying North along Hedge row (near dirt access road)

Project Site: STAMP
Date: 3/16/10
Location: Site C Parcel 10

Project Code: WQAID
Time: 8:25 AM
Species: Horned Lark

Surveyor: T. Somerville, C. Stallone

Call Back Response Survey 1: Positive Negative

Call Back Response Survey 2: Positive Negative

Call Back Response Survey 3: Positive Negative

Notes:

- 3 larks present along roadside of Crosby Road

Project Site: STAMP
Date: 3/16/10
Location: Site C Parcel 10

Project Code: WGAID
Time: 6:30 PM
Species: Horned Lark

Surveyor: T. Somerville

Call Back Response Survey 1:	Positive	Negative
Call Back Response Survey 2:	Positive	Negative
Call Back Response Survey 3:	Positive	Negative

Notes:

- No Call Survey Conducted, However 3 Larks were observed & heard Calling.

- Other Species
- Canada goose
- N. Cardinal
- red-winged blackbird
- killdeer
- Brown-headed Cowbird
- Mallard
- Starling

Project Site: STAMP
Date: 3/16/10
Location: Site C Parcel 10

Project Code: N9AIO
Time: 6:30 PM
Species: SEOW

Surveyor: T. Somerville

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

- Habitat shows little potential for Owls to forage or breed

Project Site: STAMP
Date: 3/16/10
Location: Site C Parcel 10

Project Code: WRHO
Time: 7:15 PM
Species: SeOw

Surveyor: T. Somerville

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

-Habitat has potential (shrub-scrub) but area is too small to support alot of foraging. Did not notice many Meadow vole paths.

Project Site: STAMP
Date: 3/24/2010
Location: Parcel 3

Project Code: WQA10
Time: 9:30 Am
Species: Horned Lark

Surveyor: T. Somerville, S. Livingstone

Call Back Response Survey 1: Positive Negative

Call Back Response Survey 2: Positive Negative

Call Back Response Survey 3: Positive Negative

Notes:

- no formal Call response survey was Conducted.
- 2 pairs were observed & heard north of the hedgerow north of Patterson Road.

Project Site: STAMP
Date: 3/24/2010
Location: parcel 2

Project Code: W9A10
Time: 9 Am
Species: Horned Lark

Surveyor: T. Somerville, S. LivingStone

Call Back Response Survey 1: Positive Negative

Call Back Response Survey 2: Positive Negative

Call Back Response Survey 3: Positive Negative

Notes:

- No formal Call response survey conducted
- Several (3-5) pairs were seen & heard just north of Patterson Road while delineating wet lands along the edge of the road.

Project Site: STAMP
Date: 4/14/2010
Location: Parcel 3

Project Code: W9A10
Time: 2:00 PM
Species: Horned Lark

Surveyor: T. Somerville, D. Owens

Call Back Response Survey 1: Positive Negative

Call Back Response Survey 2: Positive Negative

Call Back Response Survey 3: Positive Negative

Notes:

- No formal Survey being Conducted
- I dentified 1 (one) individual while surveying for wetlands. Appeared to be defending arest location amongst the cut hay

Project Site: Stamp
Date: 4/12/2010
Location: BC 1 Parcel 17

Project Code: W9A1D
Time: 6:50 AM
Species: Se Ow

Surveyor: C. Stallone, T. Somenvill

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

other birds:
- field sparrow
- Canada goose
- Savannah sparrow
- Cardinal
- RWB
- RBWP
- Song sparrow
- Am. robin
- grackle
- wood duck
- mallard
- ring neck duck
- Yellow rumped warbler
- rusty Blackbird

Project Site: Stamp
Date: 4/12/10
Location: BC 2 Parcel 23

Project Code: W9 1410
Time: 7:10 Am
Species: Se Ow

Surveyor: C Stallone, T. Somerville

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

55°, partly Cloudy, no wind

Project Site: Stump
Date: 4/12/10
Location: BC-3 Parcel 23
Surveyor: C. Stallone, T. Somerville

Project Code: WJ9A10
Time: 7:25 PM
Species: SeOw

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:

Project Site: Stamp
Date: 4/12/10
Location: Stamp (BC4) Pad 23

Project Code: WQAID
Time: 7:40 PM
Species: SeOw

Surveyor: C. Stallone, T. Somerville

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:

Project Site: STAMP
Date: 4/14/10
Location: Parcel 1

Project Code: WGA10
Time: 8:00 Am
Species: Horned Lark

Surveyor: T. Somerville, D. Owens

Call Back Response Survey 1: (Positive) Negative

Call Back Response Survey 2: (Positive) Negative

Call Back Response Survey 3: (Positive) Negative

Notes:

- Birds active in last years hay field. Likely breeding by this time

Project Site: STAMP
Date: 4/14/10
Location: Parcel 1

Project Code: WGAID
Time: 8:10 AM
Species: Pied-billed Grebe

Surveyor: T. Somerville, D. Owens

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

- no Suitable Habitat

Project Site: STAMP
Date: 4/14/10
Location: Parcel 1

Project Code: WQAID
Time: 8:20 AM
Species: SEOW

Surveyor: T. Somerville, D. Owens

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:

- Other species
- Red winged blackbird
- Northern Cardinal
- Grackle
- Canada Goose

→ Habitat not Suitable

Project Site: STAMP
Date: 4/14/10
Location: Parcel 1

Project Code: WGA10
Time: 8:30 AM
Species: N. Harrier

Surveyor: T. Somerville, D. Owens

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:

- Habitat has some potential for foraging, but birds unlikely to use often or for nesting

Full sun
70°F

Project Site: Alabama
Date: 5/5/10
Location: 43° 04.842', 78° 23.814' Parcel 23

Project Code: W9A10a
Time: 9:15 AM
Species: Least Bittern

Surveyor: Charlotte Stallone

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: (Positive) Negative

Notes: found one nesting!

Full sun
70°F

Project Site: Alabama
Date: 5/5/2010
Location: 43°04.842' 78°23.814' Parcel 23
Surveyor: Charlotte Stallone

Project Code: W9A10a
Time: 9:06 am
Species: King Rail

Call Back Response Survey 1: Positive (Negative)

Killdeer, Song Sparrow, red wing blackbird, woodpecker robin

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:

Pied billed Grebe 9:10 am

26 CBRS 1 Pos (Neg)

CBRS 2 Pos (Neg)

CBRS 3 Pos (Neg)

Project Site: Alabama
Date: 5/17/10
Location: Parcel 7

Project Code: WGALWa
Time: 11 am
Species: King rail

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes: - Sedge sparrow
Red wing black bird
easter towee
warblers
Song sparrow

Project Site: Alabama
Date: 5/17/10
Location: Parcel 7

Project Code: W1941Oa
Time: 11:05
Species: least bittern

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

Blue Jay
Song sparrow

Wave 4H

Project Site: Alabama
Date: 5/17/10
Location: Panel 7

Project Code: W9A10a
Time: 11:10 am
Species: Pied billed grebe

Surveyor: _____

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes: Warblers
Jay
Red wing black bird

Project Site: Alabama
Date: 5/17/10
Location: Panel B

Project Code: W9A10a
Time: 12:34 pm
Species: Grasshopper Sparrow

Surveyor: Charlotte Stallard

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:
Gold finch
Song sparrow
Warblers
Robin
Red wing blackbird
Dobe links
Gold finch,
Red tail hawk

Project Site: Alabama
Date: 5/17/16
Location: Parcel 7

Project Code: 109A10a
Time: 12:40
Species: Black Tern

Surveyor: Charlotte Stallong

Call Back Response Survey 1:	Positive	Negative
Call Back Response Survey 2:	Positive	Negative
Call Back Response Survey 3:	Positive	Negative

Notes:

Gold finch
Redwing blackbird
red tail hawk
Robin
Song sparrow

Project Site: Alabama
Date: 5/17/10
Location: Parcel 8

Project Code: W9A10a
Time: 12:45 pm
Species: Northern Harrier

Surveyor: Charlotte Stallons

Call Back Response Survey 1: Positive Negative

Call Back Response Survey 2: Positive Negative

Call Back Response Survey 3: Positive Negative

Notes:

Gold finch
Bobolink
warblers

Project Site: Alabama
Date: 6/25/10
Location: Panel 23

Project Code: W9A10a
Time: 9:20 am
Species: Northern Harrier

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	Negative
Call Back Response Survey 2:	Positive	Negative
Call Back Response Survey 3:	Positive	Negative

Notes:

Project Site: Alabama
Date: 6/25/10
Location: Parcel #3

Project Code: W9A10a
Time: 11:20 a.m.
Species: Bald Eagle

Surveyor: Charlotte stallone

Call Back Response Survey 1: Positive Negative

Call Back Response Survey 2: Positive Negative

Call Back Response Survey 3: Positive Negative

Notes:

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A10a
Time: 6:09 am
Species: King Rail

Surveyor: Charlotte Stallone.

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:
Redwing Blackbird
Great Blue Heron
Warblers
Crow
Catbirds
Robins
tree sparrow

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A10a
Time: 6:15 am
Species: Henslow Sparrow

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

Red wing blackbird
Heron
Warblers (free beer - check out)
Crows
Cat birds
Robins
Tree sparrow
Swallows

Parcel 17
8:17 am
43° 04.794 } found 2
78° 23.757 } sparrows

taped call
Continued to call, I was near nest ☺

52
side B

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A10a
Time: 10:20
Species: Horned Lark

Surveyor: Charlotte Stallone

Call Back Response Survey 1: (Positive) Negative

Call Back Response Survey 2: (Positive) Negative

Call Back Response Survey 3: (Positive) Negative

Notes:

GB Heron
RW Blackbird
Warblers
Crows
Cat birds
Robins

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A10a
Time: 6:25 am
Species: Grasshopper Sparrow

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	Negative
Call Back Response Survey 2:	Positive	Negative
Call Back Response Survey 3:	Positive	Negative

Notes:

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A10a
Time: 6:30am
Species: Least Bittern

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes: found nest looks to be abandoned, bird has not been continuing to build incomplete nest

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A1Da
Time: 10:35 am
Species: Pied-billed Grebe

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes:

Project Site: Alabama
Date: 6/25/10
Location: Parcel 23

Project Code: W9A10a
Time: 6:40 am
Species: Black Tern

Surveyor: Charlotte Stallone

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes:

Project Site: W9A10a
Date: 7/16/2010
Location: Parcel 19

Project Code: W9A10a
Time: 6:45
Species: King Rail

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	Negative
Call Back Response Survey 2:	Positive	Negative
Call Back Response Survey 3:	Positive	Negative

Notes:

Project Site: Alabama
Date: 7/16/2010
Location: Parcel 19

Project Code: W9AL0a
Time: 6:50
Species: Black Tern

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	Negative
Call Back Response Survey 2:	Positive	Negative
Call Back Response Survey 3:	Positive	Negative

Notes:

Project Site: Alabama
Date: 7/16/10
Location: 19
Surveyor: Charlotte Stallone

Project Code: W9A10a
Time: 6:30 am
Species: Grasshopper Sparrow

Call Back Response Survey 1: Positive (Negative)

Call Back Response Survey 2: Positive (Negative)

Call Back Response Survey 3: Positive (Negative)

Notes: Red wing blackbird
Blue warbler

Project Site: Alabama
Date: 7/16/2010
Location: Parcel 19

Project Code: W9A10a
Time: 6:35am
Species: Henlow's Sparrow

Surveyor: Charlotte Stallone

Call Back Response Survey 1:	Positive	Negative	
Call Back Response Survey 2:	Positive	Negative	Possible
Call Back Response Survey 3:	Positive	Negative	

Notes:
Heard similar call during playback
Sparrow flew closeby could not make id
of bird though

Goldfinch
Red wing blackbird

Project Site: Alabama
Date: 7/16/2010
Location: Parcel 19

Project Code: W9A1Da
Time: 6:40 am
Species: Horned Lark

Surveyor: Charlotte Stallcup

Call Back Response Survey 1:	Positive	(Negative)
Call Back Response Survey 2:	Positive	(Negative)
Call Back Response Survey 3:	Positive	(Negative)

Notes: warblers, song sparrow, crow

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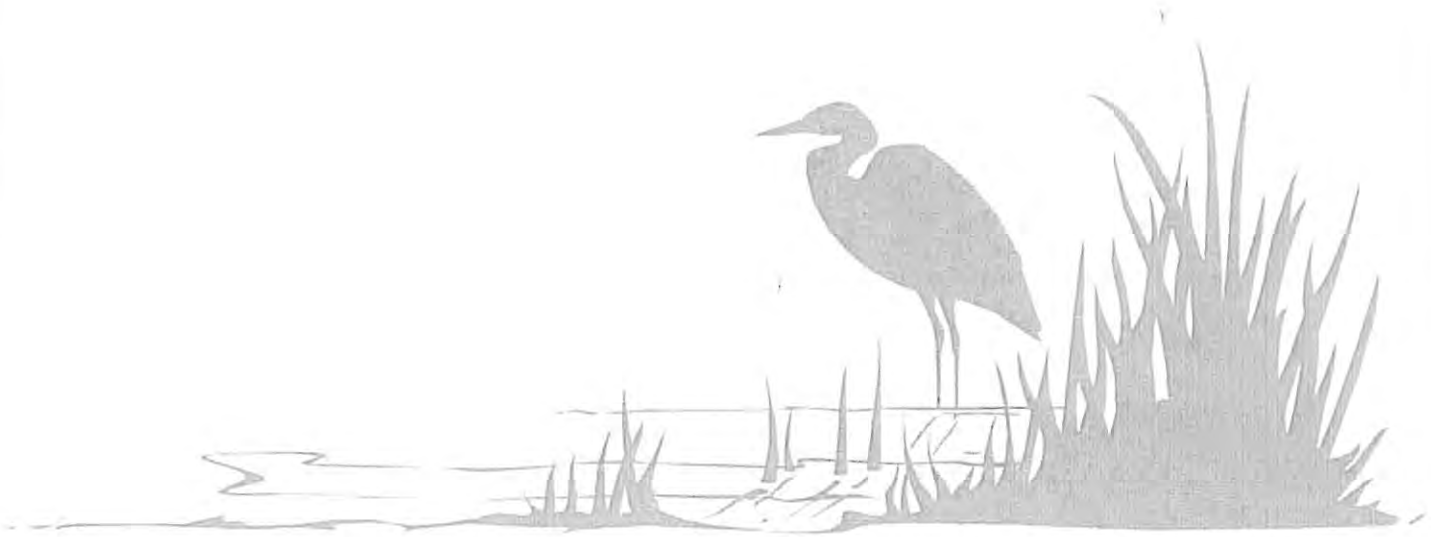
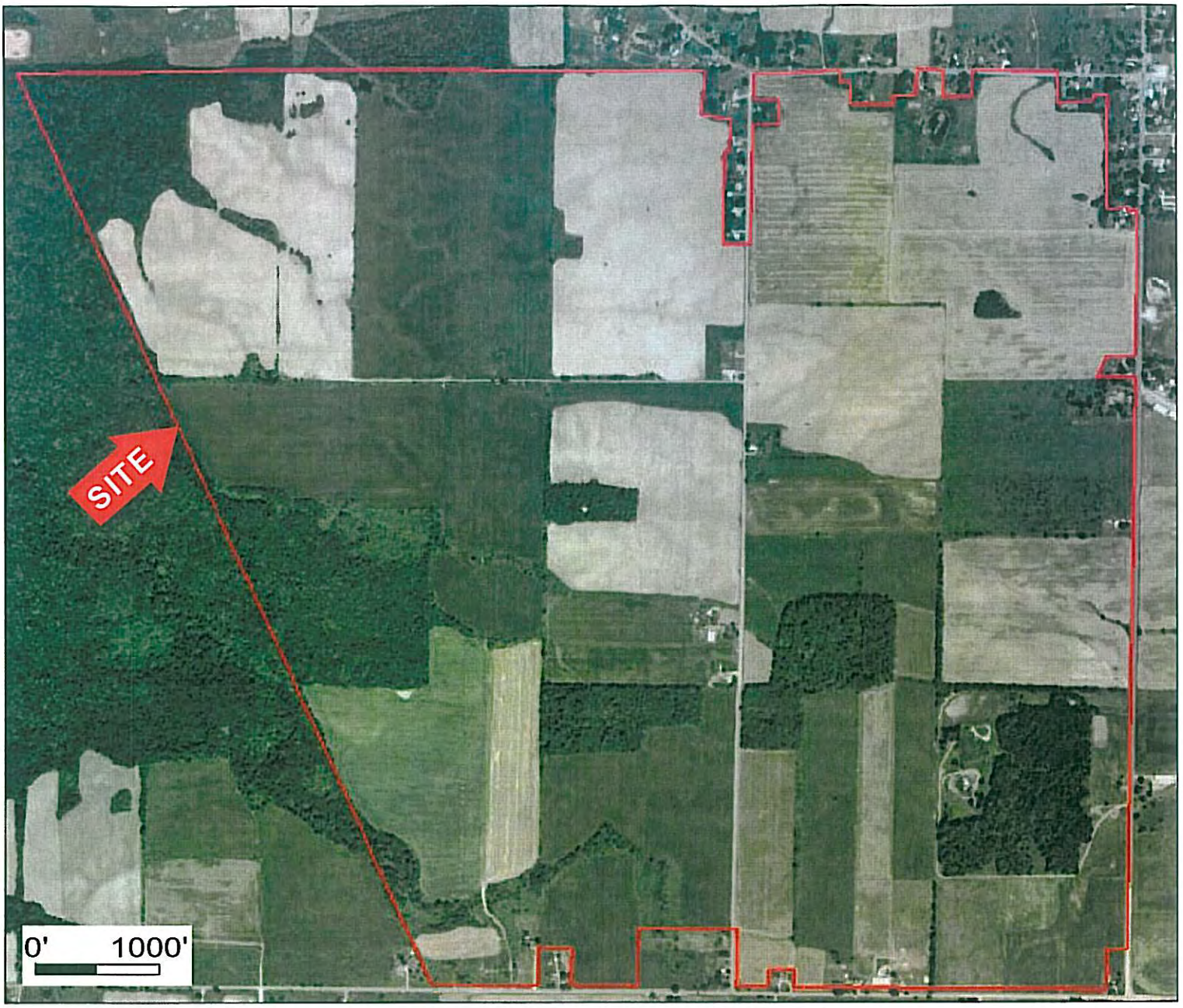


ATTACHMENT C

Aerial Photograph

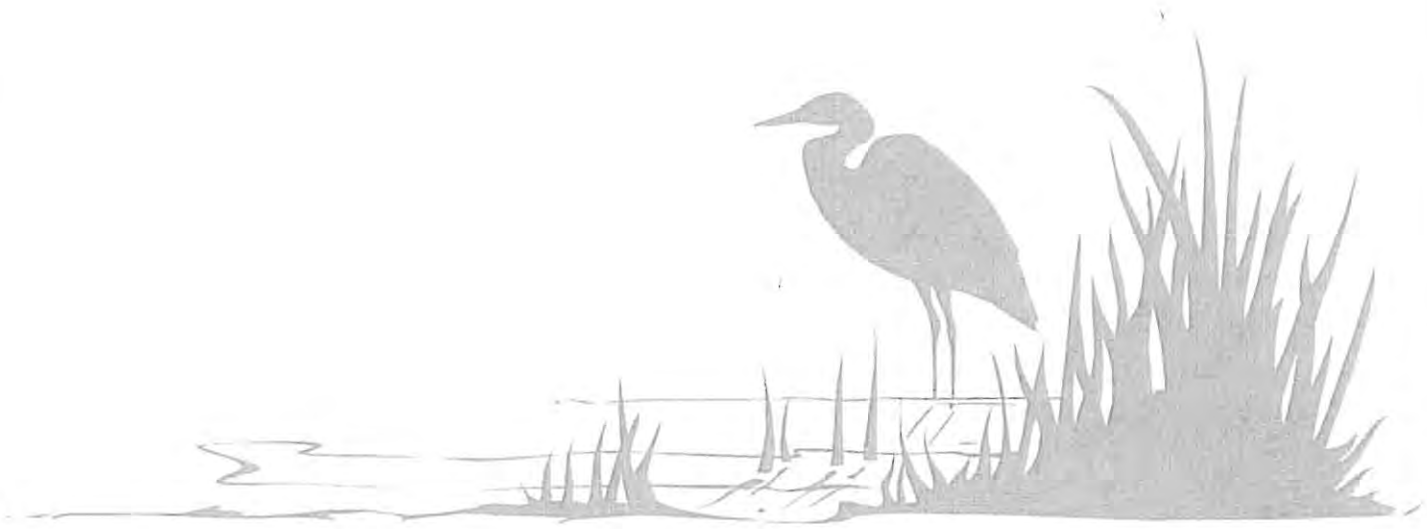


EARTH DIMENSIONS, INC.

Attachment C: Aerial Photograph
http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
Site visited 10/31/08

Alabama STAMP
Town of Alabama, Genesee County, New York

Alabama STAMP



ATTACHMENT D

Site Photographs

Photo 1: Faces north.

Photo 2: Faces west.

Photo 3: Faces east.

Photo 4: Faces southwest.

Photo 5: Faces west.

Photo 6: Faces north.

Photo 7: Faces north.

Photo 8: Faces south

Photo 9: Faces west.

Photo 10: Faces south.

Photo 11: Faces south.

Photo 12: Faces east.

Photo 13: Faces southwest.

Photo 14: Faces north.

Photo 15: Faces north.

Photo 16: Faces south.

Photo 17: Faces west.

Photo 18: Faces north.

Photo 19: Faces south.

Photo 20: Faces northwest.

Photo 21: Faces east.

Photo 22: Faces southeast.

Photo 23: Faces east.

Photo 24: Faces north.

Photo 25: Faces east.

Photo 26: Faces south.

Photo 27: Faces north.

Photo 28: Faces southwest.

Photo 29: Faces south.

Photo 30: Faces north.

Photo 31: Faces east.

Photo 32: Faces south

Photo 33: Faces east.

Photo 34: Faces west.

Photo 35: Faces east.

Photo 36: Faces south.

Photo 37: Faces west.

Photo 38: Faces east.

Photo 39: Faces north.

Photo 40: Faces west.

Photo 41: Faces north.

Photo 42: Faces west.

Photo 43: Faces southeast.

Photo 44: Faces north.

Photo 45: Faces south.

Photo 46: Faces south.

Photo 47: Faces west.

Photo 48: Faces east.

Photo 49: Faces northeast.

Photo 50: Faces south.

Photo 51: Faces south.

Photo 52: Faces east.

Photo 53: Faces south.

Photo 54: Faces northwest.

Photo 55: Faces northeast.

Photo 56: Faces south.

Photo 57: Faces north.

Photo 58: Faces south.

Photo 59: Faces southeast.

Photo 60: Faces west.

Photo 61: Faces northwest.

Photo 62: Faces north.

Photo 63: Faces west.

Photo 64: Faces south.

Photo 65: Faces south.

Photo 66: Faces east.

Photo 67: Faces southeast.

Photo 68: Faces south.

Photo 69: Faces southwest.

Photo 70: Faces west.

Photo 71: Faces south.

Photo 72: Faces south.

Photo 73: Faces southwest.

Photo 74: Faces north.

Photo 75: Faces south.

Photo 76: Faces east.

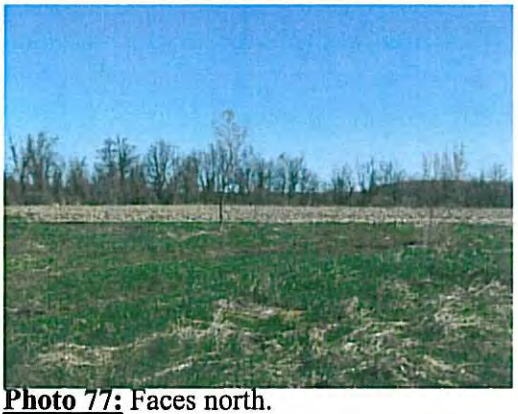


Photo 77: Faces north.

Photo 78: Faces east.

Photo 79: Faces west.

Photo 80: Faces south.

Photo 81: Faces southeast.

Photo 82: Faces west.

Photo 83: Faces south.

Photo 84: Faces southeast.

Photo 85: Faces west.

Photo 86: Faces southwest.

Photo 87: Faces southeast.

Photo 88: Faces south.

Photo 89: Faces north.

Photo 90: Faces south.

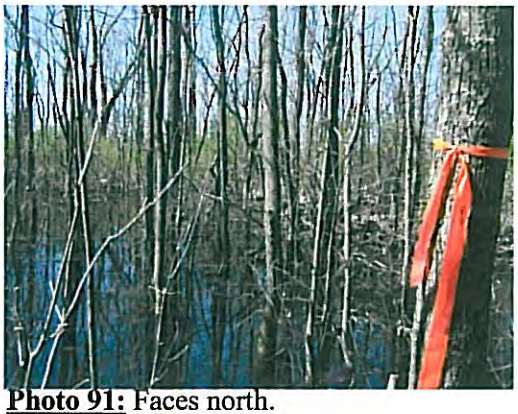


Photo 91: Faces north.

Photo 92: Faces southeast.

Photo 93: Faces west.

Photo 94: Faces east.

Photo 95: Faces south.

Photo 96: Faces northwest.

Photo 97: Faces east.

Photo 98: Faces southeast.

Photo 99: Faces northeast.

Photo 100: Faces south.

Photo 101: Faces northwest.

Photo 102: Faces west.

Photo 103: Faces south.

Photo 104: Faces south.

Photo 105: Faces west.

Photo 106: Faces west.

Photo 107: Faces west.

Photo 108: Faces west.

Photo 109: Faces west.

Photo 110: Faces west.

Photo 111: Faces south.

Photo 112: Faces north.

Photo 113: Faces south.

Photo 114: Faces east.

Photo 115: Faces northeast.

Photo 116: Faces southwest.

Photo 117: Faces west.

Photo 118: Faces west.

Photo 119: Faces east.

Photo 120: Faces north.

Photo 121: Faces north.

Photo 122: Faces east.

Photo 123: Faces east.

Photo 124: Faces southwest.

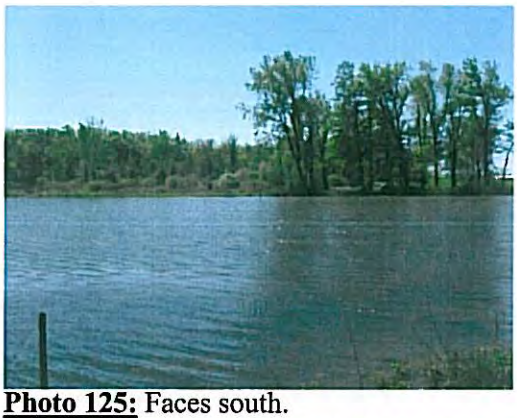


Photo 125: Faces south.

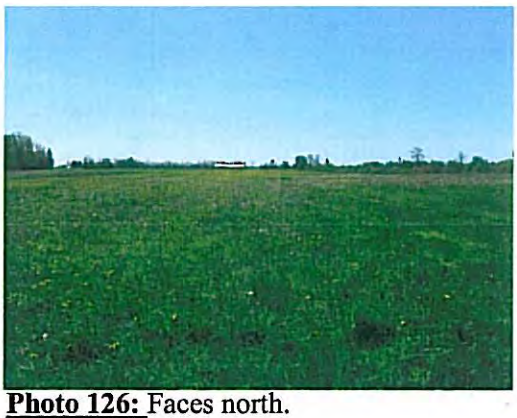


Photo 126: Faces north.

Photo 127: Faces southwest.

Photo 128: Faces north.

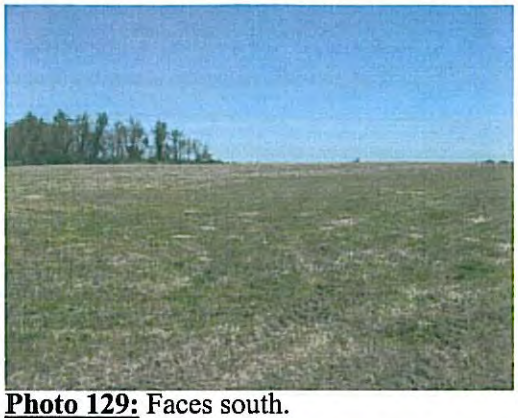


Photo 129: Faces south.

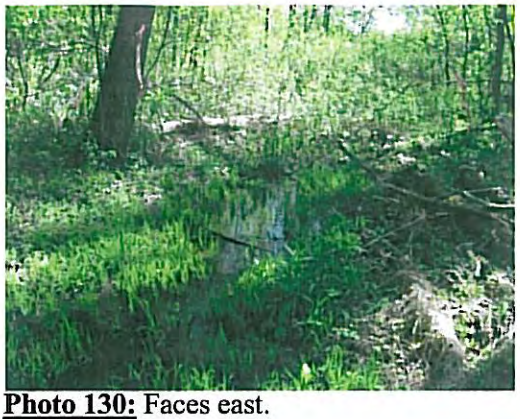


Photo 130: Faces east.

Photo 131: Faces west.

Photo 132: Faces northwest.

Photo 133: Faces southeast.

Photo 134: Faces south.

Photo 135: Faces south.

Photo 136: Faces north.

Photo 137: Faces north.

Photo 138: Faces west.

Photo 139: Faces east.

Photo 140: Faces southwest.

Photo 141: Faces north.

Photo 142: Faces south.

Photo 143: Faces southeast.

Photo 144: Faces southwest.

Photo 145: Faces northeast.

Photo 146: Faces west.

Photo 147: Faces east.

Photo 148: Faces southwest.

Photo 149: Faces west.

Photo 150: Faces north.

Photo 151: Faces south.

Photo 152: Faces south.

Photo 153: Faces east.

Photo 154: Faces west.

Photo 155: Faces east.

Photo 156: Faces northeast.

Photo 157: Faces west.

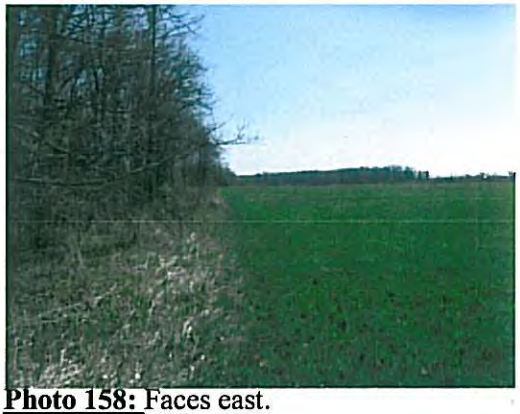


Photo 158: Faces east.

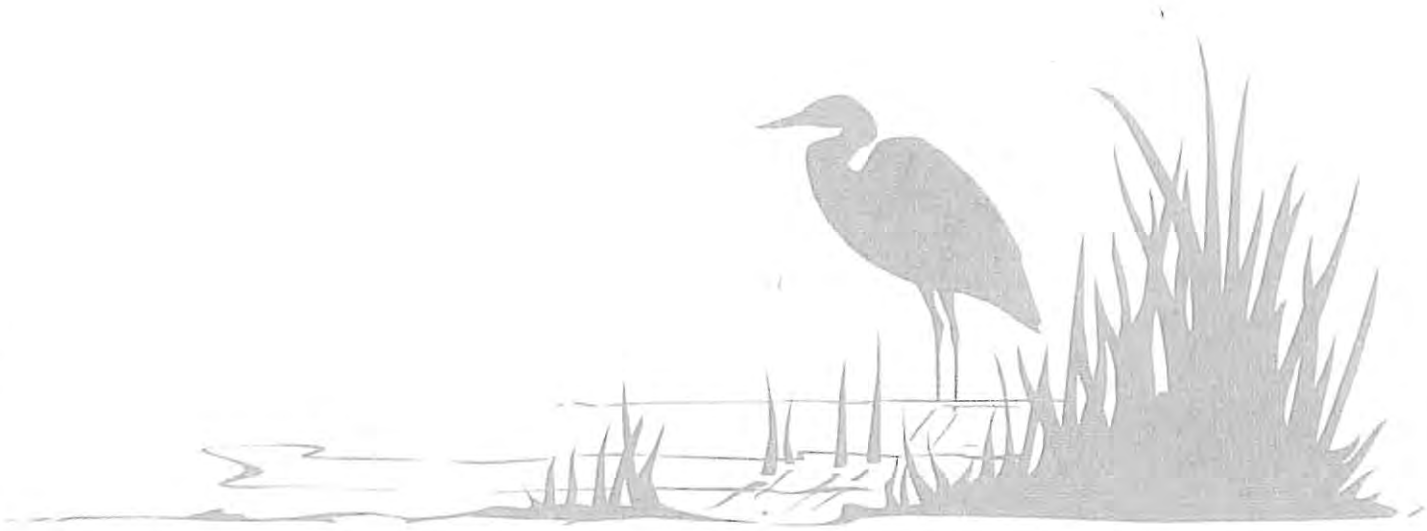
Photo 159: Faces east.

Photo 160: Faces north.

Photo 161: Faces south.

Photo 162: Faces northeast depicting the location of the threatened species heartleaf plantain (*Plantago cordata*).

Alabama STAMP



ATTACHMENT E

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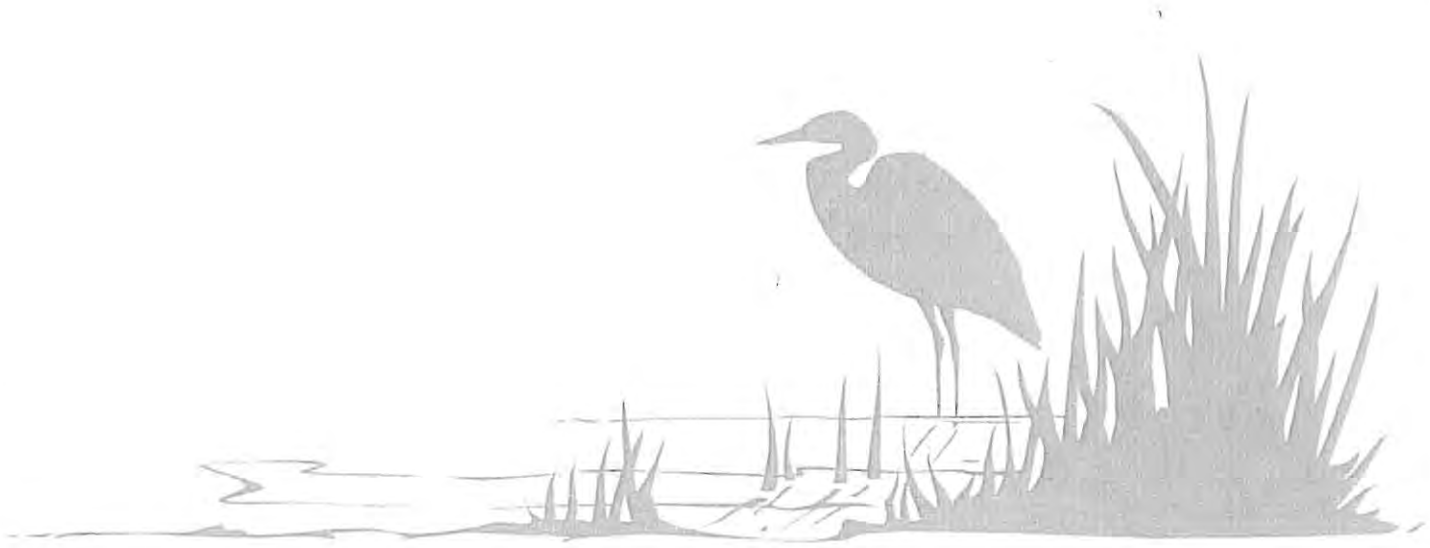


ATTACHMENT F

Agency Correspondence

Genesee County

Federally Listed Endangered and Threatened Species and Candidate Species

This list represents the best available information regarding known or likely County occurrences of Federally-listed and candidate species and is subject to change as new information becomes available.

Common Name	Scientific Name	Status
Bald eagle [1]	*Haliaeetus leucocephalus*	D
Bog turtle (*Historic*)	*Clemmys [=Glyptemys] muhlenbergii*	T
Eastern massasauga	*Sistrurus catenatus catenatus*	C
Eastern prairie fringed orchid *(Historic)*	*Platanthera leucophea*	T
Houghton's goldenrod	*Solidago houghtonii*	T

Status Codes: E=Endangered, T=Threatened, P=Proposed, C=Candidate, D=Delisted.

[1] The bald eagle was delisted on August 8, 2007. While there are no ESA requirements for bald eagles after this date, the eagles continue to receive protection under the Bald and Golden Eagle Protection Act (BGEPA). Please follow the Service's May 2007 Bald Eagle Management Guidelines to determine whether you can avoid impacts under the BGEPA for your projects. If you have any questions, please contact the endangered species branch in our office.

Information current as of: 3/22/2010

Print Species List

(W9A10a)

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
www.dec.state.ny.us

Alexander B. Grannis
Commissioner

November 3, 2009

Scott J. Livingstone
Earth Dimensions, Inc
1091 Jamison Road
Elma, NY 14059

Dear Mr. Livingston:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to an Environmental Assessment for the proposed Possible Industrial Useage of 1,340 Acres, area as indicated on the map you provided, located in the Town of Alabama, Genesee County.

Enclosed is a report of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site. The information contained in this report is considered sensitive and should not be released to the public without permission from the New York Natural Heritage Program.
PLEASE NOTE: This possible development is ADJACENT to the Tonawanda Wildlife Management Area.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement on the presence or absence of all rare or state-listed species or significant natural communities. This information should not be substituted for on-site surveys that may be required for environment impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

Sincerely,
Tara Salerno jp
Tara Salerno, Information Services
New York Natural Heritage Program

Enc.
cc: Reg. 8, Wildlife Mgr.

001163

Natural Heritage Report on Rare Species and Ecological Communities

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor,
Albany, NY 12233-4757
(518) 402-8935

~This report contains **SENSITIVE** information that should not be released to the public without permission from the NY Natural Heritage Program.
~Refer to the User's Guide for explanations of codes, ranks and fields.
~Location maps for certain species and communities may not be provided 1) if the species is vulnerable to disturbance, 2) if the location and/or extent is not precisely known, 3) if the location and/or extent is too large to display, and/or 4) if the animal is listed as Endangered or Threatened by New York State.

Natural Heritage Report on Rare Species and Ecological Communities

BIRDS

Podilymbus podiceps

Office Use 12479

Pied-billed Grebe
Breeding

NY Legal Status: Threatened
Federal Listing:
Last Report: **
NYS Rank: S3B,S1N - Vulnerable
Global Rank: G5 - Secure
EO Rank: **
ESU

County: Genesee
Town: Alabama
Location: At, or in the vicinity of, the project site.
Directions: **
General Quality and Habitat: **For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager for the Region where the project is located.

VASCULAR PLANTS

Plantago cordata

Office Use 10050

Heartleaf Plantain

NY Legal Status: Threatened
Federal Listing:
Last Report: 1999-05-09
NYS Rank: S3 - Vulnerable
Global Rank: G4 - Apparently secure
EO Rank: Excellent

County: Genesee
Town: Alabama, Tonawanda Indian Reservation (Genesee County)
Location: Creek North of Whitney Creek
Directions: The plants occur along the entire length of a small, clear flowing stream that permeates the northernmost portion of the Tonawanda Indian Reservation and to a very minor extent the Tonawanda Wildlife Management Area.
General Quality and Habitat: This is an exceptionally vigorous population in a high-quality habitat. The plants occur along and within a small, mud bottom stream. With the exception of that portion flowing through the wildlife management area the stream is shaded by a mature canopy of hemlock and hardwoods. Associated species: Tsuga canadensis, Quercusalba, Quercus rubra, Carya ovata, Fagus grandifolia, Acer saccharum, Tilia americana, Fraxinus americana, Ostrya virginiana, and Prunus serotina. Those plants observed within the wildlife management area are primarily in the open and exposed to direct sunlight for much of the day.

Triphora trianthophora

Office Use 63

Nodding Pogonia

NY Legal Status: Endangered
Federal Listing:
Last Report: 1997-08-20
NYS Rank: S2 - Imperiled
Global Rank: G3G4 - Vulnerable
EO Rank: Fair

County: Genesee
Town: Tonawanda Indian Reservation (Genesee County)
Location: At, or in the vicinity of, the project site.
Directions: **
General Quality and Habitat: **For information on the population at this location and management considerations, please contact the NY Natural Heritage Program Botanist at smyoung@gw.dec.state.ny.us or 518-402-8951.

001164

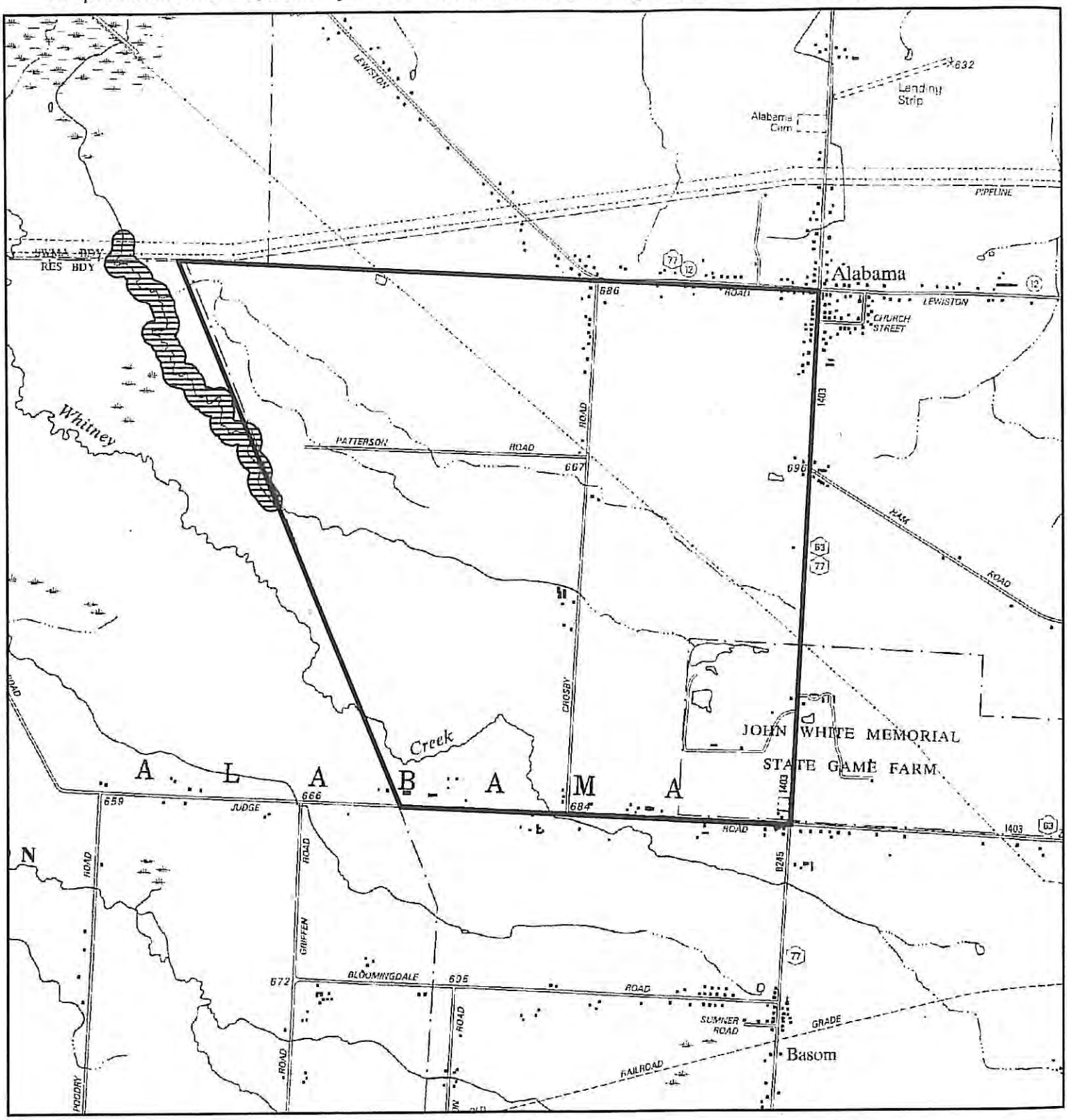
3 Records Processed

More detailed information about many of the rare and listed animals and plants in New York, including biology, identification, habitat, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.acris.nynhp.org, from NatureServe Explorer at http://www.natureserve.org/explorer, from NYSDEC at http://www.dec.ny.gov/animals/7494.html (for animals), and from USDA's Plants Database at http://plants.usda.gov/index.html (for plants).

More detailed information about many of the natural community types in New York, including identification, dominant and characteristic vegetation, distribution, conservation, and management, is available online in Natural Heritage's Conservation Guides at www.acris.nynhp.org. For descriptions of all community types, go to http://www.dec.ny.gov/animals/29384.html and click on Draft Ecological Communities of New York State.

Natural Heritage Map of Rare Species and Ecological Communities

Prepared October 23, 2009 by the NY Natural Heritage Program, NYS DEC Albany, NY



Legend

Project Site

NY Natural Heritage Program Database Records*

Heartleaf Plantain

1:24,000

0 0.15 0.3 0.6 0.9 1.2 Miles

*The locations that are displayed are considered sensitive and should not be released to the public without permission. We do not provide map locations for all records. Please see report for details.

001166

N W E S

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor,
Albany, NY 12233-4757
(518) 402-8935

HISTORICAL RECORDS

The following plants and animals were documented in the vicinity of the project site at one time, but have not been documented there since 1979 or earlier.
There is no recent information on these plants and animals in the vicinity of the project site and their current status there is unknown. In most cases the precise location of the plant or animal in this vicinity at the time it was last documented is also unknown and therefore location maps are generally not provided.
If appropriate habitat for these plants or animals is present in the vicinity of the project site, it is possible that they may still occur there.

Natural Heritage Report on Rare Species and Ecological Communities

BUTTERFLIES and SKIPPERS

Erynnis persius persius

- **Persius Duskywing**

NY Legal Status: Endangered
Federal Listing:
Last Report: 1970-05-14

NYS Rank: SH - Historical
Global Rank: G5T1T3 - Critically imperiled
EO Rank: Historical, no recent information

Office Use
13221
ESU

County: Erie, Genesee, Niagara
Town: Alabama, Newstead, Pembroke, Royalton, Tonawanda Indian Reservation (Erie County), Tonawanda
Location: Tonawanda Indian Reservation
Directions: The butterflies were on the Tonawanda Indian Reservation 2.5 mi northeast of Akron and west of Route 77, north of Route 11, and south of Route 12.
General Quality and Habitat: The butterflies were observed on an Indian reservation.

Plebejus melissa samuelis ***(formerly Lycaeides melissa samuelis)***

- **Karner Blue**

NY Legal Status: Endangered
Federal Listing: Endangered
Last Report: 1970-06-13

NYS Rank: S1 - Critically imperiled
Global Rank: G5T2 - Imperiled
EO Rank: Failed to find but search more

Office Use
3648
ESU
USFWS

County: Erie, Genesee, Niagara
Town: Tonawanda Indian Reservation (Erie County), Tonawanda Indian Reservation (Genesee County), To
Location: Tonawanda Indian Reservation
Directions: The butterflies were on the Tonawanda Indian Reservation 2.5 mi northeast of Akron and west of Route 77, north of Route 11, and south of Route 12.
General Quality and Habitat: Karner blue butterflies have not been seen at this site since 1970. The butterflies were observed on an Indian reservation.

New York State Department of Environmental Conservation

Regional Permit Administrators

Region	Counties	Regional Permit Administrator
1	Nassau & Suffolk FAX: 631-444-0360	Roger Evans NYSDEC 50 Circle Rd SUNY @ Stony Brook Stony Brook, NY 11790-3409 631-444-0365 631-444-0355 (Duty Analyst-M,W&F only)
2	New York City, (Boroughs of Manhattan, Brooklyn, Bronx, Queens & Staten Island) FAX: 718-482-4975	John Cryan NYSDEC One Hunters Point Plaza 47-40 21st St. Long Island City, NY 11101-5407 718-482-4997
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster & Westchester FAX: 845-255-3042	Margaret Duke NYSDEC 21 South Putt Corners Rd. New Paltz, NY 12561-1620 845-256-3054
4	Albany, Columbia, Greene, Montgomery, Rensselaer & Schenectady FAX:518-357-2460	William Clarke NYSDEC 1130 North Westcott Rd. Schenectady, NY 12306-2014 518-357-2069
4 (sub-office)	Delaware, Otsego & Schoharie FAX: 607-652-2342	Kent Sanders* NYSDEC 65561 State Highway - Route 10 HCR #1, Box 3A Stamford, NY 12167-9503 607-652-7741
5	Clinton, Essex, Franklin & Hamilton FAX: 518-897-1394	Michael McMurray NYSDEC Route 86, P.O. Box 296 Ray Brook, NY 12977-0296 518-897-1234
5 (sub-office)	Fulton, Saratoga, Warren & Washington	Marc Migliore* NYSDEC

	FAX: 518-623-3603	P.O. Box 220 232 Golf Course Rd. Warrensburg, NY 12885-0220 518-623-1281
6	Jefferson, Lewis & St. Lawrence FAX: 315-785-2242	Larry Ambeau NYSDEC State Office Bldg. 317 Washington St. Watertown, NY 13601-3787 315-785-2245 or 2246
6 (sub-office)	Herkimer & Oneida FAX: 315-793-2748	Patrick Clearey* NYSDEC State Office Building 207 Genesee St. Utica, NY 13501-3787 315-793-2555
7	Cayuga, Madison, Onondaga & Oswego FAX: 315-426-7425	John Feltman NYSDEC 615 Erie Blvd. West (Env. Permits Room 206) Syracuse, NY 13204-2400 315-426-7438
7 (sub-office)	Broome, Chenango, Cortland, Tioga & Tompkins FAX: 607-753-8532	Michael Barylski* NYSDEC 1285 Fisher Ave. Cortland, NY 13045-1090 607-753-3095
8	Chemung, Genesee, Livingston, Monroe, Ontario, Orleans, Schuyler, Seneca, Steuben, Wayne & Yates FAX: 585-226-2830	Peter Lent NYSDEC 6274 East Avon Lima Rd. Avon, NY 14414-9519 585-226-5400
9	Erie, Niagara & Wyoming FAX: 716-851-7168	Steve Doleski NYSDEC 270 Michigan Ave. Buffalo, NY 14203-2999 716-851-7165
9 (sub-office)	Allegany, Cattaraugus, & Chautauqua FAX: 716-372-2113	Charles Cranston* NYSDEC Suite 3, 182 East Union Allegany, NY 14706-1328 716-372-0645

*Deputy Regional Permit Administrator

http://www.dec.ny.gov/about/39381.html

USERS GUIDE TO NY NATURAL HERITAGE DATA

New York Natural Heritage Program, 625 Broadway, 5th Floor, Albany, NY 12233-4757 phone: (518) 402-8935

NATURAL HERITAGE PROGRAM: The NY Natural Heritage Program is a partnership between the NYS Department of Environmental Conservation (NYS DEC) and The Nature Conservancy. Our Mission is to facilitate the conservation of New York's biodiversity by providing comprehensive information and scientific expertise on rare species and natural ecosystems to resource managers and other conservation partners. We accomplish this mission by combining thorough field inventories, scientific analyses, expert interpretation, and the most comprehensive database on New York's distinctive biodiversity to deliver the highest quality information for natural resource planning, protection, and management.

DATA SENSITIVITY: The data provided in the report are ecologically sensitive and should be treated in a sensitive manner. The report is for your in-house use and should **not** be released, distributed or incorporated in a public document without prior permission from the Natural Heritage Program.

EO RANK: A letter code for the quality of the occurrence of the rare species or significant natural community, based on population size or area, condition, and landscape context.

A-E = Extant: A=Excellent, B=Good, C=Fair, D=Poor, E=Extant but with insufficient data to assign a rank of A-D.
F = Failed to find. Did not locate species during a limited search, but habitat is still there and further field work is justified.
H = Historical. Historical occurrence without any recent field information.
X = Extirpated. Field/other data indicates element/habitat is destroyed and the element no longer exists at this location.
U = Extant/Historical status uncertain.
Blank = Not assigned.

LAST REPORT: The date that the rare species or significant natural community was last observed at this location, as documented in the Natural Heritage databases. The format is most often YYYY-MM-DD.

NY LEGAL STATUS – Animals:

Categories of Endangered and Threatened species are defined in New York State Environmental Conservation Law section 11-0535. Animals listed as Endangered, Threatened, or Special Concern are protected against taking, importation, transportation, possession, or sale without a permit. Endangered, Threatened, and Special Concern species are listed in regulation 6NYCRR 182.5.

E - Endangered Species: any species which meet one of the following criteria:
- Any native species in imminent danger of extirpation or extinction in New York.
- Any species listed as endangered by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

T - Threatened Species: any species which meet one of the following criteria:
- Any native species likely to become an endangered species within the foreseeable future in NY.
- Any species listed as threatened by the U.S. Department of the Interior, as enumerated in the Code of the Federal Regulations 50 CFR 17.11.

SC - Special Concern Species: those species which are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York.

P - Protected Wildlife (defined in Environmental Conservation Law section 11-0103): wild game, protected wild birds, and endangered species of wildlife.

U - Unprotected (defined in Environmental Conservation Law section 11-0103): the species may be taken at any time without limit; however a license to take may be required.

G - Game (defined in Environmental Conservation Law section 11-0103): any of a variety of big game or small game species as stated in the Environmental Conservation Law; many normally have an open season for at least part of the year, and are protected at other times.

NY LEGAL STATUS – Plants:

The following categories are defined in regulation 6NYCRR part 193.3 and apply to NYS Environmental Conservation Law section 9-503.

E - Endangered Species: listed species are those with:
- 5 or fewer extant sites, or
- fewer than 1,000 individuals, or
- restricted to fewer than 4 U.S.G.S. 7 ½ minute topographical maps, or
- species listed as endangered by U.S. Dept. of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.

T - Threatened: listed species are those with:
- 6 to fewer than 20 extant sites, or
- 1,000 to fewer than 3,000 individuals, or
- restricted to not less than 4 or more than 7 U.S.G.S. 7 and ½ minute topographical maps, or
- listed as threatened by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.

R - **Rare:** listed species have:
- 20 to 35 extant sites, or
- 3,000 to 5,000 individuals statewide.

V - **Exploitably vulnerable:** listed species are likely to become threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked.

U - **Unprotected;** no state status.

FEDERAL STATUS (PLANTS and ANIMALS): The categories of federal status are defined by the United States Department of the Interior as part of the 1974 Endangered Species Act (see Code of Federal Regulations 50 CFR 17). The species listed under this law are enumerated in the Federal Register vol. 50, no. 188, pp. 39526 - 39527. The codes below without parentheses are those used in the Federal Register. The codes below in parentheses are created by Heritage to deal with species which have different listings in different parts of their range, and/or different listings for different subspecies or varieties.

(blank) = No Federal Endangered Species Act status.
LE = Formally listed as endangered.
LT = Formally listed as threatened.
C = Candidate for listing.
LE,LT = Formally listed as endangered in part of its range, and as threatened in the other part; or, one or more subspecies or varieties is listed as endangered, and the others are listed as threatened.
LT,PDL = Populations of the species in New York are formally listed as threatened, and proposed for delisting.

GLOBAL AND STATE RANKS (animals, plants, ecological communities and others): Each element has a global and state rank as determined by the NY Natural Heritage Program. These ranks carry no legal weight. The global rank reflects the rarity of the element throughout the world and the state rank reflects the rarity within New York State. Infraspecific taxa are also assigned a taxon rank to reflect the infraspecific taxon's rank throughout the world. ? = Indicates that the state or global rank is uncertain and more information is needed. Range ranks, e.g. S1S2, indicate not enough information is available to distinguish between two ranks.

GLOBAL RANK:

G1 - **Critically imperiled** globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology.

G2 - **Imperiled** globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.

G3 - **Vulnerable:** Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or vulnerable to extinction throughout its range because of other factors.

G4 - **Apparently secure** globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 - **Demonstrably secure** globally, though it may be quite rare in parts of its range, especially at the periphery.

GH - Historically known, with the expectation that it might be rediscovered.

GX - Species believed to be extinct.

GU - Lack of information or substantial conflicting information about status or trends makes ranking infeasible at this time.

NYS RANK:

S1 - **Critically imperiled:** Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in New York State.

S2 - **Imperiled:** Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.

S3 - **Vulnerable:** Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.

S4 - Apparently secure in New York State.

S5 - Demonstrably secure in New York State.

SH - Historically known from New York State, but not seen in the past 20 years.

SX - Apparently extirpated from New York State.

SU - Lack of information or substantial conflicting information about status or trends makes ranking infeasible at this time.

SxB and SxN, where Sx is one of the codes above, are used for migratory animals, and refer to the rarity within New York State of the breeding (B)populations and the non-breeding populations (N), respectively, of the species.

TAXON (T) RANK: The T-ranks (T1 - T5) are defined the same way as the Global ranks (G1 - G5), but the T-rank refers only to the rarity of the subspecific taxon.

T1 through T5 - See Global Rank definitions above.

Q - Indicates a question exists whether or not the taxon is a good taxonomic entity.

Revised December, 2008

New York State Department of Environmental Conservation
Division of Environmental Permits - Region 8
6274 East Avon-Lima Road, Avon NY 14414-9519
Phone: (585) 226-5400 **FAX** (585) 226-2830
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

March 5, 2010

Via E-mail (gcedc@gcedc.com) and U.S. Mail

Chad Zambito, VP of Marketing and Community Development
Genesee County Economic Development Center
One Mill Street
Batavia, New York 14020

Re: SEQR Generic EIS Scoping Comments – STAMP
DEC Pre-application No. 8-1820-00020/00001
Town of Alabama, Genesee County

Dear Mr. Zambito:

The NYS Department of Environmental Conservation (DEC) has reviewed the draft generic environmental impact statement scoping document circulated by Frank Pavia for the above-referenced project, which we received on February 4, 2010. We also appreciated the opportunity to meet with you and other project representatives on February 18, 2010 to discuss the draft scope. The Department supports Genesee County Economic Development Center's plan to prepare a Draft Generic Environmental Impact Statement (GEIS) for the Science & Technology Advanced Manufacturing Park (STAMP) project.

In our prior correspondence dated January 21, 2010 the Department provided you with information related to the Department's jurisdiction and several related issues. The potential DEC jurisdiction identified in our January letter has not changed based on the information discussed at our meeting, and provided in the draft scoping document. We have reviewed the draft scope in light of the Department's expected jurisdiction, and offer the following comments on the draft scoping document for your consideration.

General

1. The scope should provide for an executive summary in the GEIS in which the major elements of the project and GEIS can be summarized.

2. The list of appendices is a helpful and necessary part of the GEIS scope. In some instances, however, it is not clear how the appendices relate to the evaluation of impacts proposed in the GEIS. Where necessary, the text of the GEIS scope should reference the appendix in which additional supporting information and analyses will be included.

3. In addition to the list of appendices provided in the GEIS scope, it may be helpful to include an appendix that contains all involved and interested agency correspondence received on the project, and an appendix that contains copies of the relevant SEQR documents (e.g, lead agency coordination, positive declaration, and final scoping document).

Description of the Proposed Action

4. Section 3.3 – The scope should elaborate on how the industry requirements will be identified and described. We recommend that the industry requirements be defined specifically enough to

meaningfully evaluate potential impacts to water, air, and land related to water use, chemical use, energy use, chemical & petroleum bulk storage, and waste generation, handling and disposal. Based on our scoping discussion, project consultants are experienced in the planning and operation of similar facilities and reliable data is likely available to accurately and specifically describe these requirements. Perhaps this will be more fully addressed under Section 3.5 – Technology Manufacturing Operations.

5. Section 3.4 – The scope indicates in paragraphs 1 and 2 of this section that the "full build out" project footprint will be identified, including building locations, building footprint sizes, green spaces, and configurations of the development areas. We recommend that this planning also include the locations of any reasonably foreseeable infrastructure improvements. To the extent that detailed planning will be undertaken to determine the footprint of the development and infrastructure improvements, a full and complete inventory of the site's natural and cultural resources should be completed and presented in the GEIS. Further comments in this regard are noted below.

6. Section 3.4 – The scope should identify the preferred development alternative (see additional comments below under Item 19).

7. Section 3.5 – To the extent that the "Industry Requirements Report" will be used as supporting material for the description of the technology manufacturing operations, it should be noted in this section of the scoping document.

8. Section 3.7 – The Department supports the inclusion of this section of the GEIS, which will allow involved agencies to determine the requirements for further SEQR review of future actions associated with the project. The thresholds identified should address the following criteria, among other potential criteria:
   a. building and infrastructure locations,
   b. building and infrastructure footprints,
   c. building and infrastructure heights and setbacks,
   d. volumes, types and general locations of petroleum and chemical bulk storage,
   e. solid and liquid waste types and quantities that will be generated, and waste handling logistics (i.e., temporary storage, transport etc.), and
   f. air emission types, sources, and quantities.

<u>Existing Conditions, Potential Impacts and Mitigation Measures</u>

9. Section 5.2 – More detail should be provided to identify how surface and groundwater resources will be evaluated. The following should be addressed in the GEIS:
   a. A separate section heading should be included for an evaluation of stormwater runoff. This section should identify the current requirements of the Department's State Pollutant Discharge Elimination System (SPDES) Permits related to stormwater discharges from construction activities (GP-0-10-001) and industrial activities (GP-0-06-002; "multi-sector" permit). The GEIS should evaluate how these requirements will be met. Sufficient information should be developed to identify the size and location of necessary stormwater management measures and outfalls. A reference should be included to identify any supporting information or reports that will be included as an appendix.
   b. A table should be provided to summarize the amounts and types of wetlands, streams, and other water bodies present on the site, along with their jurisdictional status. A table should also be included that summarizes the physical impacts (temporary and permanent) of each project alternative under consideration on surface waters and wetlands. It may also be helpful to summarize potential impacts related to various infrastructure and utility improvement alternatives, and to summarize potential impacts by phase.

c. To the extent that the impacts to groundwater will be evaluated in this section, it should include potential impacts that may result from the development of new, off-site groundwater sources to supply the project site.
d. Mitigation measures should be identified to protect on-site groundwater quality and should include a full discussion of the applicable regulatory requirements for chemical & petroleum bulk storage, and waste handling. Information developed in Section 5.5 of the GEIS ("Technology Industry Health and Safety") that is relevant to the protection of surface and groundwater should also be summarized in this section of the GEIS. Additional information regarding the Department's requirements are provided on-line at:
chemical & bulk storage: http://www.dec.ny.gov/chemical/287.html
waste management: http://www.dec.ny.gov/chemical/292.html

e. Mitigation measures related to physical impacts to surface waters and wetlands should include a full discussion of project alternatives that avoid filling, piping, or relocation of streams and wetlands. This portion of the GEIS should be based on a fully-coordinated discussion with the Department and U.S. Army Corps of Engineers based on a current and agency-accepted delineation of all wetlands and other jurisdictional surface waters on the site.

10. Section 5.3 – The evaluation of impacts on air resources associated with site development should include those both from on-site manufacturing processes, on-site facility operation (e.g., emissions related to heating), and, to the extent it can be quantified, off-site power generation. The Department's guidance on the evaluation of greenhouse gases in an environmental impact statement may also be a helpful resource in guiding the development of this section of the GEIS. It is available on-line under "Climate Change Guidance Documents" at:
http://www.dec.ny.gov/regulations/56552.html

11. Section 5.4 – Threatened and Endangered Species: The Department identified several state-listed species in our prior correspondence that should be evaluated in the GEIS. The scoping document should include the list of species that will be evaluated. The scope should indicate that a determination regarding the presence of available habitat for each species (including nesting, foraging, roosting etc.) will be made. Where suitable habitat is present that may be impacted by project development, further surveys should be performed and mitigation measures should be developed. The scope should identify the general survey methods and schedule that will be used in the GEIS. Surveys and species identification must be undertaken by a qualified expert, particularly for insect species where specialized knowledge of insect anatomy is necessary. DEC staff are available for further consultation on proposed survey methods and locations as the GEIS is developed. Based on our preliminary review, we recommend use of the following general methods for each species:

Common Name	*Scientific Name*	State Status	General Survey Method[1]	General Survey Schedule
Heartleaf plantain	*Plantago cordata*	Threatened	Visual survey of suitable habitat	Mid-April to May
Northern harrier	*Circus cyaneus*	Threatened	Line transect or point count within suitable habitat	June (with other grassland birds) and also during winter
King rail	*Rallus elegans*	Threatened	Call Response survey within suitable habitat	Multiple surveys early May to late June (with other secretive marsh birds)

Nadda Pegana

Bald eagle	*Halieaeetus leucocephalus*	Threatened	Visual survey	For nesting pairs March – June
Black tern	*Chlidonias niger*	Endangered	Point count from edge of suitable habitat	Mid-June
Short-eared owl	*Asio flammeus*	Endangered	Point count within suitable habitat	Muliple visits Dec - March
Henslow's sparrow	*Ammodramus henslowii*	Threatened	Call survey within suitable habitat	June – both morning and evening
Horned lark	*Eremophila alpestris*	Special Concern	Line transect or point count within suitable habitat	June (with other grassland birds)
Grasshopper sparrow	*Ammodramus savannarum*	Special Concern	Line transect or point count within suitable habitat	June (with other grassland birds)
Least bittern	*Ixobrychus exilis*	Threatened	Call response survey within suitable habitat	Multiple surveys early May to late June (with other secretive marsh birds)
Pied-billed grebe	*Podilymbus podiceps*	Threatened	Call response survey within suitable habitat	Multiple surveys early May to late June (with other secretive marsh birds)
Karner blue butterfly	*Plebejus melissa samuelis*	Endangered	Walking potential habitat- where wild blue lupine is present.	During first and second flight periods (May-July)
Persius duskywing	*Erynnis persius*	Endangered	Walking potential habitat -where wild blue lupine or indigo (*Baptisia* spp.) are present	During flight period (May-June)

12. Section 5.4 – Vegetation, Fish and Wildlife:
    a. The Department recommends that the GEIS include the development of a long-term land management plan for the site that will address changes in land use over the course of the project's anticipated build out. The plan should identify the location of lands to be developed and provide a general schedule of development. To the extent that development lands may provide short-term habitat beneficial to wildlife during build out, this should be incorporated into the plan. Lands that will remain undeveloped should also be identified, along with a habitat management goal that supports or enhances adjacent undeveloped lands and wildlife management areas.
    b. To the extent that the acquisition of the John White Wildlife Management Area (WMA) is advanced, the potential impacts to fish and wildlife should be addressed in this section of the GEIS. As noted during our discussion, the John White Wildlife Management Area is being actively managed by the Department for grassland bird species, and is also used to provide universally accessible hunting opportunities for the public. Mitigation for impacts to fish and wildlife caused by an acquisition of the John White WMA would require the project sponsor to locate a site which would provide equivalent fish and wildlife benefits and transfer the title to the Department. If pursued, a detailed discussion of potential mitigation sites would need to be included in the GEIS.

13. Section 5.5 – Technology Industry Health and Safety: As noted above in our comments under Item 9.d, additional information concerning the Department's requirements for chemical and petroleum bulk storage, and waste management can be found on the DEC website.

14. Section 5.7 – The GEIS should evaluate the compatibility of the proposed re-zoning with the continued use of the John White and Tonawanda WMAs for wildlife conservation and public recreation. In discussions regarding acquisition of the John White WMA, the Department has summarized the encumbrances of the John White WMA, and the significant administrative procedures associated with its acquisition or change in land use. These procedures would include approval from the U.S. Fish & Wildlife Service and New York State Legislature. For any federal approvals required for acquisition or use-changes associated with the John White WMA, information should be provided in the GEIS on any related National Environmental Policy Act (NEPA) involvement. (See additional comments under Item 12.b above.)

15. Section 5.8 – Utilities:
    a. Section 5.6 of the scope regarding the assessment of traffic indicates that the physical impacts of necessary traffic improvements will be identified and mitigation measures will be developed. Section 5.8 of the GEIS regarding utilities should likewise identify the physical impacts of any foreseeable and necessary improvements to utility lines, corridors, and facilities. In particular, the feasibility study identified several locations where the installation of sewer and water mains may be required. In addition, we note that a power line right-of-way crosses the Tonawanda State WMA. If the expansion of power line transmission rights-of-way are needed to serve this site, the physical impacts and potential mitigation measures should also be evaluated.
    b. The ownership, operation, and maintenance of water and sewer infrastructure should be identified and discussed in the GEIS, with particular attention to any applicable provisions of New York State's Transportation Corporations Law.
    c. Wastewater treatment and water supply alternatives should be identified in the scoping document. Much of this information appears to be available in the project feasibility study.
    d. The development of a phasing plan for construction activities related to water and sewer infrastructure may be beneficial.
    e. Sewer:
        i. The GEIS should identify the projected industrial class codes that will use the site and discuss wastewater pretreatment requirements for identified users.
        ii. For any on-site streams that are identified to receive treated wastewater, a waste assimilative capacity analysis should be prepared and included in the GEIS that accounts for full build out. This analysis may also be appropriate for any site where significant upgrades to an existing wastewater treatment plant are identified.
        iii. The development of a phasing plan for the development of sewer infrastructure may be helpful. However, the GEIS should provide adequate information to document that sufficient wastewater treatment capacity can be provided for full build out of the project.
    f. Water:
        i. The GEIS should identify the basis for the proposed water demand.
        ii. Adequate information should be provided in the GEIS to demonstrate that proposed sources of water supply are sufficient to supply the site.

16. Section 5.9 – Public lands and recreation that are identified and evaluated in this section of the GEIS should include the John White State WMA and the Tonawanda State WMA. These sites are managed for wildlife conservation and are both used for passive recreation and hunting. The compatibility of the proposed land uses with these public lands should be evaluated. In addition, indirect impacts associated with increases in development surrounding the site should also be considered.

17. Section 5.9 – This section indicates that solid and hazardous waste management will be addressed in this section of the GEIS. To the extent that portions of this section may be also be related to Section 5.5 of the GEIS (Technology Industry Health and Safety), the information should also be summarized in Section 5.5.

18. Section 5.12 – This section of the scope should indicate that the development of the Phase 1A and 1B study protocols will be developed in consultation with both the New York State Office of Parks, Recreation and Historic Preservation (OPRHP), and the Tonawanda Seneca Indian Nation. Where the Phase 1B analysis identifies the potential for archaeological resources to be present, the GEIS should also include the results and findings of a Phase 2 investigation. As noted in our prior correspondence, during the Department's review of permit applications associated with this project, we will be required to comply with the requirements of the State Historic Preservation Act (SHPA), and follow the policies contained in the Department's policy on Contact, Cooperation, and Consultation with Indian Nations. As a result, any SEQR findings issued by the Department based on the GEIS will need to address cultural resources. Therefore, the GEIS should also include and address comments from OPRHP and the Tonawanda Seneca Indian Nation on the Phase 2 cultural resources investigation of the project site.

19. Section 6 – Project Alternatives: The scoping document only identifies one development alternative for consideration. The Department recommends that additional development alternatives be identified for consideration in the GEIS that would avoid and minimize impacts to wetlands, streams, and other sensitive natural resources that may be identified on the site. Some variation of development Options A and C contained in the Feasibility Study should be investigated further in the GEIS. Comparisons of the potential environmental impacts of several available development alternatives should be provided, and summarized in tabular form.

Thank you for the opportunity to provide our written comments on the GEIS for the STAMP project. We hope that the GCEDC will find the information we have provided helpful in the preparation of the GEIS for this important regional project. If you have any questions about the information provided in this letter, you may call me at (585) 226-5382 or e-mail me at sesheele@gw.dec.state.ny.us.

Sincerely,

Scott E. Sheeley

Digitally signed by Scott E. Sheeley
Date: 2010.03.05 15:23:36 -05'00'

Scott E. Sheeley
Deputy Regional Permit Administrator

Cc Paul D'Amato, Regional Director
Peter Lent, Regional Permit Administrator
Frank Ricotta, Regional Engineer
Randy Nemecek, Regional Natural Resources Supervisor
Jeff Gregg, DEC Albany, Office of General Counsel (1500)
Supervisor, Town of Alabama
Christine Abrams, Tonawanda Seneca Nation
USACOE, Buffalo District
Bob McNary, Empire State Development Corporation, Finger Lakes Region
Frank Pavia, Esq., Harris Beach, PLLC
Sheila Hess, Conservation Connects

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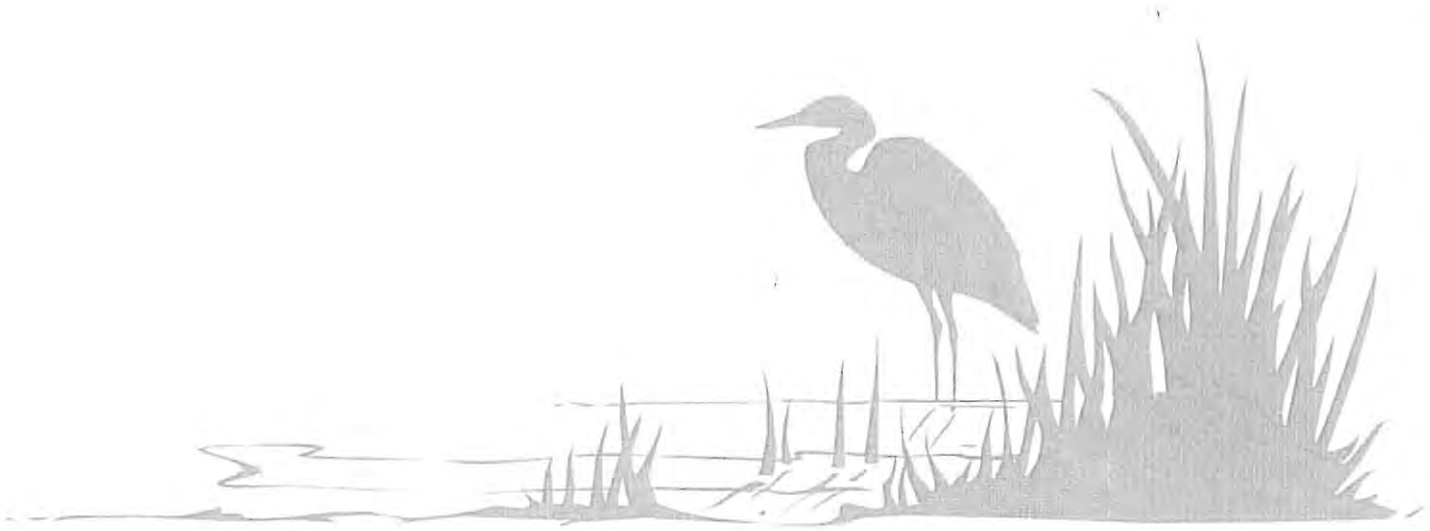

ATTACHMENT G

Investigation Personnel

FIELD INVESTIGATION PERSONNEL

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Report Preparation
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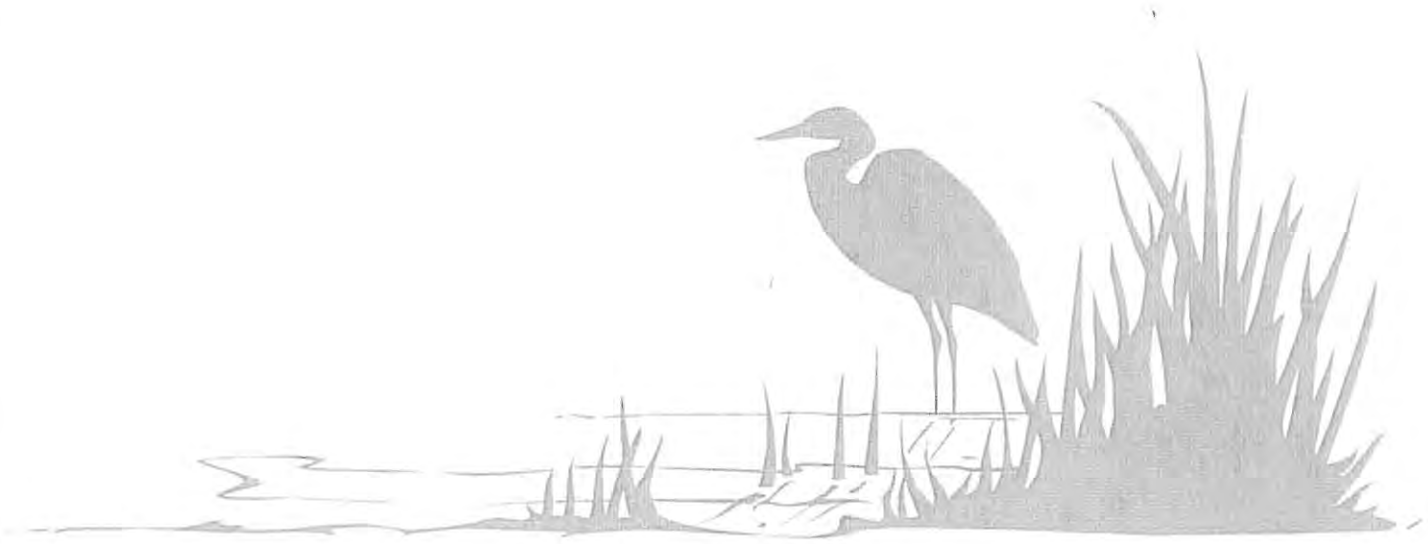


ATTACHMENT I

Survey Summary Logs

March	April	May	June	July	August
	Heartleaf Plantain	Heartleaf Plantain	Heartleaf Plantain	Heartleaf Plantain	
Northern Harrier	Northern Harrier	Northern Harrier	Northern Harrier	Northern Harrier	
		King Rail (Multiple Surveys)	King Rail (Multiple Surveys)		
	Bald Eagle	Bald Eagle	Bald Eagle	Bald Eagle	
		Black Tern	Black Tern	Black Tern	
Short-eared Owl (Multiple Surveys)	Short-eared Owl (Multiple Surveys)				
			Henslow's Sparrow (Multiple Surveys)	Henslow's Sparrow (Multiple Surveys)	
Horned Lark	Horned Lark		Horned Lark	Horned Lark	
		Grasshopper Sparrow	Grasshopper Sparrow	Grasshopper Sparrow	
		Least Bittern (Multiple Surveys)	Least Bittern (Multiple Surveys)	Least Bittern (Multiple Surveys)	
	Pied-billed Grebe (Multiple Surveys)	Pied-billed Grebe (Multiple Surveys)	Pied-billed Grebe (Multiple Surveys)		
	Karner Blue Butterfly	Karner Blue Butterfly	Karner Blue Butterfly	Karner Blue Butterfly	
	Persius Duskywing	Persius Duskywing	Persius Duskywing	Persius Duskywing	
	Wild lupine	Wild lupine	Wild lupine	Wild lupine	Wild lupine
					Nodding Pagonia (Multiple Surveys)
				Houghton's Goldenrod	Houghton's Goldenrod
			Eastern Prairie Fringed Orchid	Eastern Prairie Fringed Orchid	
		Bog Turtle	Bog Turtle		
	Eastern Massasauga	Eastern Massasauga	Eastern Massasauga	Eastern Massasauga	Eastern Massasauga

Survey Dates For all species listed for survey within corresponding month
March 16, 24, 31, April 12, 14, 16, 30, May 5, 17, June 25, July 16, and August 6, & 26, 2010.

Common Name	Survey Schedule	List of Applied EDI Survey Methods	DEC Survey Time	Recommended DEC Survey Methods	Dates of Surveys
Heartleaf Plantain	in fruit from June to early October	1. Line transect 2. Visual survey of suitable habitat	Mid April to Mid May	1. Visual survey of suitable habitat	April 12, 14, 16, 30, May 5, 17, August 6, 26, 2011 Visual Survey
Nodding Pagonia	blooms for a very short period sometime around the second or third week of August	1. Line transect 2. Visual survey of suitable habitat including suitable soils			August 6 & 26, 2011 Visual Survey
Houghton's Goldenrod	Blooms in August	1. Line Transect 2. Visual survey of suitable habitat including suitable soils			July 16, August 6, & 26, 2010
Eastern Prairie Fringed Orchid	Blooms from late June to early July	1. Line Transect 2. Visual survey of suitable habitat including suitable soils			June 25, July 16, 2010
Northern Harrier	Best time to look May through June	1. Line transect 2. Call response 3. Survey in suitable habitat	June & also in winter	1. Line transect or point count in suitable habitat	3/16/2010 8:18am Survey in suitable habitat 4/14/2010 8:30am Callback 5/17/2010 12:45pm Callback 6/25/2010 9:00am Callback
King Rail	Mid May to mid August	1. Line transect 2. Call response 3. Survey in suitable habitat	Multiple Surveys early May to late June	1. Call response survey in suitable habitat	5/5/2010 9:06am Callback 5/17/2010 11:00am Callback 6/25/2010 6:09am Callback 6/25/2010

					6:45am Callback
Bald Eagle	Breeding March thru mid June	1. Line transect 2. Call response 3. Survey in suitable habitat	Nesting Pairs March-June	1. Visual	6/25/2010 11:00am Callback
Black Tern	May to mid September	1. Line transect 2. Call response 3. Survey in suitable habitat	Mid June	1. Point count from edge of habitat	5/17/2010 12:40pm Callback 6/25/2010 6:40am Callback 7/16/2011 6:50am
Short-eared Owl	March and April	1. Line transect 2. Call response 3. Survey in suitable habitat	Multiple visits Dec-March	1. Point count in suitable habitat	3/16/2010: 7:25am, 7:40am, 6:30pm, 7:15pm Callback 4/12/2010 6:50am, 7:10am, 7:25pm, 7:40pm Callback 4/14/2010 8:20am Callback
Henslow's Sparrow	Mid June thru mid July	1. Line transect 2. Call response 3. Survey in suitable habitat	June- both morning and evening	1. Call response survey in suitable habitat	6/25/2010 6:15am Callback 8:17 am Survey in suitable habitat 7/16/2010 6:35am Callback
Horned Lark	Nesting in NY as early as February Two or more clutches a season	1. Line transect 2. Call response 3. Survey in suitable habitat	June	1. Line transect or point count in suitable habitat	3/16/2010 7:40am, 8:25am, 6:30pm Survey in suitable habitat 3/25/2010 9:00am, 9:30am

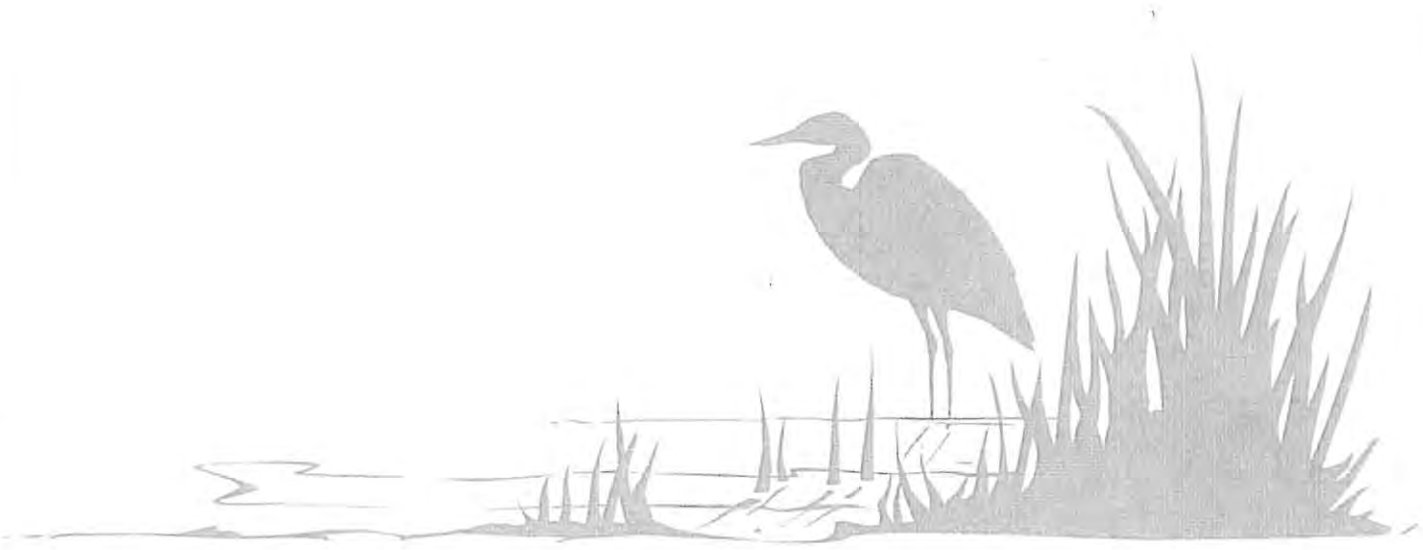
					Survey in suitable habitat 4/14/2010 2:00pm Survey in suitable habitat 4/14/2010 8:00am Callback 6/25/2010 6:20am Callback 7/16/2010 6:40am Callback
Grasshopper Sparrow	Return and begin nesting in mid to late May	1. Line transect 2. Call response 3. Survey in suitable habitat	June	1. Line transect or point count in suitable habitat	5/17/2010 12:34pm Callback 6/25/2010 6:25am Callback 7/16/2010 6:30am Callback
Least Bittern	May and July	1. Line transect 2. Call response 3. Survey in suitable habitat	Multiple Surveys early May to late June	1. Call response survey in suitable habitat	5/5/2010 9:15am Callback 11:05am Callback 6/25/2010 6:30am 7/16/2010 6:55am Callback
Pied-billed Grebe	mid April through mid May	1. Line transect 2. Call response 3. Survey in suitable habitat	Multiple Surveys early May to late June	1. Call response survey in suitable habitat	4/14/2010 8:10am Callback 5/5/2010 9:10am Callback 5/17/2010 11:10am Callback 6/25/2010 6:35am Callback
Karner Blue Butterfly	adults emerge from May to	1. Line transect 200' in suitable	During 1st and 2nd flight	1. Walking potential habitat	April 12, 14, 16, 30, May 5, 17,

	early June, A Second brood occur for about a week in the second half of July	habitat	periods (May – July)	– where wild blue lupine is present	June 25, July 16, 2011
Persius Duskywing	April to June	1. Line transect 200' in suitable habitat	During flight period (May – June)	1. Walking potential habitat – where wild blue lupine or indigo is present	April 12, 14, 16, 30, May 5, 17, June 25, July 16, 2011
Bog Turtle	Breeding from May to mid June (Diurnal)	1. Line transect 200' in suitable habitat 2. Visual survey from early morning to mid-day hours			May 5, 17, June 25, 2010
Eastern Massasauga	Spring emergence (i.e. April and May) for all age classes and during the basking period in mid to late summer (i.e., late August and early September)	1. Line transect 200' in suitable habitat 2. Visual survey when > 50% cloud cover, less than 15 mph wind speed, and air temperatures between 50 and 80° F – most active during the warmest part of the day			April 12, 14, 16, 30, May 5, 17, June 25, July 16, and August 6, & 26, 2010
Wild lupine	sprouting from rhizomes in late March or April and flowers in May and June	1. Line transect 200' in suitable habitat			April 12, 14, 16, 30, May 5, 17, June 25, July 16, and August 6, & 26, 2010

Parcel Number / Wetland Number(s)	Data Point Numbers Recorded	Community Type(s)/ Comments	Potential Habitat
Parcel 1 Wetland 3	D1 through D11	Cropland/Field Crop, Hardwood Swamp, Successional Northern Hardwoods, PSS scrubby, fragmented by farming, overgrown with vines, invasive species, debris, adjacent to active farming	northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), short-eared owl (*Asio flammeus*), eastern massasauga (*Sistrurus catenatus catenatus*),
Parcel 2 Wetland 9	D12,D13,D16	Cropland/Field Crop, Hardwood Swamp, Successional Northern Hardwoods, adjacent to active farming, high quality, nearly level micro-relief, lake plain, power line right of way through wetland	northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*),
Parcel 3 Wetland 10	D14,D15	Cropland/Row Crop, Shallow Emergent Marsh, Shrub Swamp, farmed, water stagnant adjacent to active farming	horned lark (*Eremophila alpestris*), eastern prairie fringed orchid (*Platanthera leucophaea*),
Parcel 6	D51 through D57	Cropland/Row Crop, Cropland/Field Crop, Shallow Emergent Marsh, Successional Northern Hardwoods, Hardwood Swamp	northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*),
Parcel 7 Wetland 20	D19 through D25	Successional Northern Hardwoods - Rich Mesic Forest, Floodplain Forest, Shrub swamp and Hardwood Swamp, with linear water course through farmed areas, nice uplands within, some areas shrubby in field, few openings, adjacent to active farming, concave drainageway, concave, lake plain, kettle hole	nodding pogonia (*Triphora trianthophora*), heartleaf plantain (*Plantago cordata*), Houghton's goldenrod (*Oligoneuron houghtonii*), eastern prairie fringed orchid (*Platanthera leucophaea*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*),
Parcel 8 Wetland 20 Wetland 22 Wetland 24 Wetland 25	D17, D18, D26 through D29, D34, D36	Successional Old Field, Cropland/Field Crop, Floodplain Forest, Phragmites Marsh, Shallow Emergent Marsh, Shrub Swamp with linear water course through farmed areas, includes reed canary grass nice uplands within, some areas shrubby in field, few openings, adjacent to active farming, concave drainageway, concave, lake plain, kettle hole, Whitney Creek corridor, Class C- non-trout, some invasive species, fish present in channel, fringe of wetlands/floodplains, adjacent to active farming, high quality, concave, small farm dump area located by D28	nodding pogonia (*Triphora trianthophora*), heartleaf plantain (*Plantago cordata*), Houghton's goldenrod (*Oligoneuron houghtonii*), eastern massasauga (*Sistrurus catenatus catenatus*), northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*),
Parcel 9 Wetland 20	D30 through D33	Shrub Swamp, Hardwood Swamp, Successional Northern Hardwoods, Shallow Emergent Marsh, Hedge Row, Cropland/Row Crop, with linear water course through farmed areas, includes reed canary grass nice uplands within, some areas shrubby in field, few openings, adjacent to active farming, concave drainageway, concave, lake plain, kettle hole	horned lark (*Eremophila alpestris*),
Parcel 11 Wetland 34	D37 through D39, D50	Cropland/Row Crop, Shallow Emergent Marsh, linear water course through farmed areas, include reed canary grass, some areas shrubby in field, adjacent to active farming, irregular topography, slightly altered, lake plain	horned lark (*Eremophila alpestris*), eastern prairie fringed orchid (*Platanthera leucophaea*),
Parcel 12 Wetland 48	D41, D61	Shrub Swamp, Successional Shrubland, very dense in spots	heartleaf plantain (*Plantago cordata*), Houghton's goldenrod (*Oligoneuron houghtonii*),
Parcel 16 Wetland 36 Wetland 37	D58 through D60	Cropland/Field Crop, Rich Mesic Forest – Successional Northern Hardwoods, Hardwood swamp, upland islands within, some logging trails present and/or debris, adjacent to active farming, lake plain, nearly level with microtopography, concave drainageway	nodding pogonia (*Triphora trianthophora*), heartleaf plantain (*Plantago cordata*), Houghton's goldenrod (*Oligoneuron houghtonii*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*), persius duskywing (Erynnis persius persius), karner blue (Plebejus melissa samuelis), wild lupine (*Lupinus perennis*),

Parcel Number / Wetland Number(s)	Data Point Numbers Recorded	Community Type(s)/ Comments	Potential Habitat
Parcel 17 Wetland 36 Wetland 37	D42 through D45	Successional Shrubland, Shallow Emergent Marsh, Cropland/Field Crop, Hardwood swamp, upland islands within, some logging trails present and/or debris, adjacent to active farming, lake plain, nearly level with microtopography, concave drainageway	northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*), persius duskywing (Erynnis persius persius), karner blue (Plebejus melissa samuelis), wild lupine (*Lupinus perennis*), short-eared owl (*Asio flammeus*),
Parcel 18 Wetland 36	D46	Hardwood swamp, upland islands within, some logging trails present and/or debris, adjacent to active farming, lake plain, nearly level with microtopography, concave drainageway	northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*),
Parcel 20 Wetland 29	D35	Hardwood swamp, Cropland/Field Crop, fragmented from farming, squared wood edges, upland islands within, some logging trails present and/or debris, adjacent to active farming, vernal pools present	bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*), northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*),
Parcel 21 Wetland 22 Wetland 23	No Data	Cropland/Field Crop, Successional Northern Hardwoods, Shallow Emergent Marsh, Hardwood Swamp, Whitney Creek corridor, Class C- non-trout, some invasive species, fish present in channel, fringe of wetlands/floodplains, adjacent to active farming, high quality, concave, small farm dump area located by D28	nodding pogonia (*Triphora trianthophora*), heartleaf plantain (*Plantago cordata*), Houghton's goldenrod (*Oligoneuron houghtonii*), eastern massasauga (*Sistrurus catenatus catenatus*), northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), eastern prairie fringed orchid (*Platanthera leucophaea*),
Parcel 22 Wetland 36 Wetland 37	No Data	Cropland/Field Crop, Hardwood Swamp, upland islands within, some logging trails present and/or debris, adjacent to active farming, lake plain, nearly level with microtopography, concave drainageway	nodding pogonia (*Triphora trianthophora*), heartleaf plantain (*Plantago cordata*), Houghton's goldenrod (*Oligoneuron houghtonii*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*), persius duskywing (Erynnis persius persius), karner blue (Plebejus melissa samuelis), wild lupine (*Lupinus perennis*), northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*),
Parcel 23 Wetland 40 Wetland 41 Wetland 42 Wetland 45	D47 through D49, D62, D63	Man Excavated Pond/ Shallow Emergent Marsh Hardwood Swamp, Shrub Swamp, Rich Mesic Forest – Successional Northern Hardwoods, fragmented edges from land manipulation from game farm development, manmade ponds and trail system within, slightly concave,	northern harrier (*Circus cyaneus*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), bog turtle (*Glyptemys muhlenbergii*), eastern massasauga (*Sistrurus catenatus catenatus*), least bittern (*Ixobrychus exilis*), king rail (*Rallus elegans*), Houghton's goldenrod (*Oligoneuron houghtonii*), eastern prairie fringed orchid (*Platanthera leucophaea*), nodding pogonia (*Triphora trianthophora*), heartleaf plantain (*Plantago cordata*),

Alabama STAMP



ATTACHMENT J

Avian Survey Protocols

ARIZONA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT January 2006

STANDARDIZED NORTH AMERICAN MARSH BIRD MONITORING PROTOCOLS

by Courtney J. Conway

Wildlife Research Report #2005-04

USGS
science for a changing world

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES

Suggested Citation: Conway, C. J. 2005. Standardized North American Marsh Bird Monitoring Protocols. Wildlife Research Report #2005-04. U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.

Introduction

The amount of emergent wetland habitat in North America has declined sharply during the past century (Tiner 1984). Populations of many marsh birds that are dependent on emergent wetlands appear to be declining (Tate 1986, Eddleman et al. 1988, Conway et al. 1994), but we currently lack adequate monitoring programs to determine status and estimate population trends. Marsh birds include all species that primarily inhabit marshes (i.e., marsh-dependent species). Primary species of concern in North America include King Rails (*Rallus elegans*), Clapper Rails (*Rallus longirostris*), Virginia Rails (*Rallus limicola*), Soras (*Porzana carolina*), Black Rails (*Laterallus jamaicensis*), Yellow Rails (*Coturnicops noveboracensis*), American Bitterns (*Botaurus lentiginosus*), Least Bitterns (*Ixobrychus exilis*), Pied-billed Grebes (*Podilymbus podiceps*), Limpkins (*Aramus guarauna*), American Coots (*Fulica americana*), Purple Gallinules (*Porphyrula martinica*), and Common Moorhens (*Gallinula chloropus*). The U.S. Fish and Wildlife Service has identified Black Rails, Yellow Rails, Limpkins, and American Bitterns as *Birds of Conservation Concern* because they are relatively rare and we lack basic information on status and trends in most areas (U. S. Fish and Wildlife Service 2002). Many U.S. states consider these species threatened or of special concern for similar reasons. King Rails are federally endangered in Canada and Black Rails are federally endangered in Mexico. Because rails and bitterns consume a wide variety of aquatic invertebrates, populations may be affected by accumulation of environmental contaminants in wetland substrates (Odom 1975, Klaas et al. 1980, Eddleman et al. 1988, Gibbs et al. 1992, Conway 1995). Marsh birds are also vulnerable to invasion of wetlands by purple loosestrife (*Lythrum salicaria*) (Gibbs et al. 1992, Meanley 1992). Hence, marsh birds may represent "indicator species" for assessing wetland ecosystem quality, and their presence can be used as one measure of the success of wetland restoration efforts. Marsh birds also have high recreational value; many species are highly sought-after by recreational birders. Finally, several rails are game species in many states yet we lack responsible population surveys on which to base harvest limits.

For these reasons, numerous federal agencies are cooperating to monitor marsh bird populations in North America to estimate population trends. Continued monitoring will also allow resource managers to evaluate whether management actions or activities adversely impact wetland ecosystems. Any management action that alters water levels, reduces mudflat/open-water areas, alters invertebrate communities, or reduces the amount of emergent plant cover within marsh habitats could potentially affect habitat quality for marsh birds (Conway 1995). The survey protocol outlined below is a standardized survey methodology intended for use on National Wildlife Refuges and other protected areas across North America. Results will be pooled to estimate population trends in these protected areas. These protocols will be modified as problems are identified by participants during the first 1-2 years of the survey effort. Participants are strongly encouraged to follow protocols exactly and to report any problems with implementing the protocols immediately so that we can modify and revise the methodology.

During surveys for primary marsh birds, observers may (at their option) record species of secondary concern that are also under-sampled by other monitoring programs, e.g., grebes,

herons, egrets, waterfowl, Forster's and Black Terns (*Sterna forsteri* and *Chlidonias niger*), Wilson's Snipe (*Gallinago delicata*), Sandhill Cranes (*Grus canadensis*), Northern Harriers (*Circus cyaneus*), Belted Kingfishers (*Ceryle alcyon*), Alder and Willow Flycatchers (*Empidonax alnorum* and *E. traillii*), Sedge and Marsh Wrens (*Cistothorus platensis* and *C. palustris*), Red-winged and Yellow-headed Blackbirds (*Agelaius phoeniceus* and *Xanthocephalus xanthocephalus*), Sharp-tailed and LeConte's Sparrows (*Ammodramus caudacutus* and *A. leconteii*), Common Yellowthroats (*Geothlypis trichas*), etc. However, surveyors should limit the number of secondary species to only those species of management concern. Many of the species listed above are adequately sampled by the North American Breeding Bird Survey. Listening or looking for too many secondary species may reduce one's ability to detect primary species.

PARAMETERS TO BE ESTIMATED

Density/abundance indices

Abundance is the total number of birds within a defined area of interest. Density is abundance divided by area, or the number of birds/ha of emergent habitat within a wetland during one season. Surveys rarely count all individuals present in the sampling area because detection probability is typically less than 100%. However, number of birds responding during standardized surveys will provide an index to abundance that will allow comparisons among wetland basins and habitat types. Abundance indices will also allow examination of the effects of management actions (e.g., wetland restoration) on marsh birds by comparing changes in abundance indices between managed and un-managed sites both before and after activities have occurred. Indices also allow comparison among other areas in the region to determine the relative importance/quality of local habitats to regional marsh bird populations. The value of an abundance index relies on a **consistent** positive correlation between number of individuals detected during a survey and number of individuals actually present in the area sampled (i.e., low spatial and temporal variation in detection probability). Few reliable estimates of detection probability during marsh bird surveys are currently available (but see Conway et al. 1993, Legare et al. 1999, Bogner and Baldassarre 2002). However, because we are incorporating methods for estimating components of detection probability into these survey protocols, validation of indices based on call-broadcast surveys for primary marsh bird species will be possible. Because we will estimate distance to each bird detected, we will also evaluate the usefulness of distance sampling to provide estimates of density. We will calculate abundance indices for the primary marsh bird species during the breeding season.

Population trend

Population trend is the percent annual change in population size for a particular species at some defined spatial scale. Estimates of population trend allow managers to determine whether local or regional marsh bird populations are declining. Managers can establish *a priori* population trend thresholds or trigger points below which immediate management action should be taken. Such actions can prevent local extinctions by identifying population problems before they become severe. We will estimate population trends of marsh birds by using weighted linear regression to estimate annual changes in the number of individuals detected per survey point for each target species. Few estimates of marsh bird population trends currently exist, and reliable

estimates of population trends will probably require >5 years of survey data. We will estimate population trends for the primary marsh bird species during the breeding season. We will soon be able to conduct a meaningful power analysis to determine the percent annual change detectable with a specific number of survey points.

Trends in habitat availability

We will also estimate trends in emergent habitat availability at each site. Trends in habitat availability are the percent annual change in the amount of each major wetland habitat type. Information on emergent habitat availability will allow us to: 1) extrapolate density indices to estimate total numbers of marsh birds within a local area, 2) correlate changes in marsh bird numbers with changes in habitat availability to identify potential causes of observed population changes (Gibbs and Melvin 1993), 3) identify emergent habitats that need protection, and 4) design management actions in ways that either improve or minimize adverse effects to preferred habitat of marsh birds.

FIELD PROCEDURES, METHODS, PROTOCOLS

Wetland basins included in surveys

Surveys will be conducted in all emergent marshes (freshwater, brackish, and salt marshes) within the "survey area" that are >0.5 ha in total area. Small, isolated wetland patches (<0.5 ha) can be included, but their inclusion is not mandatory (but once included, they can not be eliminated). The "survey area" can be an entire National Wildlife Refuge (for very small refuges) or a portion of a larger Refuge. If the "survey area" will be a portion of a larger refuge, the participant should divide the refuge or area into *x* potential "survey areas" and randomly select the one (or more) to be used for the survey. Observers should not choose the "survey area" non-randomly based on where they know marsh birds exist (or exist in high density). Such an approach is a biased sampling design that will always lead to perceived population declines (i.e., if you place samples in areas where density is highest then only declines are expected to occur). Hence, we will use an "area-based" sampling frame rather than a "marsh-based" sampling frame. Emergent habitat is not perennial and changes spatially over time - we want a sampling design that allows for that. By sampling "all emergent marshes within one or more defined survey areas" observers will have to add survey points as emergent habitat increases or shifts within their defined management area. If a refuge has various marsh types or fire histories that they want to incorporate into the survey and these marsh types are separated spatially, then the refuge can chose several discrete "survey areas" within which they commit to surveying all of the wetland habitat each year. Once the survey area(s) is selected, a map of the area should be obtained (aerial photo, hand-drawn map, etc.) that identifies roads and extent of emergent marsh patches. Again, **all** marsh patches within the "survey area" must be surveyed each year. As location of marsh patches in the "survey area" change annually, additional survey points must be added to ensure that all marsh patches are surveyed (but no survey points are ever 'dropped' from the survey). Surveys should include as many survey points as needed to cover the area of interest (survey area). The number of survey points to include within a local refuge or management area (or the size of the survey area selected) depends on personnel time available and other logistical constraints. For our pooled analyses, any number of points from a local

refuge will be useful. However, to obtain sufficient data to estimate population trends at the local scale, participants should consider approximately 50 survey points or more at a refuge if possible. More points will provide more power to detect local trends. The number of points to include on a particular survey route can vary among routes. The number of points on a particular survey route should correspond to the number that one surveyor can get done in a morning (or evening) survey window. If points are far apart or you are dealing with isolated wetlands, you may only be able to survey a small number of points in a morning (e.g., 6 or 8 or whatever). This would constitute a "route". If travel between adjacent points is relatively easy and the wetland is large, you may be able to complete 15 or more points in one morning/evening (and hence have 15 points on that survey route). One caveat is that the morning/evening survey window should correspond to when marsh birds are most vocal in your area. Although the protocol says that morning surveys should be completed by 10am, marsh birds in some regions may not be very responsive after 8 or 9am. Including fewer points per survey route and surveying an additional morning (rather than fewer routes with lots of points) will typically result in more detections. Remember, marsh birds are typically most vocal in the 2 hours surrounding sunrise and sunset. Once you choose the direction with which you conduct a particular survey route, be consistent (e.g., always conduct route *X* north to south). Being consistent in this respect will assure that each survey point is completed at the same time of day during each replicate survey. This consistency will help to reduce the bias created by diurnal decreases in vocalization probability of marsh birds as the morning progresses (Conway et al. 2004).

Location of survey points

Fixed, permanent survey points will be chosen and marked with inconspicuous markers in the field. If possible, locations of all survey points should also be plotted on maps of each wetland and UTM locations of each point recorded using a GPS receiver. Maps should include the direction in which the speakers should be pointed during the survey at each point. This is not always obvious to someone who has not surveyed the route before, and may create unwanted variation in numbers detected if speaker direction is not consistent. Point spacing in previous studies has varied from 40m to 800m. The more survey points included in an area, the more precise the resulting estimates of local population change. For the standardized continental monitoring program, distance between adjacent survey points is 400 m to avoid the risk of double-counting individual birds and increase the total area covered by monitoring efforts in a local area. If individual refuges want closer point spacing for some local reason (i.e., 50 points with 400m spacing is not possible at a small refuge) then use 200m spacing between points. We can ignore every other point at that particular site for the shared (pooled) data set if we choose to do so, but the individual refuge will still have an adequate local sample size to detect change over time (we can also use data from these individual refuges to evaluate the magnitude of the problem associated with double-counting if points are 200m apart). Once the survey area is selected, and a map of the survey area is available, the participant should choose the initial survey point randomly based on all possible locations for a survey point (all possible marsh-upland interfaces and all possible marsh-open water interfaces). Subsequent survey points should be at regular intervals of 400m. Survey points in ponds should be located either on the upland-emergent interface or on the open water-emergent interface, whichever will allow easier access and travel between survey points. Some marshes may be more effectively surveyed by

boat (with survey points on the open water-emergent interface) and others more effectively surveyed on foot (with survey points on the upland-emergent interface). Many local marsh bird survey efforts place survey points at the interface between emergent marsh and upland. This approach minimizes travel time between adjacent points, reduces trampling vegetation within the marsh, and may increase the distance at which observers can hear vocalizing birds due to increased elevation relative to the marsh vegetation. Each survey point receives a unique identification number. The number of survey points in each survey area will be correlated with amount of emergent marsh patches within that survey area. In marshlands that have access throughout, points should be in a 400m grid system (hence, 1 point per 16 ha of marsh). Most marshes will not have access to internal areas of the marsh and points in these marshes should be placed along the upland or open water edges. In many locations, emergent habitat occurs in small patchy marshes less than 16 ha in size. Include at least one survey point in all marshes >0.5 ha within the management area. Additional survey points can be added in small marsh patches as long as they are 400m away from all other survey points. If new marsh patches appear in future years in areas within the predefined management area that did not have emergent marsh previously and did not have survey points, additional survey points must be added (provided that they are ≥400m from existing survey points). Original survey points are never dropped from the survey and are always surveyed in subsequent years. If no appropriate marsh exists at an original survey point, then the observers still make an entry for that point but write in the "Comments" column "no survey conducted because no longer appropriate habitat".

Timing of surveys

Survey routes can be either morning or evening survey routes. Observers can conduct either morning or evening surveys on a route as long as each survey route is surveyed during the same period (morning or evening) consistently every year (once a route is designated an evening route, it will always be an evening route in perpetuity). Morning surveys begin 30 minutes before sunrise (first light) and should be completed prior to the time when marsh birds cease calling (but never later than 10:00 am). The time in the morning when marsh birds cease calling varies with weather, time of year, and among regions. Evening surveys begin 4 hours before sunset and must be completed by dark (in some regions, marsh birds may not begin calling until 3 or 2.5 hours before sunset). Vocalization probability is typically highest in the 2 hours surrounding sunrise and the 2 hours surrounding sunset - choose optimal survey windows for your region and stick to them each year. Including both morning and evening surveys into a standardized monitoring protocol will provide added flexibility and more potential survey hours for field personnel. Conduct at least 3 surveys annually during the presumed peak breeding season for all primary marsh birds in your area. Each of the 3 replicate surveys will be conducted during a 10-day window, and each of the 10-day windows will be separated by 7 days. Seasonal timing of these 3 replicate survey windows will vary regionally depending on migration and breeding chronology of the primary marsh birds breeding in your area. The first survey should be conducted when migratory passage is over, but prior to breeding. For example, in south-central Washington the first survey should be between 1-10 May, the second survey 17-27 May, and the third survey 3-13 June. Marsh birds are typically most vocal during courtship and egg-laying periods. Try to maintain 2 weeks between each replicate survey. Surveys in tidal marshes should always be conducted at a similar tidal stage for each replicate survey both within

and across years. The tidal stage within which to conduct local marsh bird surveys should be based on when highest numbers of marsh birds are likely to be detected in your area; optimal tidal stage for surveys may vary among regions. Many salt marsh passerines are forced to renest during the peak spring high tide, and detection probability is highest during the week after a high spring tide. Clapper rail surveys have been conducted during high tide since 1972 at San Francisco Bay NWR, but high tide was a period of reduced vocalization probability for clapper rails in southern California (Zembal and Massey 1987) and for black rails in northern California (Spear et al. 1999). As a general guideline, surveys in tidal marshes should **not** be conducted on mornings or evenings when high or low tide falls within the morning (or evening) survey window. Our intent is to estimate trends over time in the number of breeding adults, so we want to complete all three annual surveys prior to the initiation of juvenile vocalizations. Three or more surveys are needed to confirm seasonal presence/absence of some marsh bird species in a wetland with 90% certainty (Gibbs and Melvin 1993). Three replicate surveys per year is warranted, **especially** in areas where personnel organizing survey times may not initially know local timing of the breeding cycle of their target species. And, timing of breeding cycle differs among co-existing species of interest (e.g., American bitterns often breed much earlier than least bitterns and rails in some regions, and clapper rails and king rails breed earlier than Virginia rails and soras in some regions). Finally, including $\geq$3 replicates per season will provide us with data on temporal variation in numbers counted (a key parameter needed to conduct reliable power analyses once enough preliminary data are available) and also allow us to estimate the proportion of sites occupied by each species (MacKenzie et al. 2002). However, if for some reason you can not conduct $\geq$3 surveys on your area, we can still use your data to estimate detection probability and to compare passive with call-broadcast survey methods. The 3 survey windows increase our probability of conducting at least one survey during the peak seasonal response period of all primary marsh bird species in a local management area. Contact the program coordinator (see contact information below) or your USFWS regional non-game bird coordinator to help choose the most appropriate survey windows for your area if you are unsure. One observer should expect to survey approximately 10-20 survey points each morning, depending on travel times between survey points and length of your broadcast sequence.

Survey methods

These standardized survey methods for marsh birds are based on suggestions from a 1998 multi-agency workshop at Patuxent designed to aid agencies developing marsh bird monitoring programs (Ribic et al. 1999). The survey methods and protocols described here expand upon suggestions made at the Patuxent marsh bird monitoring workshop (Ribic et al. 1999) and incorporate suggestions from Conway and Gibbs (2001) and recent methodological advances in estimating detection probability and observer bias. Because many marsh birds are secretive, seldom observed, and vocalize infrequently, we will use broadcast calls to elicit vocalizations during vocal surveys (Gibbs and Melvin 1993, Conway et al 2004). But because we want to estimate detectability, estimate density using distance estimators, evaluate the usefulness of call-broadcast for future survey efforts, and survey secondary species, we will also record birds during a passive period prior to broadcasting calls.

At each survey point, observers will record all primary species (rails, bitterns, and pied-billed grebe) detected during both a 5-minute passive period prior to broadcasting recorded calls,

and during a period in which pre-recorded vocalizations are broadcast into the marsh. The broadcast sequence includes calls of the primary marsh bird species that are expected breeders in that area and is broadcast using a portable cassette tape player, CD player, or MP3 player. A few potential broadcast systems include:

Cassette Tape Players: Optimus SCP-88 Stereo Cassette Player (Radio Shack #14-1231); or SONY Sports Series CFD-980; or Johnny Stewart Game Caller.

CD or MP3 players: Philips Jogproof CD player AX511217 ($49 at www.surprise.com); Lenoxx, model #CD-50 (Walmart $20); Aiwa XP-SP90 or XP-MP3 Portable CD Player; or Panasonic SL-SX286J or SL-SX280G Personal CD Player (e.g., Radio Shack #14-1231 or #42-6014); or Panasonic SLSX420 ($49.99 Circuit City). Or any cheap portable CD player.

Amplified Speakers: Optimus AMX-4 amplified speakers (Radio Shack #40-1407); or Sony portable speakers (Circuit City for $19.99).

CD or MP3 broadcast equipment will probably produce better quality and more consistent sound than cassette tapes. The recorded calls should be obtained from the Marsh Bird Survey Coordinator (contact info below); request a CD of the species of interest, and we will ensure that it coincides with the protocol. The tape/CD should include exactly 30 seconds of calls of each of the primary marsh bird species interspersed with 30 seconds of silence between each species. The 30 seconds of calls should consist of a series of typical calls interspersed with approximately 5 seconds of silence. For example, an entire survey sequence might look like this:

5 minutes of silence
30 seconds of calls of first primary species configured like this:
- 3 Least Bittern *coo-coo-coo* calls
  - 6 seconds of silence
- 3 Least Bittern *coo-coo-coo* calls
  - 6 seconds of silence
- 4 series of Least Bittern *kak* calls

30 seconds of silence
30 seconds of calls of second primary species configured like this:
- 2 Sora *whinny* calls
  - 5 seconds of silence
- 3 Sora *per-weep* calls
  - 5 seconds of silence
- 4 Sora *kee* calls

30 seconds of silence
30 seconds of calls of third primary species
etc.

include a verbal "stop" at end of survey interval so that observers know when to stop the tape or CD

The chronological order of calls on the tape/CD will vary with each survey area, but will always be consistent within a particular survey area across replicate surveys and across years. Species to include in the call-broadcast is up to the individual organizing the local survey effort, but we suggest you include all species believed to be local breeders (species for which you expect to get responses). Order of calls should start with the least intrusive species first, and follow this chronological order: Black Rail, Least Bittern, Yellow Rail, Sora, Virginia Rail, King Rail, Clapper Rail, American Bittern, Common Moorhen, Purple Gallinule, American Coot, Pied-billed Grebe, Limpkin. The calls used for broadcast should include at least the primary advertising call of each species (e.g., '*whinny*' for Sora, '*grunt*' for Virginia Rail, '*clatter*' for Clapper Rail and King Rail, '*kickee-doo*' for Black Rail, '*click-click-click-click-click*' for Yellow Rail, '*coo-coo-coo*' for Least Bittern, '*pump-er-lunk*' for American Bittern). Other calls associated with reproduction should be included if the calls are common in your area for that species. Including all the common calls associated with reproduction of each species on the broadcast sequence will increase detection probability during different times of the breeding season and can help observers learn the less common calls of each target species. A list of common calls for each target species is attached. Calls given while flying or after being flushed (not associated with reproduction) are probably not useful to include in the broadcast sequence. Each individual bird detected (for primary species) during the survey period will be entered on a separate line on the field data form (see example data sheet attached). Observers should record when each individual is detected: during any of the initial 1-min passive segments, and/or during any of the 1-min call-broadcast periods. Observers do not record the number of times a bird responded during each segment. Simply record if the individual was detected during each of the 1-minute segments of the survey. Recording all the segments during which an individual bird is detected is extremely important so that we can determine whether call-broadcast is effective at eliciting additional responses for each of the primary species. These data will help us determine whether or not to use call-broadcast of all primary species during surveys in future years. Moreover, recording whether each individual responds during each 1-min sub-segment allows us to estimate detection probability using capture-recapture models (Farnsworth et al. 2002). Estimates of detection probability are essential for regional/national monitoring efforts so that we can determine how well the count data recorded index true population size/trends. Hence, observers must make a decision as to whether each vocalization heard at a survey point is a new individual for that point or is an individual that vocalized previously from that survey point. Observers should also estimate the distance from each individual bird to the survey point. Estimate distance to each bird when the bird is first detected (birds will approach the call-broadcast [Legare et al. 1999, Erwin et al. 2002] so observers need to record the distance to the bird when the bird was first detected). Recording distance to each individual will allow us to use distance sampling to estimate density for each species in each habitat type. Density indices by habitat type are useful because they allow managers to extrapolate survey data to estimate a minimum number of each marsh bird species on their entire management area. Estimating the distance to some individual birds will involve a lot of uncertainty (ie, estimating distance to birds 5m from the surveyor is much easier than estimating distance to birds that are >100m away). Cooperators are encouraged to add an additional column to their datasheet for "accuracy of distance estimate" where they assign accuracy to one of 3 accuracy categories:

1 = distance estimate is relatively accurate [i.e., ±20m]

2 = accuracy of distance estimate is iffy [i.e., ±60m]

3 = accuracy of distance estimate is believed to be poor [i.e., ±100m])

This can be done after the survey is over at each point because the number of birds detected at a point affects the accuracy of distance estimates to each individual bird.

The broadcast player should be placed upright on the ground (or on the bow of the boat), and sound pressure should be 80-90 dB at 1 m in front of the speaker. Use a sound-level meter (available at Radio Shack) to adjust volume of the broadcast player at the beginning of each day. If sound quality distorts when volume on your broadcast equipment reaches 80-90 dB, you should obtain higher quality broadcast equipment. If the ground is wet, place the speaker on an object as close to the ground as possible. Observers should stand 2 m to one side of the speaker while listening for vocal responses (standing too close to the speaker can reduce the observer's ability to detect calling birds). Observers should point the speaker toward the center of the marsh and should **not** rotate the speaker during the call-broadcast survey. Speakers should be pointed in the same direction for all replicate surveys. At points where it is not obvious which direction to point the speakers (i.e., on a road or in a canal between two marshes) surveyors should record this information on a map and on their data sheets and refer to this information on all replicate surveys. If observers detect a new bird immediately after the survey period at a particular point (or while walking between points) they should record these birds in a separate column (e.g., write "before" or "after" in the *Comments* column). Observers have the option of recording secondary species (see attached list of example species). At each point, record the total number of each secondary species detected. Hence, individual birds of secondary species do not receive their own line on the data sheet and observers do not record detections in each of the 1-min sub-segments for secondary species (see example data sheet attached). The secondary species included by a surveyor will depend on the marsh birds of interest at that refuge, management area, or physiographic region. For example, participants may want to include secondary species which are thought to be declining or which are not sampled well by other survey efforts. However, surveyors should limit the number of secondary species to only those species of management concern. Many of the other marsh bird species are adequately sampled by the North American Breeding Bird Survey. Listening or looking for too many secondary species may reduce one's ability to detect primary species.

Surveys should only be conducted when wind speed is <20 km/hr, and not during periods of sustained rain or heavy fog. Even winds <20 km/hr (12 mph) affect the detection probability of marsh birds. Participants should postpone surveys if they believe winds are affecting calling probability of marsh birds. Recommendations for conducting surveys in very windy locations include:

1) determine what time(s) of day have the least wind in your area. The daily survey windows in the protocol are recommendations -survey times should be modified under conditions where wind regularly affects vocalization frequency. The important thing is that surveys are conducted during the same daily time window each year at a particular location, and the survey windows at a particular location should be the time of day/night that has the highest detection probability for your target species in your area. In some locations, surveys conducted after sunset (or before sunrise) may have higher detection probability compared to the morning and evening survey windows recommended in the protocol

because strong winds are less frequent during the middle of the night; and

2) try to be flexible with your schedule if you can. For example, plan to conduct a survey on a particular day but postpone to the following day if its too windy, and keep postponing until you get a low-wind day to complete the survey.

If wind speed increases to above 12km/hr during the survey (or sustained rain begins while the survey is already underway), participants should stop the survey and repeat the entire survey route another day (i.e., don't just go back and repeat the remaining points on the route). When surveyors are using a motorized boat or airboat to travel between survey points, the noise generated by the boat may cause birds to stop calling. In these situations, surveyors may choose to include a "settling" period of a fixed amount of time (e.g., 1 minute) prior to starting the 5-minute passive count at each point. We recommend that **no** settling period be included. If a participant includes an initial settling period prior to each survey, the participant should keep that settling period constant among all points and all replicate surveys. Furthermore, the participant should include a comment on every data form stating that such a settling period during which detections were not recorded was included. If included, make the settling period a part of the written survey protocol so that individuals wishing to repeat the effort in future years will know that a settling period was included.

Some areas or some survey points within a survey area will have so many marsh birds calling that observers will find it impossible to record each sub-segment during which each individual bird is detected. For example, an observer may see/hear >20 coots at one survey point. In these situations, simply write down an estimate of the total number of individuals detected for that particular species during the entire survey period on one line of the data sheet (e.g., write "23 AMCO" on one line of the data sheet - see example on sample data sheet attached).

Always conduct each survey route in the same direction with each survey point surveyed in the same chronology. This will reduce temporal variation in numbers counted over replicate surveys and provide greater power to detect trends.

Which species do I include in the call-broadcast sequence?

Most participants should include all of the "primary species" in the list attached that are thought to breed in the marshes to be surveyed. The # of species included on the call-broadcast portion of the survey increases the duration of the survey by 1 min per species at each point. So, with 8 species, you will spend 13 minutes (including the initial 5 min passive listening period) at each point. For participants who want to reduce the length of time at each point, here are several things to consider: only include species on the call-broadcast that you know/assume are breeders; reduce the # of species on the broadcast segment in year 2 to include only those that responded during surveys in year 1 (simply request a new CD); do not include very common species that are fairly well monitored by other survey efforts (e.g., AMCO) in the call-broadcast segment. All observers should still record all detections of all primary marsh bird species, even if you decide not to include all primary species present in your area in the broadcast sequence.

Filling out the data sheet

The data sheet included below must be tailored by each participant to reflect the number and identity of species the participant includes on the broadcast sequence for their area. The number of species columns on the data sheet will differ regionally; include only those species for which call-broadcast is used in your survey (see the 3 sample data sheets attached). For example, if you intend to only broadcast calls of 3 species, then you will have an 8-minute survey sequence at each point (5 minutes of passive listening and 1 minute of call-broadcast for each of 3 species) and will need a data sheet with 8 response columns. If you intend to broadcast calls of 5 species, you will have a 10-minute survey sequence at each point (5 minutes of passive listening and 1 minute of call-broadcast for each of 5 species) and will need a data sheet with 10 response columns. See the example data sheets attached. Prior to the beginning of the survey, write down the day, month, and year at the top of the data sheet. Also write the full name of all observers present during the survey. If more than one observer, write down who recorded the data and **all** individuals that helped identify calling birds. Using multiple observers to detect birds at a point may confound observer bias issues when estimating trend, so its important to record any and all observers who contributed to marsh bird detections (see paragraph regarding double-observer surveys at end of this protocol). Write down the name of the marsh, the name of the refuge and/or management area, and other location information (distance and direction to nearest town, county, state). Write down whether this is the first, second, or third survey of the year at these points in the "Survey #" space at the top of the data sheet. Record ambient temperature, wind speed, wind direction, % cloud cover, precipitation, and other notes of weather conditions, and whether (and when) conditions change during the course of the morning.

When you arrive at the first survey point, write down the unique identification number of the survey point and the time. Start the survey. When a bird is detected, write the species name in the "Species" column. You can use the 4-letter acronym for the species or write the full species name. A list of 4-letter AOU species acronyms is attached to this protocol. Put a "**1**" in each column in which that individual is detected based on vocalizations and put a "**s**" in each column in which the individual is detected visually (including flying overhead). For example, if an individual Virginia Rail calls during the first 1 minute of passive listening, put a "1" in the first column. Regardless of whether that individual calls once or many times during the first minute, you only put one "1" in the first column. If that same individual bird is still calling during the second minute of passive listening, then also put a "1" in the second column. If the same individual calls during the 30 second Sora sequence or the 30 seconds of silence immediately following the Sora sequence, put a "1" in the column for "SORA". If that same individual bird calls again during the Virginia Rail sequence, you also put a "1" in the column "VIRA", and so on. Hence, if an individual bird is calling constantly throughout the survey period, you will have a "1" in every column for that individual. If the individual is heard **and** seen, put both a "1" and a "**s**" in the appropriate column. If you hear a call of the same species but from a different individual (or from an individual of another species), you start a new line on the data sheet and follow the same protocol just described for this individual bird. The difficulty is determining whether a call is coming from a new individual or a individual detected earlier at that survey point. Observers must make this decision without seeing the bird by using their best judgement. Follow the same procedure at subsequent survey points. If an individual detected at one survey point is thought to be an individual that was recorded at a previous survey point,

write "y" in the "*Detected at a Previous Point*?" column. Be conservative when in doubt as to whether an individual bird detected at the current point was the same individual recorded at a previous point (i.e., record "y" when in doubt). The number of lines filled out on the data sheet will differ among survey points and will correspond to the total number of individual marsh birds detected at each point. If no marsh birds are detected at a survey point, record the point number and starting time, and write "no birds" in the comment column. A sample data sheet is included as an example of what survey data might look like. If the observer hears a marsh bird but is unsure of its identity, the observer should write "unknown" in the Species column and record all data for this individual as described above. Make a verbal description of the unknown call in the *Comments* column (e.g., 'soft kak-kak-grr - sounds like BLRA but harsher'). This will aid future identification of unknown calls if that call is heard repeatedly. When the survey is complete at a point, write down the UTM coordinates (and datum used) from the GPS unit (or return on another day and record). Because location of survey points may affect trends, record whether each point is adjacent to an upland-wetland interface, a water-wetland interface, is in the marsh interior, and/or is along a roadside. Record any ancillary information that may have influenced vocalizations or detection probability in the Comments column (e.g., record whether surveyor is using a different boat or different boat motor that is more or less noisy than that used on previous surveys). There are indications that periodic burning of emergent marshes may benefit some marsh birds. Indeed, several refuges are involved with local studies examining the effects of fire on marsh birds. Hence, it would be useful for all participants to record the "month and year of last burn" for the 100-m radius area surrounding each survey point. If all you know is that the area surrounding a particular survey point hasn't burned in the past x years, then record $>x$ years at that point. This information will allow us to evaluate the effects of fire on marsh bird abundance at a large (continental) spatial scale with the pooled data. The data produced will supplement the more detailed studies evaluating the effects of fire being conducted on specific refuges and will help make management recommendations regarding the usefulness of fire as a tool for managing marsh bird populations.

Difficulty when many individuals of the primary species are detected at a point

Because many of these species occur at relatively low densities through much of their range, most participants will detect few or no individual birds at any given survey point. However, the large number of individuals detected at some points make recording difficult. For example, if >5 individuals of 1 species are heard during any 1-minute segment during the survey, I have difficulty recording them all in the correct columns/rows and keeping up with which row goes with which individual bird. When many birds are calling simultaneously, it can be difficult for the observer to 1) decide whether they are hearing new individuals or previously-detected ones, 2) write new individuals on a new line of the datasheet, and 3) find the correct line where they wrote down previously-detected birds. In these situations, here are a few comments, observations, and suggested remedies. First, individual surveyors do get better at this with practice even with relatively high numbers of calling birds at a point. However, everyone has a threshold when the numbers of calling marsh birds get too high at a particular point. This problem occurs more frequently when a cooperator has lots of species (and hence columns) on their call-broadcast sequence. If a participant knows at the end of the call-broadcast at a particular point that he/she was overwhelmed and didn't effectively assign the correct calls to the

correct columns (individuals), then write a note in the Comments Column saying that the sub-interval information is dubious. If this problem is common on your surveys, below is a list of solutions in decreasing order of preference. If you choose options #3 or #4 you need to make a very clear comment on your data sheet about what you were and were not recording at each point:

1) Include a circle next to each marsh bird detected and make a 'tick' identifying the general direction of that individual (this will help you differentiate one individual from other individuals of that species as more are detected at that point),
2) Reduce the number of species in your call-broadcast sequence. Only use call-broadcast for species of management/conservation interest and/or species known to respond well to call-broadcast (e.g., eliminate bitterns, coots, pied-billed grebes, and moorhens from your call-broadcast sequence so that you have <5 species on your call-broadcast sequence). Still record data for all individuals of all marsh bird species in the same way, but just reduce the # of columns.
3) For those primary species that are of lower management/conservation interest in your survey area (e.g., coots, moorhens, pied-billed grebes), only record the total number of individuals detected at that point and only use the sub-intervals for the primary species of higher management concern (e.g., black rails, yellow rails, king rails, clapper rails, bitterns). Make sure you make a clear note on the top of your datasheets that explains your deviation from the standard protocol.
4) Only record the **first** interval during which each individual is detected (as opposed to each and every interval). Be sure that you make a clear note on the top of your datasheets that you are only recording the **first** interval during which each individual is detected.

Habitat measurements

Natural changes in water level and management activities (e.g., dredging, wetland restoration efforts, prescribed burning, etc.) can lead to dramatic changes in marsh vegetation. Patterns of distribution and local population trends of marsh birds can often be best explained by local changes in wetland vegetation. Consequently, quantifying the proportion of major vegetation types (e.g., % *Typha domingensis*, *Scirpus olneyi*, *Scirpus californicus*, *Phragmites communis*, *Spartina foliosa*, *Salicornia virginica*, *Baccharis glutinosa*, *Populus fremontii*, open water, mudflat) surrounding each survey point each year can help identify the cause of observed changes in marsh bird populations. Vegetation will be quantified at 2 scales: observers should visually estimate the proportion of each major vegetation type within a 50m-radius circle around each survey point, and aerial photographs will be used to periodically determine the amount of each major vegetation type on the management area. In some locations, there is substantial seasonal change in annual growth in emergent plants. Participants should record vegetation data at a time that overlaps the breeding season for all of their target marshbirds. The important thing is to sample at a time when you are most likely to detect important changes in vegetation 5 or 10 years from now (changes that might help explain increases or decreases in number of marshbirds detected). If the vegetation doesn't change during the annual survey period, participants should consider quantifying vegetation within the 50-m radius circles during their final survey each year. However, **vegetation data does not have to be collected while the vocal survey is being conducted** (it might be most effective to make a separate trip to each survey point to collect

vegetation data). Whichever time vegetation surveys are conducted, participants should be sure to quantify vegetation at that same time each year. As an example, visual estimates of proportions of each vegetation type at a survey point might look like this: 15% water, 10% California bulrush, 20% three-square bulrush, 5% southern cattail, 20% seep willow, 10% mudflat, 20% upland shrub community. Record vegetation data to the species level because some marsh birds preferentially use only one species of emergent plant. Record vegetation data in the Comments column of the data sheet or on a separate data form. Vegetation at each point is only recorded once each year. Participants should enlist the help of a botanist or other qualified assistance to conduct vegetation surveys (remember, these survey do not have to be conducted during one of your vocal surveys). If the vegetation changes substantially at a particular point during the course of a single survey season, participants should make a note in the Comments column stating how the vegetation has changed over the course of the season. Participants should collect vegetation data at all points each year (even if no emergent vegetation currently exists at some points during some years) to document changes over time in habitat availability. Not conducting the marsh bird survey at a set of points from a previous year due to lack of suitable habitat may occur in some years due to reduction in the water table, but you should still fill out a data sheet for these points and write in the Comments section "these points were not surveyed due to lack of suitable emergent vegetation resulting from local/regional drought". It is important that we do this so that the points get entered into the regional database as "no suitable habitat" (as opposed to failure to survey for logistical reasons). Because most survey points will be at the marsh/upland or marsh/open-water interface, approximately half of the 50-m radius circle within which you record vegetation data might be "upland vegetation". There is no need to characterize upland vegetation by species. Hence, include categories in your vegetation classification called "upland vegetation", "road", and "open water" if appropriate. There may be some points that are on peninsulas or in narrow open water channels (surveyed by boat) and these points may have emergent marsh within most of the 50-m radius circle. Differentiating plants by species is difficult in some taxa and not all participants will be able to consult with a botanist prior to categorizing the vegetation types at each of their survey points. In these cases, participants can pool species by taxa or functional group (e.g., sedge spp., bulrush spp., mixed shrub). Aerial photographs of the entire survey area that allow delineation of the area of emergent vegetation should be obtained annually if possible.

Personnel and Training

All observers should have the ability to identify all common calls of primary and secondary marsh bird species in their local area. Regularly listening to the recorded calls used for surveys can help learn calls, but observers should also practice call identification at marshes (outside the intended survey area if necessary) where the primary species are frequently heard calling. All observers must pass a self-administered vocalization identification exam each year prior to conducting surveys. This exam should be a sequence requested from the program coordinator. Observers should not have heard the exam CD prior to taking the exam. All observers should also be trained to accurately determine distance to calling marsh birds, and to identify the common species of emergent plants on the management area. Methods for training observers to accurately estimate distance include: 1) place a tape recorder in the marsh at an known distance and have observers estimate distance, 2) choose a piece of vegetation in the

marsh where the bird is thought to be calling from and use a range-finder to determine distance, 3) have an observer estimate the distance to a bird that is calling with regularity and is near a road or marsh edge, then have a second observer walk along the road/edge until they are adjacent from that calling bird, and then measure this distance (by pacing or use of a GPS) and see how accurate the observer was at estimating distance. *Two-observer surveys* (see below) are very useful here - after the survey is complete have the 2 observers discuss not only what they heard, but how far each person estimated the distance to each bird. Periodic double-observer surveys not only produce estimates of detection probability (see below) but also allow participants to determine whether one person is constantly underestimating or overestimating distance to calling birds. Observers should also have a hearing test (audiogram) at a qualified hearing or medical clinic before, during, or immediately after the survey season each year. These data will be included as a covariate and will help control for observer bias in trend analyses. New participants should do at least one "trial run" before their first data collection window begins because it takes time to get used to the data sheet and recording the data appropriately.

Equipment/materials

Where possible, fixed survey points will be permanently marked with inconspicuous markers and numbered. Portable GPS receivers should be used to mark survey points onto aerial maps. GPS coordinates of each permanent survey point should be recorded and saved for reference in future years. CDs with calls of primary species should be obtained from the program coordinator (see contact info below), and new CDs should be requested if quality declines. CD players and amplified speakers should be good quality and batteries should be changed or re-charged frequently (before sound quality declines). Participants should routinely ask themselves if the quality of the broadcast sound is high. Observers should always carry replacement batteries on all surveys. A sound level meter with $\pm$5 dB precision (e.g., Radio Shack model #33-2050 for $34.99; or EXTECH sound level meter, $99 from Forestry Suppliers, Inc.) should be used to standardize broadcast volume (alternatively, Radio Shack should be willing to help you set your broadcast level appropriately using the sound meter in the store). If participants need help with purchasing broadcast equipment, contact the coordinator below. A small boat/canoe may be useful for surveying larger wetland habitats adjacent to open water, reducing travel time between survey points. When using a boat, use the same boat and motor on each survey each year to control for possible effects of engine noise on detection probability. If a different boat or different motor is used (or the same boat/motor just sounds better or worse than usual) make a note of the change in the *Comments* column. A spare CD player should be kept close-by in case the primary unit fails to operate. Three prototype field data forms for use on vocal surveys are attached to this protocol. The number of columns on the data sheet will vary among survey areas depending on the number of bird species included in the call-broadcast segment of your survey so participants will have to tailor one of the data sheets below to suite their own broadcast sequence.

DATA COLLECTION, ANALYSIS, SUMMARY AND ROUTINE REPORTING

A. Field data. Field data will be manually entered in the field on a data form (see example attached) and transferred weekly to an electronic form. At each survey point, observers

should record: full name of observer, name of data recorder (if different from observer), name of wetland, date, survey point #, start time, species of each individual detected, the intervals during which each bird was detected, and distance to each individual bird from the survey point. Each individual bird detected should be recorded on a new line on the data form. An overview map of the survey area with all roads and all survey points numbered on the map should be developed for field personnel conducting surveys and made available for future years. All data forms should be reviewed by a supervisor within 24 hours of each survey so that mistakes can be identified and corrected promptly. Copies of original data forms should be stored in two separate locations.

B. Data entry/Database management. Data will be entered into a common spreadsheet program (EXCEL, Lotus, QuattroPro, dBase, etc) as soon after collection as possible, preferably within 1 week of data collection. Timely data entry limits mistakes, reduces probability of loss of data, and helps identify potential sampling biases and logistical problems that might be corrected in future surveys. Completed surveys will be printed out after entry into the spreadsheet and compared to original data forms to assure data quality. Electronic spreadsheets containing field data will be backed up weekly. If data entry time is not available at the local site, send copies of the data sheets to the address below and we will enter the data for you. Submit your data promptly at the end of the field season to the address below so that regional summaries and analyses can be conducted and sent back to program participants. Also, submit a copy of the tape or CD used during the survey effort on your area.

C. Data reporting. Send or email the name, address, phone#, and email address of all participants to the address below. This list will be used to disseminate information to each participant at the end of each field season and to send results of annual data analyses. An annual report should be completed each year for each site. After each season, survey data should be summarized and summaries should include the mean number of individuals detected per survey point during both passive and broadcast periods for each marsh bird species. Summaries should identify locations on the management area with seasonal concentrations of marsh birds. After several years, survey data can be used to estimate population trends of marsh birds on the management area using regression analyses. Survey data will also allow comparison of birds detected during initial passive periods and during call-broadcast to evaluate the usefulness of using call-broadcast surveys to monitor marsh birds. These comparisons will allow improvement of field methods in future years. On a regional basis, estimates of population trend from areas undergoing management activities can be compared to trends from areas that have not been subject to management activities to evaluate the long-term effectiveness of management efforts.

REGIONAL CONTEXT AND INTEGRATION WITH OTHER MONITORING PROTOCOLS

Estimates of population change in marsh bird populations on the survey area will be compared to local population changes in other parts of the region and to other regions. Comparisons among other local areas in the region will allow local managers to determine the importance of local wetlands to regional population health by identifying whether marsh bird

populations on their management area are doing better or worse relative to other areas. Several U.S. Fish and Wildlife Service National Wildlife Refuges began using these marsh bird survey methods in 1999. We currently have over 60 refuges and management areas participating. We will continue refinement of survey methods based on feedback, logistical problems identified, and inconsistencies identified by participants. Your participation is needed now to ensure that **your** national monitoring program works. Survey data collected using the protocol described above will help our efforts to develop the most rigorous continental monitoring program possible for marsh birds. Please send any survey data to the address below. For assistance obtaining appropriate CDs, additional information, or questions regarding standardized marsh bird survey methods, please contact:

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USGS-BRD
Arizona Coop. Fish & Wildlife Research Unit
104 Biological Sciences East
University of Arizona
Tucson, AZ 85721
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ADDITIONAL OPTIONAL COMPONENTS TO SURVEY PROTOCOL

Recording water depth at each point (or each management unit)

Water level definitely influences abundance and distribution of marsh birds. Water levels vary annually and even daily in some marshes and these fluctuations can explain spatial and temporal changes in marsh bird abundance. Some National Wildlife Refuge control water levels in some of their management units and have the ability to directly benefit marsh birds via water management. Participants are encouraged to place gauges for measuring water level in permanent locations at numerous points within their survey area(s). Water level should be recorded before or after each marsh bird survey. If water levels vary annually (or seasonally) within your survey area, we recommend that this component be incorporated into your marsh bird survey effort.

Recording noise level at each point

Recording the level of background noise during the survey at each survey point is useful for trend analysis. This information can be used as a covariate in future trend analyses because level of background noise varies spatially and temporally and influences detection probability. Categorize background noise at each point on a scale from 0 to 4 (0= no background noise, 1=faint background noise, 2=moderate background noise (probably can't hear some birds beyond 100m), 3=loud background noise (probably can't hear some birds beyond 50m), 4=intense background noise (probably can't hear some birds beyond 25m). Each cooperator can decide whether they have the time and/or need to record noise level at each point. If noise levels are periodically high enough to reduce observers' ability to detect calling marsh birds, this

optional component is recommended.

Recording types of calls given

Knowing season patterns of different call types in a local area provides useful information. For example, the frequency of different calls given (e.g., single *clatter*, paired *clatter*, *kek*, or *kek-burr* for a clapper rail) varies throughout the season. Frequency of different calls given may also vary across regions. Different call types have different functions and can indicate pairing status and stages of the nesting cycle in a local area (allowing refinement of local survey windows). Moreover, detection probability and observer bias may differ with different call types (e.g., least bittern '*kak*' and Virginia rail '*tick*' can be confused with clapper rail '*kek*' calls) and accuracy of distance estimation may vary with call type. Hence, incorporating call types into trend analyses can potentially increase power to detect true population trends. For these reasons, observers are encouraged to record all types of calls given for each target marsh bird detected. Add an additional column ("*Calls*") to your data sheet and record call type(s) given for each individual bird detected (see sample data sheets).

Multiple-observer surveys

Estimating detection probability associated with a particular survey protocol is essential when attempting to interpret count data produced from a monitoring program. The extent to which trends in count data represent the underlying trend in true abundance depends on detection probability and observer bias associated with the particular survey method. We will estimate observer bias associated with our survey effort using the double-observer method (Nichols et al. 2000). This approach involves 2 or more trained observers recording data independently at a series of survey points (Conway et al. 2004). Hence, whenever possible, surveys should be conducted by 2 or more observers simultaneously. Each observer should fill out a separate data sheet and should record their data separately without discussing anything with the other observer. Observers should not point out a call or a bird to the other during the survey period. Each observer should stand 1-2 meters away from each other and should keep their pen on their data sheet at all times so that one observer is not cued by the sudden writing activity of another observer. Once the survey at a particular point is completed, the observers can look over each others data at that point and discuss discrepancies, but that data should not be altered; obvious mistakes should be noted in the *Comments* column **but not changed.** The differences between the observers in number of birds detected at each point is what allows us to estimate observer bias so these differences should not be altered. Double-observer surveys will obviously not be possible at all times and at all locations, but try to use multiple observers whenever possible so that we can obtain sufficient data to estimate observer bias.

Recording salinity content of water

In coastal marshes or any marshes with varying salinity levels, participants are encouraged to record the salinity content of the water directly in front of each point on each survey. Salinity levels affect use by various species of marsh birds and such information is relatively easy to collect and can be used as covariates to control for variation in models estimating population change. Participants can get an Oregon Scientific Handheld Salinity Meter [ST228] for $25.

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National Marsh Bird Monitoring Program Survey Data Sheet

Date *(eg 10-May-04)* **:**

Name of marsh or route :

Observer(s) *(list all)** **:**

Survey replicate # :

	Before	**After**
Temperature *(°F)* **:**		
Wind speed *(mph)* **:**		
Cloud cover *(%)* **:**		
Precipitation *(see below)* **:**		

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During:											Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
				Before	Pass 0-1	Pass 1-2	Pass 2-3	Pass 3-4	Pass 4-5	BLRA 5-6	LEBI 6-7	VIRA 7-8	CLRA 8-9	After					

Call Types: BLRA: *kicky-doo, grr, churt* CLRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

Pg___of____

Date *(eg 10-May-04)*: **Name of marsh or route :** **Observer(s)** *(list all)**:

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	Pass 2-3	Pass 3-4	Pass 4-5	BLRA 5-6	LEBI 6-7	VIRA 7-8	CLRA 8-9	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
																			001212

National Marsh Bird Monitoring Program Survey Data Sheet

Date *(eg 10-May-04)* : *20 April 2006*

Name of marsh or route : *Hidden Shores Marsh*

Observer(s) *(list all)**: *Chris Nadeau, Bob Blabla*

Survey replicate # : *2*

	Before	After
Temperature *(°F)* :	*10*	*21*
Wind speed *(mph)* :	*0*	*1*
Cloud cover *(%)* :	*15*	*60*
Precipitation *(see below)* :	*none*	*none*

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	Pass 2-3	Pass 3-4	Pass 4-5	BLRA 5-6	LEBI 6-7	VIRA 7-8	CLRA 8-9	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
HSM1	*1710*	*0*	*BLRA*		*1*	*1*				*1*					*grr*		*95*	*N*	
			BLRA			*1*				*1*	*1*	*1*	*1*	*1*	*kicky-doo*		*110*	*N*	
			VIRA				*1S*					*1*			*ticket, grunt*		*30*	*N*	
HSM2	*1721*	*1*	*CLRA*	*1*											*p-cltr*		*40*	*N*	
			CLRA	*1*											*p-cltr*		*45*	*N*	
			VIRA									*1*			*grunt*		*100*	*Y*	
			CLRA											*1*	*throaty hoo*		*10*	*N*	
HSM3																			Not surveyed unsuitable habitat
HSM4	*1750*	*1*	*COMO*		*1*	*1*	*1*		*1*		*1*		*1*		*wipeout*		*150*	*N*	
			SORA									*1*			*perweep*		*210*	*N*	

Call Types: BLRA: *kicky-doo, grr, churt* CLRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*

3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

List of AOU 4-letter species acronyms for primary marsh birds in North America.

Primary species

SORA	sora
VIRA	Virginia rail
CLRA	clapper rail
KIRA	king rail
BLRA	black rail
YERA	yellow rail
AMCO	American coot
COMO	common moorhen
PUGA	purple gallinule
LIMP	limpkin
PBGR	pied-billed grebe
AMBI	American bittern
LEBI	least bittern

Examples of Secondary Species (these are just some examples - there are other wetland birds that a participant may want to include; each cooperator should decide which secondary species to include in their surveys in advance and list these species on their datasheet so that all participants in future years will know the list of species recorded in prior years)

LEGR	least grebe (1 cooperator has included LEGR in their call-broadcast sequence)
EAGR	eared grebe (1 cooperator has included EAGR in their call-broadcast sequence)
GRHE	green heron (1 cooperator has included GRHE in their call-broadcast sequence)
GBHE	great blue heron
GLIB	glossy ibis
WFIB	white-faced ibis
WHIB	white ibis
NOHA	northern harrier
SACR	sandhill crane
WILL	willet
WISN	Wilson's snipe (1 cooperator has included WISN in their call-broadcast sequence)
FOTE	Forster's tern
BLTE	black tern
BEKI	belted kingfisher
ALFL	alder flycatcher
WIFL	willow flycatcher
SEWR	sedge wren
MAWR	marsh wren
COYE	common yellowthroat
YEWA	yellow warbler
SSTS	saltmarsh sharp-tailed sparrow
NSTS	Nelson's sharp-tailed sparrow
LCSP	LeConte's sparrow
SWSP	swamp sparrow
SAVS	Savannah sparrow
SESP	seaside sparrow (1cooperator has included SESP in their call-broadcast sequence)
RWBL	red-winged blackbird
YHBL	yellow-headed blackbird
BTGR	boat-tailed grackle

List of the most common calls for the primary target species of marsh birds

Black Rail: *kickee-doo* (primary breeding call), *grr-grr-grr, churt, ticuck*
Least Bittern: *coo-coo* (male advertisement), *kak-kak-kak*, *gack-gack* (given from nest), *ank-ank* (given when flushed)
Yellow Rail: *click-click*, *wheese* (female call), *descending cackle* (pair maintenance), *squeak* (given by retreating bird)
Sora: *whinny* (territorial defense and mate contact), *per-weep*, *kee* (may be given to attract mates)
Virginia Rail: *grunt* (pair contact, territorial call), *tick-it* (male advertisement call), *kicker* (female advertisement call), *kiu* (sharp, piercing call)
King Rail: *chac-chac* (pair communication), *kik-kik-kik* (mating call)
Clapper Rail: *clatter* (pair contact, territorial call), *kek* (male advertisement call), *kek-burr* (female advertisement call), *kek-hurrah ,hoo, squawk* (chase squeal), *purr*
American Bittern: *pump-er-lunk* (territorial/advertisement call), *chu-peep* (given during copulation ceremony), *kok-kok-kok* (given when flushed)
Common Moorhen: *cackle* (primary advertising call), *squawk, yelp, cluck, purr*
Purple Gallinule: *cackle* (primary advertising call), *squawk*, *grunt*
American Coot: *pow-ur* (crowing for territorial defense), *puhk-ut* (warning), *puhk-kuh-kuk* (crowing for territorial challenge), *puhlk*, *tack-tack* (cackling), *kerk* (sharp cough)
Pied-billed Grebe: 3-part gurgling song, *quaa-aaa-aaa* (wavering, guttural copulation call), *kwah* (alarm call), *ek-ek-ek* (rapid, staccato greeting call), *tshick-tshick*
Limpkin: *krr-oww*

2008 GRASSLAND BIRD SURVEY PROTOCOL

Volunteer Commitment Dates: April 12, 2008 – July 31, 2008

Time of day to conduct surveys: 5:30 am – 9:30 am

Pre-survey Wait Period	**Wait 2 minutes prior to starting survey**
Number of minutes at each point:	**5 minutes: separated into 3- and 2-minutes**
Number of visits per point:	**Two (bird surveys only, no habitat surveys in 2008)**
Bird surveys	**One from May 15-31 and one from June 1-15**
Data Entry	**Entered electronically and mailed to NJAS by July 31, 2008**

Minimum number of points surveyed in one day: 1 Route/Site

Protocol for volunteers

All citizen scientists are required to attend a training workshop. During this workshop, routes and/or sites will be assigned and corresponding maps will be handed out. Each volunteer will be required to do at least one route/site. We will make every attempt to match volunteers to their preferred counties. Volunteers are welcome to survey multiple routes; but do not try to be too ambitious and take on more than you can handle. It will be much more difficult to reassign routes after the surveys have been initiated, and they all need to be completed this year.

Reporting Time

All volunteer hours spent performing grasslands bird surveys must be recorded on the provided timesheet. The project name is 2008 Grasslands Bird Surveys. In addition to the project name please record the Site Code, especially if you are working on more than one route/site. Make sure that all information is filled in every time you go into the field to work on this project. This includes scouting, bird surveys, data entry, etc. Also be sure to record the miles traveled during each survey. NJAS must provide this timesheet to our partners at the Division of Fish and Wildlife. It is essential that this form be completed and returned to NJAS with your data sheets at the end of the field season.

Scouting

Prior to the first bird survey, every point in each route/site needs to be scouted to determine suitability and accessibility. This initial visit must take place from April 12 – May 14. If a point is inaccessible or unsuitable, the point may be moved to suitable habitat at a nearby location. To move a point, choose a location with suitable habitat on your route map that is at

least 0.5 mile (straight distance) from any other point. Suitable habitat is an open area (no trees or shrubs), greater than 5 hectares (12.5 acres) and dominated by grasses and forbs. When you find the new point location, draw an arrow on the route map from the old point location to the new one and indicate why it was moved (developed, inaccessible, etc). If there are no other suitable locations that meet the criteria to move a point, then mark it on the map with an X and indicate why it was not surveyed (developed, inaccessible, etc.). PLEASE LET US KNOW (kristin.mylecraine@njaudubon.org) about any points that you move. If the area around the original point is not a grassland habitat anymore, for example, it has been developed, please let us know immediately.

Bird Surveys

Make sure you are familiar with the songs of species likely to be seen during your surveys, and the points on identification. Some species are rather secretive and do not allow close approach for visual identification. We have provided CDs of songs to all participants in the training workshops, and you are encouraged to keep practicing. We recommend you use a good field guide for visual identification.

Each volunteer will be responsible for one or more routes and/or sites. A route follows existing roads through grassland habitat and consists of survey points. Each point is located at a pre-determined location from which the observer conducts the bird survey. The radius around each point for 100 meters is considered the "map-circle". An interior circle with a 25 meter radius is also part of the map-circle. Routes vary in length and have different numbers of points.

A site is a property that contains grassland habitat, which is being managed for grassland bird species. Observers are granted permission by the landowner (through their contract with the State) to enter the property to survey. Site sizes vary, but most contain 1-5 survey points with the same count circle method employed.

Note on Routes: those of you who have been assigned a roadside route must run the first bird survey in numerical order by point from the lowest number to the highest number. The second run is done in reverse going from the highest point number to the lowest. This is done so that points aren't surveyed at the same time of day during each survey period.

Surveys should not be conducted during rain or during periods of high winds (greater than 12mph {Beaufort 3}, which is enough to constantly move leaves or twigs and to extend a light flag). Every point in a route must be surveyed on the same day. Surveys will take place from one half hour before to four hours after sunrise (approximately between 5:30 AM and 9:30 AM), two times during the breeding season, preferably from May 15-31, and June 1-15. Surveys must take place at least 7 days apart. For example, do not conduct one of your surveys on May 31st and the other one on June 4.

Once the observer arrives at the survey point wait 2 minutes before beginning the count. This enables the observer to prepare for the count and allows the birds to calm down and return to normal activity. During the survey the observer stands at the point for 5 minutes and records on the data sheet all grassland bird species seen or heard. This 5-minute period is divided into

two periods; a 3- and a 2-minute period. The observer records the species and number of birds seen or heard during the first 3 minutes separately from those encountered during the next 2 minutes. Record all birds as less than 25 meters, 25-100 meters or greater than 100 meters away from the survey point on the data sheet. Plot all individuals of target species observed at less than 100 meters on the circle map with the abbreviation of the common name (see Appendix III). ***Do not count longer than five minutes.*** Do not exceed the 5-minute time limit because you are sure a certain "good bird" is there and not calling -- it will probably be recorded some other year, and valid negative data are as important as positive data in this survey. Species recorded that are not found on the form should be added at the bottom. ***If you observe a target species before or after the 5-minute survey, write it down in the margin or blank spaces on the bottom of the datasheet with a "before" or "after" next to it.***

One and only one observer should conduct the count. Counting should be done from outside the car from a stationary point. Absolutely no method of coaxing birds should be used during the 5-minute survey period. This means no "spishing", tape playbacks or any other method of enticing a bird to sing or call or make itself visible. It is crucial that all surveys be done consistently. Target birds observed between stops should not be counted, but may be noted in the margin of the route map with a line indicating the location of the species. Such birds are of interest, but do not spend extra time pursuing them, as it is important to finish within the time limit; bird activity changes drastically after this time.

Be sure you record the survey site code, survey point number, observer, recorder (if applicable), date, start time and weather conditions on every datasheet.

Each survey will be undertaken singly or by two people. We prefer single observers because we do not want the volunteer's ability to concentrate on the birds to be compromised by the presence of another person. However, if you want to conduct the surveys with your birding partner, please take all precautions to avoid being distracted. Remember, only one person should be the primary observer. The second person can act as the recorder in this situation. If there are two observers, the primary observer says what she/he sees or hears to the recorder in a quiet voice and the recorder repeats back what she/he heard as the data is recorded. Only the birds seen and heard by the primary observer get recorded on the forms. ***If the recorder sees or hears a target species before or after the 5-minute survey, write it down in the margin or blank spaces on the bottom of the datasheet with a statement that this is a recorder observation.***

> ***Note on Counting the Same Bird: The same bird seen/heard in the 3-minute portion of the survey, then seen/heard again in the 2-minute portion is ONLY recorded in the 3-minute period as this is definitely a single individual. If you are sure that a bird observed in the 2-minute period is different from the one observed in the 3-minute period, by all means record it as a different individual in the 2-minute time slot. Noting on the data sheet that you were sure two different birds were observed will help with our data entry.***

In all situations, avoid biasing the data by disturbing the birds. Walk out of your car quietly, approach the survey point cautiously, avoid unnecessary movements and try to blend in as much as possible.

Data Entry

All observers will have access to NJAS's online data entry website. Go to http://www.njaudubon.org/Research/CitizenScience/Grassland_Surveys.html. At the bottom of the page you can click on **Enter Data**. This will send you to a new page. Click on the link: http://www.njaudubon.org/GrasslandWeb_ At the bottom of the page click **Create a New Account.** Enter a User ID for yourself. Enter a password (at least 5 characters) and confirm that password. Enter your name, phone number and email address in the appropriate box. In the **Site Password** box type **grassland**. A page will open that asks you for the new User ID and password. Type them in, hit enter and you should be relocated to the data entry page. If you have any technical difficulties with this please let me know immediately so we can correct the problem. Once you have entered all of your data please mail all data sheets by August 31, 2008 to:

Kristin Mylecraine
New Jersey Audubon Society
Scherman-Hoffman Wildlife Sanctuary
11 Hardscrabble Road
Bernardsville, NJ 07924

Thank you for your assistance and good luck with all of your surveys.

Appendix I. WEATHER CONDITIONS (FROM BREEDING BIRD SURVEY)

WIND SPEED CODES:

Beaufort Scale	Wind Speed in mph	Indicators of Wind Speed
0	Less than 1	Smoke rises vertically
1	1 to 3	Wind direction shown by smoke drift
2	4 to 7	Wind felt on face; leaves rustle
3	8 to 12	Leaves, small twigs in constant motion; light flag extended
4	13 to 18	Raises dust and loose paper; small branches are moved
5	9 to 24	Small trees in leaf sway; crested wavelets on inland waters

SKY CONDITION CODES:

0 Clear or a few clouds
1 Partly cloudy (scattered) or variable sky
2 Cloudy (broken) or overcast
4 Fog or smoke
5 Drizzle
7 Snow
8 Showers

NOTE: Surveys *should not* be conducted when wind speeds exceed Beaufort 3, and/or during sky conditions 5-8 (drizzle, snow, rain showers).

Appendix II: Equipment Checklist

Clipboard & Pencils, Erasers, etc.
Bird Count Datasheets for all survey points
Overall Site Maps on aerial photo
Survey Point Maps with Count Circle on aerial photo (one for each point)
Route Map(s)
Binoculars
Watch with second hand (or timer)
Compass (optional)
GPS Unit (optional)
Thermometer (optional)

Appendix III: Target Species and Abbreviations

Target Grassland Species	
American Kestrel	AMKE
Bobolink	BOBO
Dickcissel	DICK
Eastern Meadowlark	EAME
Grasshopper Sparrow	GRSP
Henslow's Sparrow	HESP
Horned Lark	HOLA
Northern Bobwhite	NOBO
Northern Harrier	NOHA
Savannah Sparrow	SAVS
Sedge Wren	SEWR
Upland Sandpiper	UPSA
Vesper Sparrow	VESP
Scrub-Shrub Dependent Species	
Black-billed Cuckoo	BBCU
Blue Grosbeak	BLGR
Blue-winged Warbler	BWWA
Brown Thrasher	BRTH
Chestnut-sided Warbler	CSWA
Eastern Bluebird	EABL
Eastern Towhee	EATO
Field Sparrow	FISP
Golden-winged Warbler	GWWA
Indigo Bunting	INBU
Prairie Warbler	PRAW
Red-winged Blackbird	RWBL
White-eyed Vireo	WEVI
Yellow-billed Cuckoo	YBCU
Yellow-breasted Chat	YBCH

You will undoubtedly observe many other species. Though data regarding these species are interesting to NJAS, the main focus of the project is to record the required information pertaining to the target grassland species. We recommend not spending considerable time focusing in on the more common species (i.e. Song Sparrow), but feel free to note them on the datasheet.

Inventory Methods for Raptors

Standards for Components of British Columbia's Biodiversity No. 11

Prepared by
Ministry of Sustainable Resource Management
Environment Inventory Branch
for the Terrestrial Ecosystems Task Force
Resources Inventory Committee

October 2001

Version 2.0

Published by the
Resources Inventory Committee

National Library of Canada Cataloguing in Publication Data

Main entry under title:

Inventory methods for raptors [computer file]

(Standards for components of British Columbia's biodiversity; no. 11)

Available on the Internet

Issued also in printed format on demand. Previously published: Standard inventory methodologies for components of British Columbia biodiversity. Raptors. 1997 [Version 1.1]

ISBN 0-7726-4619-8

1. Birds of prey - British Columbia. 2. Bird populations - British Columbia. 3. Ecological surveys - British Columbia - Methodology. I. British Columbia. Ministry of Sustainable Resource Management. Environment Inventory Branch. II. Resources Inventory Committee (Canada). Terrestrial Ecosystems Task Force. III. Series.

QL685.5.B7I58 2001 333.95'8911'09711 C2001-960239-1

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Preface

This manual, version 2.0, is a revised and improved presentation of standard methods for inventory of raptors in British Columbia at three levels of inventory intensity: presence/not detected (possible), relative abundance, and absolute abundance. The manual was compiled by the Terrestrial Ecosystems Task Force, under the auspices of the Resources Inventory Committee (RIC). The objectives of the working group are to develop inventory methods that will lead to the collection of comparable, defensible, and useful inventory and monitoring data for the species component of biodiversity.

This manual is one of the Standards for Components of British Columbia's Biodiversity (CBCB) series that present standard protocols designed specifically for groups of species with similar inventory requirements. The series includes an introductory manual (*Species Inventory Fundamentals No. 1*) which describes the history and objectives of RIC, and outlines the general process of conducting a species inventory according to RIC standards, including selection of inventory intensity, sampling design, sampling techniques, and statistical analysis. The *Species Inventory Fundamentals* manual provides important background information and should be thoroughly reviewed before commencing with a RIC wildlife inventory. RIC standards are also available for vertebrate taxonomy (No. 2), animal capture and handling (No. 3), voucher collection (No. 4), and radio-telemetry (No. 5). Field personnel should be thoroughly familiar with these standards before engaging in field inventories which may involve any of these activities.

Standard dataforms are required for all RIC species inventory. Survey-specific dataforms accompany most manuals while general wildlife inventory forms are available in *Species Inventory Fundamentals No. 1 [Forms]*. This is important to ensure compatibility with provincial data systems, as all information must eventually be included in the Species Inventory (SPI) Datasystem (visit the website at http://srmwww.gov.bc.ca/rib/wis/spi/).

It is recognized that development of standard methods is necessarily an ongoing process. The CBCB manuals are expected to evolve and improve quickly over their initial years of use. Field-testing is a vital component of this process and feedback is essential. Comments and suggestions can be forwarded by contacting:

Conservation Data Centre
Ministry of Sustainable Resource Management
P.O. Box 9344, Station Prov Govt
Victoria, BC V8W 9M1
Email: spi_mail@victoria1.gov.bc.ca

Acknowledgments

Funding of the Resources Inventory Committee work, including the preparation of this document, is provided by the Corporate Resource Inventory Initiative (CRII) and by Forest Renewal BC (FRBC). Preliminary work of the Resources Inventory Committee was funded by the Canada-British Columbia Partnership Agreement of Forest Resource Development FRDA II.

The Resources Inventory Committee consists of representatives from various ministries and agencies of the Canadian and the British Columbia governments as well as from First Nations peoples. RIC objectives are to develop a common set of standards and procedures for the provincial resources inventories, as recommended by the Forest Resources Commission in its report "The Future of our Forests".

For further information about the Resources Inventory Committee and its various Task Forces, please access the Resources Inventory Committee Website at: http://www.for.gov.bc.ca/ric.

Terrestrial Ecosystems Task Force

All decisions regarding protocols are the responsibility of the Resources Inventory Committee.

The current version of this manual was the result of the hard work of Frank Doyle (Wildlife Dynamics Consulting). Section 5, species accounts and survey notes, was largely based on materials adapted from the RIC Raptors Inventory course compiled by Michael Setterington (AXYS Environmental Consulting Ltd.) and Frank Doyle. Statistical review comments were provided by John Boulanger (Integrated Ecological Research). Helpful comments were provided by Erica McCLaren, Laura Darling, Andy Stewart and Ross Vennesland

The Components of British Columbia's Biodiversity series is currently edited by Leah Westereng.

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1. INTRODUCTION

In western cultures, raptors, or birds of prey, are celebrated as one of the most spectacular forms of wildlife. The Bald Eagle is the national symbol of the USA, falcons have been the prized possession of kings and noblemen, and owls are portrayed as wise in myth and folklore. Today, for many people, raptors symbolize the majesty and wildness of nature

In ecology, raptors are considered ecological indicators for environmental pollution and habitat degradation and destruction. Raptors are generally long-lived birds that feed high in the food chain; this makes them more susceptible to poisoning from pollution and pesticides than short-lived or plant-eating species. Some pesticides accumulate in organisms over time and become concentrated as they move up the food chain. The most well documented case of this sequence of events was in the Peregrine Falcon, which was extirpated east of the Mississippi due to the wide scale use of DDT after World War II (Johnsgard 1990). The concentration of DDT, or more correctly the stable metabolite DDE, led to egg shell thinning causing complete reproductive failure in this population.

Although organochlorine pesticide use has been brought under control in North America since the ban of DDT in the mid 1970's, the less resolvable and more serious problem of habitat degradation remains. The gradual yet consistent destruction of wild lands and subsequent conversion into agricultural, recreational and urban lands, contracts and fragments the geographic range of many raptors (Wilcox 1987). The best known case is the California Condor, which lost habitat at an exceedingly fast rate between the 1850's and 1950's. Through much captive breeding effort, there now exists about 50 birds in the wild and about 130 birds in captivity. Recently, in the Pacific Northwest and in southern British Columbia, declines in the number of Spotted Owls have been attributed to tree harvesting in old growth systems (Dunbar *et al.* 1991). The fact that raptors are negatively affected by human activities is evident by the disproportionate number of raptors on the red and blue lists in British Columbia (Conservation Data Center 2001). Raptors, however, can also be positively influenced by human activities (i.e. Barn Owl, Red-tailed Hawk). Certain management actions such as providing nest boxes and nest perches have increased or led to the return of species to an area. In addition, agricultural fields often provide good hunting habitat for raptors.

The inventory and monitoring of raptors is extremely important. To have a reference point for comparing present status with that of the past is a prerequisite for informed land use decisions and better management. The purpose of this manual is to provide standard protocols for raptor censuses at different levels of intensity (presence/not detected, relative abundance and absolute abundance), at various times of the year.

2. INVENTORY GROUP

Below are the raptor species belonging to this inventory group listed by scientific name, English name, and species code. The last column is for the status of the species in British Columbia and indicates whether the species is on the red or blue list (Conservation Data Centre 2001). Note that if the status is given at the species level it pertains to all of the related subspecies, if the status varies below the species level then it will be given at the subspecies level.

For species information including species-specific protocol, see Section 5, Species Accounts and Survey Notes. For the most current taxonomic listings please check for the most recent version of the *Vertebrates of British Columbia: Scientific and English Names* (Resources Inventory Committee 2002)

ORDER **CICONIIFORMES:** Storks, Herons, Ibises and New World Vultures

FAMILY **CATHARTIDAE:** New World Vultures

Cathartes aura (Linnaeus)	Turkey Vulture	B-TUVU	--
ssp: *teter* Friedmann			--

ORDER **FALCONIFORMES:** Diurnal Birds of Prey

FAMILY **ACCIPITRIDAE:** Kites, Eagles, Hawks and Allies

Pandion haliaetus (Linnaeus)	Osprey	B-OSPR	--
ssp: *carolinensis* (Gmelin)			--
Haliaeetus leucocephalus (Linnaeus)	Bald Eagle	B-BAEA	--
ssp: *alascanus* Townsend		B-BAEA-AL	--
leucocephalus (Linnaeus)		B-BAEA-LE	--
Circus cyaneus (Linnaeus)	Northern Harrier	B-NOHA	--
ssp: *hudsonius* (Linnaeus)			--
Accipiter striatus Vieillot	Sharp-shinned Hawk	B-SSHA	--
ssp: *perobscurus* Snyder		B-SSHA- PE	--
velox (Wilson)		B-SSHA- VE	--
Accipiter cooperii (Bonaparte)	Cooper's Hawk	B-COHA	--
Accipiter gentilis (Linnaeus)	Northern Goshawk	B-NOGO	--
ssp: *atricapillus* (Wilson)		B-NOGO-AT	--
laingi (Taverner)		B-NOGO-LA	R
Buteo platypterus (Vieillot)	Broad-winged Hawk	B-BWHA	R
ssp: *platypterus* (Vieillot)			--
Buteo swainsoni Bonaparte	Swainson's Hawk	B-SWHA	R
Buteo jamaicensis (Gmelin)	Red-tailed Hawk	B-RTHA	--
ssp: *alascensis* (Grinnell)		B-RTHA-AL	--
calurus (Cassin)		B-RTHA-CA	--
harlani (Audubon)		B-RTHA-HA	--

Buteo regalis (Gray)	Ferruginous Hawk	B-FEHA	R
Buteo lagopus (Pontoppidan)	Rough-legged Hawk	B-RLHA	--
ssp: *sanctijohannis* (Gmelin)			--
Aquila chrysaetos (Linnaeus)	Golden Eagle	B-GOEA	--
ssp: *canadensis* (Linnaeus)			--

FAMILY **FALCONIDAE:** Caracaras and Falcons

Falco sparverius Linnaeus	American Kestrel	B-AMKE	--
ssp: *sparverius* (Linnaeus)			--
Falco columbarius Linnaeus	Merlin	B-MERL	--
ssp: *columbarius* Linnaeus		B-MERL-CO	--
richardsonii (Ridgway)		B-MERL-RI	--
suckleyi (Ridgway)		B-MERL-SU	--
Falco peregrinus Tunstall	Peregrine Falcon	B-PEFA	--
ssp: *anatum* (Bonaparte)		B-PEFA-AN	R
pealei (Ridgway)		B-PEFA-PE	B
tundrius White		B-PEFA-TU	--
Falco rusticolus Linnaeus	Gyrfalcon	B-GYRF	B
ssp: *obsoletus* (Gmelin)		B-GYRF-OB	--
uralensis (Severtzov and Menzbier)		B-GYRF-UR	--
Falco mexicanus Schlegel	Prairie Falcon	B-PRFA	R

ORDER **STRIGIFORMES:** Owls

FAMILY **TYTONIDAE:** Barn Owls

Tyto alba (Scopoli)	Barn Owl	B-BNOW	B
ssp: *pratincola* (Bonaparte)			

FAMILY **STRIGIDAE:** Typical Owls

Otus flammeolus (Kaup)	Flammulated Owl	B-FLOW	B
ssp: *idahoensis* (Merriam)			
Otus kennicottii (Elliot)	Western Screech-Owl	B-WSOW	--
ssp: *kennicottii* (Elliot)		B-WSOW-KE	--
macfarlanei (Brewster)		B-WSOW-MA	R
Bubo virginianus (Gmelin)	Great Horned Owl	B-GHOW	--
ssp: *lagophonus* (Oberholser)		B-GHOW-LA	
saturatus Ridgway		B-GHOW-SA	
subarcticus (Hoy)		B-GHOW-SU	
Nyctea scandiaca (Linnaeus)	Snowy Owl	B-SNOW	--
Surnia ulula (Linnaeus)	Northern Hawk Owl	B-NHOW	--
ssp: *caparoch* (Müller)			
Glaucidium gnoma Wagler	Northern Pygmy-Owl	B-NPOW	--
ssp: *californicum* (Sclater)		B-NPOW-CA	--
grinnelli Ridgway		B-NPOW-GR	--
swarthi Grinnell		B-NPOW-SW	B

Athene cunicularia (Molina)	Burrowing Owl	B-BUOW	R
ssp: *hypugaea* (Bonaparte)			
Strix occidentalis (Xántus de Vesey)	Spotted Owl	B-SPOW	R
ssp: *caurina* (Merriam)			
Strix varia Barton	Barred Owl	B-BDOW	--
ssp: *varia* (Barton)			
Strix nebulosa Forster	Great Gray Owl	B-GGOW	--
ssp: *nebulosa* (Forster)			
Asio otus (Linnaeus)	Long-eared Owl	B-LEOW	--
ssp: *tuftsi* Godfrey			
Asio flammeus (Pontoppidan)	Short-eared Owl	B-SEOW	B
ssp: *flammeus* (Pontoppidan)			
Aegolius funereus (Linnaeus)	Boreal Owl	B-BOOW	--
ssp: *richardsoni* (Bonaparte)			
Aegolius acadicus (Gmelin)	Northern Saw-whet Owl	B-NSWO	--
ssp: *acadicus* (Gmelin)		B-NSWO-AC	--
brooksi (Fleming)		B-NSWO-BR	B

3. GENERAL PROTOCOL

Detecting breeding and non-breeding raptors is difficult due to their low densities and generally secretive nature (Fuller and Mosher 1987). Survey methods for raptor inventories vary with the behaviour of the bird, its nest location and time of year. This manual distinguishes between conspicuous and inconspicuous raptors, based on life history and behaviour, as each requires different inventory techniques. For all raptors, standard definitions to describe occupancy and activities at nesting areas can be found in Postupalsky (1974, 1983), Newton and Marquiss (1982), and Steenhof (1987). Inconspicuous raptor surveys are labour intensive, requiring surveyors to actively search, using aural detection, broadcast calls and sign of conspecifics to locate raptor species and/or their nests. Inconspicuous breeding raptors utilize concealed nest sites, nocturnal lifestyles, and/or secretive hunting strategies. This group includes most species of owl, accipiters, and Merlin (Table 1).

Conspicuous breeding raptors are defined as raptors characterized by large nests in open habitat, soaring flight, and/or perches out in the open. This group includes the Turkey Vulture, Osprey, eagles, most hawks, some falcons, and Burrowing Owl (Table 2). In general, the techniques for detecting conspicuous raptors involve a "look and see" approach, with the only difference between survey methods being the mode of transportation (i.e., aircraft, boat, land vehicle or foot; Bibby *et al.* 1992).

Depending on the level of intensity, the survey design will be more or less rigid. For presence/not detected objectives, a fairly *ad hoc* survey design will probably suffice; however, for the minimal additional effort of utilizing a more systematic survey design, investigators can realize considerable benefits, particular with regard to sample size calculations and statistical power. As well, adhering to a sample design will allow most surveys to produce relative abundance estimates, which can be used for comparing populations between sites and/or trend monitoring.

Absolute abundance, however, is more difficult to determine for raptors due to their low breeding densities and secretive nature. There are exceptions to this general rule for estimating the abundance of breeding populations of eagles, ospreys and some falcons. For these birds, it is possible to locate conspicuous nest sites from the air while employing a stratified random quadrat sampling design. No methods are recommended for deriving an absolute abundance estimate for inconspicuous raptors.

It should always be kept in mind that raptors may be very sensitive to human activity. As a general rule nests should not be disturbed, especially during the egg laying and incubation stages or the nesting attempt may be abandoned (Fyfe and Olendorff 1976). Observers should therefore leave the area if the birds are obviously being disturbed. When disturbed during this sensitive nesting period, they will sometimes abandon nests disturbed at the egg stage, or move to a new location in succeeding years. Other consequences of disturbance include eggs and young being fatally exposed to overheating or hypothermia or to predators when the females are forced to leave the nest to defend the nest

Information pertaining to Table 1 and 2 below.

Survey Timing: "B" indicates breeding surveys.
"NB" indicates surveys outside the breeding season.

Survey Intensity: Call Playback, Roadside and Boat surveys can be used to determine Presence/not detected or Relative Abundance. Foot surveys will likely only be able to provide Presence/not detected due to low sample sizes. Aerial surveys can also be used to estimate absolute abundance. Migration surveys are only used for Presence/not detected and are less preferred than other methods.

Note that standwatches and ground nest searches are not inventory methods on their own and so are not listed in Table 1 or 2.

Table 1. Recommended inventory methods during the breeding and non-breeding seasons for inconspicuous raptor species of British Columbia.

Species	Call Playback	Roadside Survey	Foot Survey	Migration Survey
Sharp-shinned Hawk	B			NB
Cooper's Hawk[1]	B			NB
Northern Goshawk	B			NB
Merlin	B			NB
Barn Owl	B	B	B	NB
Flammulated Owl	B			
Western Screech-Owl	B			
Great Horned Owl	B			
Snowy Owl		NB		
Northern Pygmy-Owl	B			
Spotted Owl	B			
Barred Owl	B			
Great Gray Owl	B			
Long-eared Owl	B			
Short-eared Owl		B	B	NB
Boreal Owl	B			
Northern Saw-whet Owl	B			

[1] Dawn vocalization surveys during the breeding surveys can also be used. See Section 5, Species Accounts and Survey Notes.

Table 2. Recommended inventory methods during the breeding and non-breeding seasons for conspicuous raptor species of British Columbia.

Species	Roadside Survey	Boat Survey	Aerial Nest Survey	Migration Survey
Turkey Vulture	B			NB
Osprey		B, NB	B, NB	NB
Bald Eagle		B, NB	B, NB	NB
Golden Eagle		B, NB	B, NB	NB
Northern Harrier	B, NB			NB
Broad-winged Hawk				NB
Swainson's Hawk	B			NB
Red-tailed Hawk	B			NB
Ferruginous Hawk	B			
Rough-legged Hawk	B, NB			NB
American Kestrel	B, NB			NB
Peregrine Falcon		B	B	NB
Gyrfalcon		B	B	
Prairie Falcon	B	B	B	NB
Northern Hawk Owl	B			
Burrowing Owl [1]	B			

[1] Call Playback has also been used at known breeding sites.

3.1 Survey Standards

The following are guidelines for conducting standardized raptor inventories in British Columbia. Close adherence to these guidelines will permit the collection of reliable data that should satisfy individual and corporate inventory needs, as well as contribute to biodiversity monitoring at local, regional, and provincial scales.

3.1.1 Personnel

Probably the most essential component for the collection of accurate data is a competent observer. This can not be over emphasized. Many papers have been written on the variability and error between observers. Fuller and Mosher (1987) state that observers should be familiar with both bird behaviour and their habitat and have excellent raptor identification skills. To maintain a high skill level, the project leader should assess all potential workers, and provide guidance where needed. Field training sessions should be held prior to data collection to increase observer expertise and to evaluate and correct differences between observers (e.g., Kepler and Scott 1981).

As well as visual identification, personnel should be familiar with the calls of those raptors expected to be within the study area as well as any similar sounds that they could be confused with. This is particularly important for detecting inconspicuous raptors in forested habitats. Thus, good hearing is essential and differences in hearing ability between observers may strongly affect results of surveys (Scott and Ramsay 1981).

It is valuable to know that a Raptor Inventory training course with a raptor identification component has been developed. For more information or to register, contact the Forest Continuing Studies Network: http://www.fcsn.bc.ca.htm.

It is also important that crew members have First Aid training (with a Transportation Endorsement as needed) as it is up to the project leader to ensure his/her work team has the necessary training to carry out a reliable and safe raptor inventory.

3.1.2 Weather

Poor weather such as high winds, rain, and fog can influence both the bird's behaviour and the observer's ability to visually and aurally identify raptors. High winds and rain are potentially a greater problem in forests due to the increased noise in the canopy than in open grasslands. Some general guidelines for appropriate and inappropriate weather conditions for surveying are provided in the Table 3.

Table 3. Acceptable and unacceptable weather conditions for raptor surveys.

Condition	Acceptable	Unacceptable
Wind	Beaufort 0 (<2 km/hr). Smoke rises. Beaufort 1 (2-5 km/hr). Some smoke drift Beaufort 2 (6-11 km/hr). Leaves rustle. Beaufort 3 (12-19 km/hr). Leaves & twigs in motion.	Beaufort 4 (20-29 km/hr). Raises dust - small branches move. Beaufort 5 (30-39 km/hr). Small trees sway. Beaufort 6 (> 40 km/hr).
Precipitation	None Light drizzle Light snow (winter)	Steady rain Heavy snow
Temperature	As local conditions allow. Ideally temperatures should be close to the season average. Be aware that equipment often malfunctions in cold conditions (<10°C). There is also evidence that owls may be less vocal in very cold weather (Takats *et al.* 2001).	

3.1.3 Time of Year

Raptors are widely distributed in British Columbia with at least one species present in each geographic area (Munro 1979). Their distribution and density is mostly dependent on food supply and during the breeding season, nest site availability. Raptor behaviour and location varies with season. Therefore, it is important to consider the time of year when determining which inventory method should be used for each raptor species (see Tables 1 and 2).

Surveys during the breeding season

Many raptor surveys are conducted during the breeding season, when species are territorial and active nests may be located. For example, owls and accipiters are most easily found during the breeding season when they respond to call playback surveys (Fuller and Mosher 1987). However, care should be taken not to disturb raptors during courtship, egg laying or incubation (see Section 5, Species Accounts and Survey Notes, for timing guidelines).

Migration surveys

Raptors move in relation to the available food supply. Newton (1979) classified these movements into five categories: dispersal, local movement, migration, irruptions and nomadism. Raptor surveyors are most concerned with migrations. Newton (p.180, 1979) defines migration as "a massive shift of birds twice each year between regular breeding and wintering ranges". It is different from the other movements in that the distance traveled is much further and the flight path is generally restricted to one direction.

Migration tends to concentrate birds along flyways, and in winter, some areas increase in raptor density (e.g., Fraser Lowlands). Although the overall migration direction is the same each year, the actual paths that individual birds use can change. This should be remembered when explaining yearly variation at individual hawk watch stations (see Section 3.8).

Surveys during the non-breeding season

Raptors are typically less common and non-territorial during the winter season. Although numbers are lower, survey results still have high management value since the birds surveyed are resident, and winter is often a limiting time due to factors such as extreme cold and food availability (Manuwal and Huff 1987, Huff *et al.* 1991, Ralph *et al.* 1993). Roadside surveys outlined in this manual are often used as an inventory technique during the winter when certain raptor species (e.g., Rough-legged Hawks) concentrate in agricultural fields.

3.1.4 Time of Day

Raptors can be crepuscular, nocturnal or diurnal and depending on the season and the species may be all three at the same time. Surveys should be planned for the active cycle of the species being studied, an example of this is nocturnal owl surveys being conducted between 0.5 hours after sundown and 0.5 hours before sunrise.

3.1.5 Habitat Data Standards

A minimum amount of habitat data must be collected for each survey type. The type and amount of data collected will depend on the scale of the survey, the nature of the focal species, and the objectives of the inventory. As most, provincially-funded wildlife inventory projects deal with terrestrially-based wildlife, standard attributes from the terrestrial Ecosystem Field Form developed jointly by MOF and MELP (1995) will be used. The manual, *Species Inventory Fundamentals* (No.1), contains a generic discussion of habitat data collection as well as a list of the specific requirements for raptor surveys (Appendix E, RIC 1998).

3.1.6 Conducting surveys on foot vs other transportation

Surveys on foot enable you to search areas that can not be approached by vehicles. They also allow a better analysis of habitat, and a good opportunity to scan areas for bird sign. In many ways, they allow surveyors to escape background noise (from vehicles) and improve their awareness of surroundings.

The disadvantages of surveys on foot relative to surveys using other transportation are that less territory can be covered; therefore, these surveys can be more labour intensive. Surveyors may also miss action that is taking place above the forest canopy when they are concentrating their efforts on finding birds or nests within the forest.

Keep in mind the following factors:

- Stop and listen often or when in promising raptor habitat;
- Be aware of the noise you may be making and its effect on both your hearing and what the birds may be able to hear (e.g., Gortex™ and nylon clothing may be fairly noisy);
- Keep an eye on the ground for moulted feathers, kill or plucking sites, whitewash, etc. (see Section 3.1.7, Sign: Prey Remains, Pellets, Whitewash, and Feathers);
- Learn which species will react to your presence and at what time during their breeding cycle they will respond; and
- Be ready for flushing birds, and notice their reaction as well as location.

3.1.7 Sign: Prey Remains, Pellets, Whitewash, and Feathers

Identification of a raptor's use of a habitat can include more than an actual sighting of the bird itself. The sign left by the raptors after killing and consuming prey, and evacuating waste materials can also indicate habitat use. Prey remains, pellets and whitewash, combined with an evaluation of the habitat where the material was found, can be used as an indication of the presence of many species of raptors.

Prey remains

Of all the aids in identification of the raptor species, the use of prey remains is one of the most difficult to become familiar with and can be very misleading. Some generalizations can be made but in many cases the site and sign differ from kill to kill by the same species. In part, this is due to the actions of scavenging species, which are comprised of most of the mammals (including common herbivores and rodents), insects, and many bird species.

The sign left at the kill site will be a product of the raptor responsible, size of prey, the scavengers present, and the order in which they arrived at the kill site. Most scavengers will remove and cache any items they can carry. Therefore, if parts of a suspected kill are found in a tree, it does not necessarily mean it was killed by a bird, because it is just as likely that the remains were cached in the tree by a scavenging squirrel or bird.

Become familiar with the different ways the raptor species kill and pluck prey, this will help in the identification of the raptor species. As with whitewash and pellets, the information gained may not be conclusive in itself, but combined with other information will help narrow down the species responsible for the kill.

As a general rule, owls do very little plucking to remove feathers and fur whilst other raptors remove large amounts. Once again, be aware that many scavengers also pluck the fur and feathers before eating. Therefore, it is often difficult to determine if the animal was killed or died from other causes and was then scavenged. Furthermore, most raptors will also scavenge.

Pellets

Identification of raptor and corvid (ravens, crows, jays) pellets is a useful tool when conducting intensive foot searches for the presence of raptors and their nests. Pellets by themselves are an unreliable method of identifying the species of raptor or corvid that cast the pellet. However, when used in conjunction with knowledge of the likely perch and nest sites of different species, it is a powerful tool in identifying the species most likely to be present in a particular location. Information on perching/hunting and nest sites can be gained from field guides. Information on pellet size and shape can be obtained from Murie (1974).

Pellets come in many shapes and sizes, and most raptors cast pellets that are typical, and therefore identifiable, for each species. However, exceptions will also occur. For example, Great Horned Owl pellets are usually cylindrical (3 cm diameter), blunt ended, and 6–10 cm long, yet may also be smaller (2–3 cm) and round to pear shape.

In some locations, perches, nests, and roost sites are in short supply and thus are used by several species of raptor and corvid. Therefore, correct identification of the raptors casting the pellets is very difficult, unless this is supported by other evidence (visual sighting, type of whitewash, feathers).

It is difficult to determine the age of the pellets. The appearance of pellets varies with exposure to light, moisture, and temperature. The presence of a pellet or pellets at a nest/perch site may therefore not be of the species using that site at that time, even though it may appear to have a fresh appearance.

As a general rule, pellets cast by owls contain more small bones than those of other raptors, but beware of taking this generalization too literally and become familiar with pellets you know have been cast by a certain species.

Observers should also be aware that many species of birds cast pellets, and that corvid pellets, particularly raven pellets, can be easily mistaken for those of a raptor (Murie 1974). Similar confusion can arise with pellets cast by fish eating birds such as gulls and herons whose pellets can look very similar to those of fish eating raptors.

It should be noted that certain precautions should be exercised when examining pellets. Many raptors prey on rodents, which have a potential to carry Hantavirus. Therefore, when handling pellets, they should either be sterilized, and/or individuals should wear gloves and face masks when handling pellets.

Cautionary Note: Health risks associated with handling raptor pellets are minimal; the digestive process tends to kill harmful bacteria. However, although mice vole content in the diet varies between raptors, wearing appropriate safety clothing is recommended particularly in areas where there is a risk of contacting Hantavirus.

Whitewash

Small owls (e.g., Northern Saw-whet Owl, Western Screech-Owl) leave small "blobs" of whitewash that are characterized by a central globular mass. Sites with this whitewash may sometimes be associated with moulted feathers or pellets. The larger owls (e.g., Barred Owl, Great Horned Owl) produce 3–4 cm "blobs" or blotches on the forest floor. Again, this whitewash may be associated with pellets. Owl whitewash sometimes contains a hint of yellow colour and is generally found near the base of trees near the trunks. Large owls tend to perch higher in the canopy, so whitewash may be spread out and difficult to identify.

Whitewash of Sharp-shinned and Cooper's Hawks is characterized by streaks rather than blobs. Sharp-shinned Hawk whitewash streaks are usually 6–12 cm long and can sometimes be found in association with pellets. Cooper's Hawk whitewash streaks range from 6–18 cm long. These are usually found on the forest floor or on understory vegetation below a perch or nest tree. Red-tailed Hawk whitewash is difficult to locate due to their preference of perch sites high in the canopy.

Crow and Raven whitewash is similar to owl whitewash. However, habitat differences help in identifying the differences between the corvid species and the owls. Corvid whitewash is usually found in more open, less concealed habitat, and not near tree trunks.

Moulted feathers

Feathers moulted by raptors around nest/perch and roost sites are a useful aid in identification, especially when combined with the presence of whitewash and pellets. Become familiar with the size, shape, markings and texture of feathers from different species either by looking at feathers moulted by known raptors or by looking through museum and private collections of collected birds.

Females of most raptor species moult flight and tail feathers near the nest beginning around the time of incubation. These relatively conspicuous feathers are good indicators of nesting and are typically found within 50 m of a nest.

As a general guide, the feathers of owls have an external downy appearance and texture, which is used to muffle the sound of the wings as they hunt. Be aware that feathers of immature birds (which in Bald Eagles can be 4–5 years old) can look very different from those of adult birds, as can the feather of the different sexes (e.g., Northern Harrier male and female).

3.1.8 Data Entry

Ultimately, all species inventory data, which are collected to RIC standards will be stored in the Species Inventory (SPI) datasystem, housed within the Environment Inventory Branch of Ministry of Sustainable Resource Management. For more information visit the SPI website at http://www.elp.gov.bc.ca/rib/wis/spi/

3.1.9 Data Analysis

You will find the data analysis section is at the end of this manual. However, it is essential that the frameworks, assumptions, and constraints of various statistical tests be considered during project planning. Please see Species Accounts and Survey Notes (Section 5), and the information in the survey specific methods (Section 3.3 to 3.10), under the heading Data analysis.

3.1.10 Survey Design Hierarchy

Raptor surveys follow a survey design hierarchy, which is structured similarly, to all RIC standards for species inventory. Figure 1 clarifies certain terminology used within this manual (also found in the glossary), and illustrates the appropriate conceptual framework for a call playback survey. A survey set up following this design will lend itself well to standard methods and RIC dataforms.

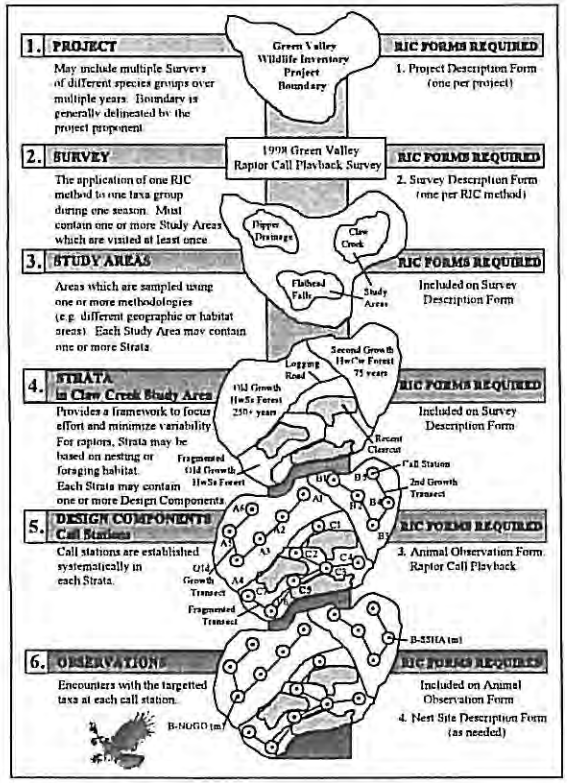

Figure 1. RIC species inventory survey design hierarchy with examples.

3.2 Inventory Surveys

The table below outlines the type of surveys that are used for inventorying raptors for the various survey intensities. These survey methods have been recommended by wildlife biologists and approved by the Resources Inventory Committee.

Table 4. Types of inventory surveys, the dataforms needed, and the level of intensity of the survey.

Survey Type	Forms Needed	Intensity*
Raptor Aerial Block	• Wildlife Inventory Project Description Form • Wildlife Inventory Survey Description Form • Animal Observations Form- Raptor Aerial Block	• PN • RA • AA
Raptor Encounter Transect (aerial, boat, roadside, and foot)	• Wildlife Inventory Project Description Form • Wildlife Inventory Survey Description Form • Animal Observations Form- Raptor Encounter Transect	• PN • RA
Raptor Call Playback	• Wildlife Inventory Project Description Form • Wildlife Inventory Survey Description Form • Animal Observations Form- Raptor Call Playback	• PN • RA
Nest Site Description	• Animal Observations Form- Nest Site Description, is filled out only when a nest is located during the survey	When nest is located.

* PN = presence/not detected (possible); RA = relative abundance, AA = absolute abundance

3.2.1 Species-specific Inventory Survey Information

Sections 3.3 to 3.10 provide the general protocol for raptor species using these survey methods. Always review Section 5, Species Accounts and Survey Notes, for species-specific information about these methods for the species that interest you.

3.3 Call Playback Surveys

Raptors call to identify themselves, establish and defend territories and to attract mates. The use of call playback takes advantage of this knowledge by putting an "intruder" into an already claimed territory (Smith 1987). The response of the bird can be either behavioural (visual) and/or vocal which, allows the observer to record the presence of the bird. Use call playback for inconspicuous or nocturnal raptor species (e.g., owls and accipiters) known to respond to calls during the breeding season.

Call playback surveys are conducted by broadcasting calls at stations either along roadsides using vehicles, or in more remote areas while walking transects. In many cases birds will travel long distances to respond, thus playback itself is not useful for locating nests. However, it is very useful in association with nest searches in areas where birds respond. If the object of the survey is to find new nests and their location is required, follow Section 3.5, Ground Nest Search.

For determining presence/not detected it is possible to survey for a group of raptors at the same time by playing more than one species' call at a station. However, as it is not known what the effects are on the different species when more than one call is played, single-species inventories are still preferred. For determining relative abundance only one potential raptor species can be surveyed at a time using call playbacks. As well, a specific sampling design must be followed.

It is important to note that some raptor species have more than one call and they will respond to these calls differently, depending on the time of year. Sometimes raptors may not respond to playback in low prey years. It is also important to avoid playing calls during courtship, egg laying or incubation periods as this may disrupt successful breeding of raptors. See species accounts (Section 5) for more specific information and recommendations.

As can be seen in "species accounts" (Section 5) individual raptor and owl populations vary in density across the landscape, subsequently for many species a range of suitable call playback station distances are suggested. Depending on the type of survey planned (presence/not detected or relative abundance) a more appropriate survey design may be obtained by pre-sampling the proposed project area to establish the probable species and densities likely to be encountered. If this pre-sampling visit indicates higher densities than can be accurately surveyed using the recommended distance, then adjust inter-station distance accordingly (record distance on field dataforms).

Office procedures

- Review the introductory manual No. 1, *Species Inventory Fundamentals* (RIC 1998).
- Obtain maps for Project and Study Area(s) (e.g., 1:50 000 air photo maps, 1:20 000 forest cover maps, 1:20 000 TRIM maps, 1:50 000 NTS topographic maps). Any map that is used to record data must be referenced to NAD83.
- Outline the Project Area on a small to large-scale map (1:250 000 – 1:20 000).
- Determine Biogeoclimatic zones and subzones, Ecoregion, Ecosection, and Broad Ecosystem Units for the Project Area from maps.

- Delineate one to many Study Areas within this Project Area. Study Areas should be representative of the Project Area if conclusions are to be made about the Project Area. For example, this means if a system of stratification is used in the Sampling Design then strata within the Study Areas should represent relevant strata in the larger Project Area.
- Compile a list of all potential raptor species for the Study Area(s).
- Learn about possible species that may mimic your calls, and species with similar calls, in your area. For example, jays and other birds will mimic broadcast calls, but often give themselves away by adding a non-raptor like chirp at the end of the call. Surveyors should be able to discern their calls.
- Obtain or prepare quality recordings on a CD (preferred) or digital tape cassette of the raptor calls of interest (see Equipment section for instructions on how to prepare recordings).
- Due to the potential variation in call dialects, local recordings of raptor calls are preferable to general recordings.
- It is important to note that some raptor species have more than one call and they will respond to these calls differentially, depending on the time of year. Research the best call to use at each time of year or season and ensure all calls required are recorded.

Sampling design

The Design Component for this survey is (call playback) stations

Presence/not detected

- Although a strict sampling design is not required, some type of systematic or stratified design should be employed so that effort is consistent, and equal between replicates of surveys (see *Species Inventory Fundamentals*, No. 1, RIC 1998).
- Ideally, the presence/not detected survey will be identical to one replicate of a relative abundance survey.

Relative abundance

- Stratify habitat based upon expected densities. Typically this is derived from an analysis of available habitat.
- Randomly choose strata in which to survey.
- Within each strata use systematic sampling. Transects should be a specified distance apart and so should the call playback stations along these transects (this requires an understanding of the territory size required by the raptor being surveyed). Transects may follow roads, trails, predetermined straight lines, contours or drainages.

Sampling effort

Presence/not detected

- Determining presence is straightforward if a raptor detection is made.
- Determining absence is much more difficult because of the uncertainty of whether the species is absent or just not found. The number of replicates required for a presence/not detected survey can be tested by replicating the call playback surveys many times in an area as part of relative abundance methods. Assuming survey independence, an approximation calculation of the number of surveys needed to detect the species present in an area can be made by plotting the proportion of surveys with positive results (Y-axis) against the number of surveys taken (X-axis). See Section 5 of *Species Inventory Fundamentals* manual (RIC 1998) for more details.

Relative abundance

- Sample effort should be determined by the use of power analysis packages (see Section 4.2 and Section 5 of *Species Inventory Fundamentals* (RIC 1998).
- Preliminary surveys would be most useful for input to power analysis.

Personnel

- Two workers are required; the crew leader should be a qualified biologist and possess raptor experience.
- Crew members should have prior experience in call playback surveys or they must be properly trained in the method. Excellent hearing is essential.

Equipment

- Maps
- Waterproof Notebook
- Compass
- Binoculars
- Flagging tape

Broadcasting Equipment

- High quality broadcast equipment. A portable megaphone attached via a mono cord to a walkman or disc player (preferred) is recommended (Hardy and Morrison 2000).
- This set-up is particularly useful for call playback surveys on foot as it is lighter and easier to pack than a portable stereo.
- The machine should be able to broadcast sounds over an area of 400 m; one technical description of a recommended player has a frequency of about 40 Hz to 12 kHz and power output of 1.2 watts at 1 kHz, with a volume output of 100-110 db at 1 m from the megaphone (Hardy and Morrison 2000).
- CDs (preferred) or digital tape cassettes of raptor calls of species of interest. Note that tape cassettes should be replaced periodically to ensure tape quality.
- Prepare multiple recordings on the call playback CD/cassette (at least 3).
- Each recording of calls should be the same duration (approximately 20-30 seconds). Thus, one recording is equal to as many calls of a particular raptor as can fit into 20 seconds, given the natural spacing between that raptor's vocalizations.
- When preparing recordings, ensure that the species' call is not cut off at an unnatural point in its call. It is best to make the recording slightly shorter/longer than 20 seconds as necessary to avoid this situation.
- Try to eliminate background noise on recordings.
- Prepare the CD/cassette so that it can be:
    - played continuously at a station by taping 30 seconds of silence after each recording (for a total of 2.5 minutes of recording per station); or
    - put on pause between recordings. Ensure that there is a long enough pause between recordings to indicate the end of one recording and the beginning of the next. CDs/cassettes prepared this way will eliminate excess noise from being heard between recordings as well as save batteries (by reducing broadcasting time and the amount of rewinding required for cassettes).

Field procedures - single species inventory

- The time of year for commencing call playback surveys can be determined from knowledge of when egg laying will occur (refer to Section 5, Species Accounts and Survey Notes).
- Call playback stations should be separated along a transect such that the distance covered is maximized, and duplication of called areas is minimized. This distance must be balanced with the ability to detect the raptor. Too great a distance between stations increases the likelihood of not detecting a raptor. For information from the literature, consult Species Accounts and Survey Notes, Section 5.
- Note that severe safety hazards may necessitate sampling at periods alternate to optimal times or may cause station location to deviate slightly from those recommended. For example, rock fall and avalanche hazards may be present in steep terrain and so safety conditions must be considered in these areas especially during late winter, early spring, and following severe rainstorms at any time. Stations may need to be temporarily moved to an alternative safe position where auditory radius maintains survey coverage of the transect (van Woudenberg 1997 unpubl.).
- For raptor species that have more than one call, use the one most appropriate for the time of year that the survey is being conducted (e.g., alarm call versus begging call). Note that the type of call used may change during the survey season.

Upon arriving at each station

- Wait a minimum of 2 minutes upon arriving at a call playback station (Takats *et al.* 2001).
- Use this time to 'adjust ears' and to listen for spontaneous calling raptors (before recorded calls are broadcasted). Note the noise from running water (e.g., from nearby stream) may cause interference in hearing vocalizations (particularly owls) and should be avoided.
- Record location and weather conditions.
- Habitat data for the station may be collected at this time, on your route back after you have completed the stations on your transect, or on another day (providing stations can be re-located).
- If the targeted species is heard spontaneously calling do <u>not</u> broadcast any recorded calls for this species (go to *Raptor response* protocol).
- If a spontaneously calling raptor is heard that is <u>not</u> the targeted species:
- Record the detected species.
- Wait 1 minute (from the time the non-targeted species was detected), then begin broadcasting calls for the targeted species (see *Broadcasting calls* protocol). This may mean broadcasting calls for the targeted species while the non-targeted species is still calling (e.g., B-GHOW can go on and on).
- If broadcasting calls of the targeted species results in disturbance (continuous calling, mobbing action, etc.) to other raptor species, discontinue broadcasting calls at that station.
- Record on the dataform at what point the calling was discontinued (e.g. after broadcasting the first recording).
- Move on to the next station.

Broadcasting calls

- Broadcast one series of recorded calls for the targeted species (if a spontaneously calling raptor is heard, see above).
- For consistency, broadcast 3 recordings of calls (20 seconds each), with a 30 second listening interval following each recording. Thus, it will take a total of 2.5 minutes to broadcast a series at a station (e.g., 20/30, 20/30, and 20/30) and complete a call playback survey for a species at a station.
- Depending on how the CD/cassette has been prepared:
- Play the CD/cassette continuously at a station if the listening intervals (30 seconds of silence) were taped after each call recording. Note that if the CD/cassette has substantial background noise, the volume should be turned down during the 30 second listening-intervals.
- Press pause between call recordings, and use a stopwatch to time the 30 second listening-intervals if this silent period was not taped.
- Broadcast the first recording at 60^0 from the transect line (turn left or right), listen and watch for 30 seconds. Turn 120^0 (in the same direction as before) and repeat the procedure, then turn another 120^0 and repeat the procedure for the third time.
- Hold the megaphone at chest height while broadcasting recorded calls.
- Be aware of how far the sound of your recording is carrying. Louder is not necessarily better, as it may distort broadcast calls and lower detection rates. Remember, the louder the call, the further away that raptors will hear it; the further away a raptor is the less chance that you have of seeing or hearing its reaction.
- Ensure that all other persons are away from the megaphone during broadcasting as this can cause short-term loss of sensitivity and false "echo" calls.

Raptor response

- If call playback elicits a response by the targeted species (or a spontaneously calling raptor is heard):
- Do not continue to broadcast the recorded call as this may frighten the raptor and cause it to abandon or alter its territory. Also, response to call playback alters the time budget of the bird which may interfere with critical breeding behaviour (i.e., feeding, courtship, mating).
- Record the species and its approximate location (take a compass bearing).
- Response time is unknown for many species. Some species respond immediately while others only respond after a prolonged period. Note the time that the raptor responded and at what point during the broadcasting (e.g. during the second recording) it responded (optional). This information could be useful for methods assessment and future inventories.
- Move on to the next station or initiate a nest search if this is one of your project objectives (see Section 3.5).
- If call playback elicits a response by a non-targeted raptor species:
- Continue broadcasting calls for the targeted species.
- Record the species that responded and its approximate location (optional).
- Record the time and at what point during the broadcasting (e.g. during the second recording) that the non-targeted raptor species responded (optional).
- Note that if broadcasting calls of the targeted species results in disturbance (continuous calling, mobbing action, etc.) to other raptor species, discontinue broadcasting calls at that station.

- Record on the dataform at what point the broadcast series was discontinued and why.
- Wait for 5 minutes, listening and watching for a response by the targeted species.
- Move on to the next station.
- If no response is elicited after broadcasting the series of 3 call recordings:
- Wait for 5 minutes, listening and watching for a response.
- Move on to the next station.

For owls only:

- Repeat the broadcasting calls procedure up to 2 more times (e.g. broadcast a maximum of 3 series of calls), depending on species (see Section 5, Species Accounts and Survey Notes).
- Shorter stops may be preferred for owls that respond quickly, while longer stops may be preferred for slower responding owls (Francis and Bradstreet 1997). This may help to optimize the number of owls detected for the number of stations surveyed.
- Note that longer stops are only justified if they result in more owls being detected as increasing the length of stops often means reducing the number of stations surveyed in a night (Francis and Bradstreet 1997). However, some owls may not be detected if the stop duration is too short.
- Ensure to wait for 5 minutes, listening and watching for a response after each broadcasting series.
- This means up to 25 minutes could be spent at a station for a single-species owl survey.
- See above if a raptor response is elicited.

Completing a transect

- Continue the above procedures until the transect is complete, looking and listening for raptors and raptor sign between stations. At the last station, wait 5 minutes after the calls have been played, before ending the survey and leaving the area.
- Following each night of call surveying, raptor detections should be plotted on a master map.

Field procedures - modifications for a multi-species owl inventory
- for presence/not detected surveys only

- This method can not be used for Relative Abundance. A relative abundance inventory can only survey for one species at a time (i.e., only calls of one species/station can be broadcasted).
- It is not possible to obtain relative abundance with a multi-species call playback as it is not known what the effects are on the different species when more than one type of call is broadcasted.
- Fuller and Mosher (1981), caution that the behavior of a target raptor species responding to playback recordings may be inhibited by the presence of a larger competitor or predator within its territory.
- Limit the number of target species in a multi-species inventory. For each potential target species determine what information will be gained. Include only those species that are required to meet survey objectives. Consider the balance between the information that will be gained by adding another target species with the information that may be lost due to the increased difficulty to plan an optimal sampling design for multiple species (see below) or the potential difficulty to analyse the data collected.

- Although multi-species inventories can be used to determine presence/not detected of owls, single-species inventories are still preferred.
- Note that the greater the number of species being surveyed in a multi-species inventory, the greater the amount of time spent at each station (which may restrict the amount of area that can be covered in an evening if the number of crews are limited).
- The time of year for commencing call playback surveys can be determined from knowledge of when egg laying will occur (refer to Section 5, Species Accounts and Survey Notes). In general, larger species tend to lay eggs before smaller species. A word of caution is that this information is based on small sample sizes and should be used as a guide only.
- Determine optimal distance between calling stations. This can become problematic when multiple species are being surveyed at the same time.
- It is difficult to find an interstation distance that will minimize duplication of called areas and still maximize likelihood of detection, especially when different sized owls are being surveyed at the same time. The compromise reached is dependent on the species being surveyed.
- If possible only use multi-species inventories when targeting similar sized owls.
- Results based on owl inventory surveys done in Nimpkish Valley (Deal and Lamont 1996a unpubl.) recommend an interstation distance of 1000 m if only large owls are targeted and 800 m if only smaller owls are targeted.
- Terminology:
- Targeted species – refers to the species whose call is being broadcasted in attempt to elicit a response from that species.
- Focal taxa – a group of targeted species; referred to individually as a focal species or as targeted species #1, targeted species #2, targeted species #3, etc.
- Play calls in order from smallest to largest owls as calls of larger owls may decrease the responses of smaller owls.
- Follow the field procedures for a single species inventory up to and including the protocol for broadcasting calls.
- Listen and watch for a response for 5 minutes after broadcasting calls for targeted owl species #1 and before broadcasting the series of calls for the next targeted owl species (#2). This means that it will take approximately 7.5 minutes/species/station (2.5 minutes of calls plus 5 minutes listening).
- If no response is elicited:
- Broadcast and listen as above for subsequent focal taxa.
- Note that only 1 series of taped calls is broadcasted (e.g., 20/30, 20/30, and 20/30) per owl species in a multi-species inventory, even if no response is elicited.
- Once taped calls have been broadcasted for all of the focal taxa, wait 5 minutes, listening and watching for a response.
- Move on to the next station.
- If a response is elicited:
- Discontinue broadcasting the call that elicited the response, regardless of the species of raptor that responded.
- Record the species, its approximate location (take a compass bearing) and time of response (e.g. after broadcasting for targeted owl species #1, targeted owl species #2, etc.).

- Wait 1 minute, and then continue with call playback for the other focal taxa, applying the following guidelines:
  - If either targeted species #1 or a non-targeted species responded to the first series of call playbacks, broadcast calls for targeted species #2 next.
  - If the species that responded is from the focal taxa, but is not the targeted species, do not broadcast calls for this species. For example, if targeted species #2 responded to broadcasted calls for targeted species #1: the next broadcasted calls would be for targeted species #3, and then for targeted species #4, etc.
  - If a larger owl responds to a broadcasted call of a smaller owl, do not broadcast any more calls for any of the small owls. Skip to the first large owl species in the focal taxa group and begin broadcasts. For example, if broadcasted calls of a small owl (B- WSOW, targeted species #1), elicited a response from a large owl (B-BAOW, targeted species #4), then the next calls to be broadcasted would be for an even larger owl (B- GHOW, targeted species #5). The smaller owls: targeted species #2 (B- NPOW) and #3 (B-NSOW) would be skipped.
- If call playback of additional focal taxa results in mobbing or threatening behavior to other raptor species:,
  - Discontinue broadcasting calls at that station.
  - Record on the dataform at what point the broadcast series was discontinued (e.g. after broadcasting the first recording of targeted species #2) and why. This will be important in an evaluation of survey effort (e.g., to evaluate the total number of stations at which call playback for a particular species was conducted).
  - Wait 5 minutes, listening and watching for a response from any targeted species.
  - Move on to the next station.
- Once taped calls have been broadcasted for all of the focal taxa:
  - Wait 5 minutes, listening and watching for a response from any targeted species.
  - Move on to the next station.

Data analysis

Presence / Not detected

- List the species detected in a given Study Area, plot detections on a master map.
- Determine the amount of effort applied to detecting raptors on a species-by-species basis. For a multi-species inventory detection effort will not likely be the same for all species, as all calls may not have been played at all stations. For each species only stations that the species' call was played can be included in survey effort. Note that even following these guidelines, it is still not known how the "presence" of another species (e.g., other broadcasted calls) will effect the response of the previous/next targeted species.

Relative Abundance

- Determine the average number of responding birds of a given species per station per Study Area.

3.4 Foot Surveys

Foot surveys may be used to determine presence/not detected (possible) of inconspicuous breeding raptors such as Short-eared Owls and Barn Owls, that may not respond to broadcast calls.

The major disadvantage of foot surveys is that large areas can not be covered. This method, especially in coniferous stands, is slow and time consuming and probably will never result in an accurate census (Swengel and Swengel 1987). Intensively searching an entire area may give a very accurate count however, the results can not be viewed as general and are unlikely to apply elsewhere. Thus, instead of intensively searching a large area, it is recommended that the habitat be stratified based on density estimates and habitat quality (low, medium or high). Once, habitat is stratified, randomly select smaller sample areas and run transects through this area.

After a raptor has been heard and/or seen, a nest search may be conducted if the objective of the survey is to find new nests. When conducting foot surveys during the breeding season, care should be given as to the approximate timing of nest visits (see Section 3.5, Ground Nest Search).

Office procedures

- Review the introductory manual No. 1, *Species Inventory Fundamentals* (RIC 1998).
- Obtain maps for Project and Study Area(s) (e.g., 1:50 000 air photo maps, 1:20 000 forest cover maps, 1:20 000 TRIM maps, 1:50 000 NTS topographic maps). Any map that is used to record data must be referenced to NAD83.
- Outline the Project Area on a small to large-scale map (1:250 000 – 1:20 000).
- Determine Biogeoclimatic zones and subzones, Ecoregion, Ecosection, and Broad Ecosystem Units for the Project Area from maps.
- Delineate one to many Study Areas within this Project Area. Study areas should be representative of the Project Area if conclusions are to be made about the Project Area. For example, this means if a system of stratification is used in the Sampling Design then strata within the Study Areas should represent relevant strata in the larger Project Area.
- Compile a list of all potential raptor species for the Study Area.

Sampling design

The Design Component for this survey is a transect.

Presence/not detected

- Although a strict sampling design is not required, systematic sampling using transects is recommended so that effort can be replicated.
- Ideally, the presence/not detected survey will be identical to one replicate of a relative abundance survey.

Relative abundance

- Stratify habitat based upon expected densities.
- Randomly choose strata in which to survey.

- Within each strata use systematic sampling. Transects should be a specified distance apart and so should the stations along these transects. Transects may follow roads, trails, predetermined straightlines, contours or drainages.

Sampling effort

Presence/not detected

- Determining presence is straightforward if a raptor detection is made.
- Determining absence is much more difficult because of the uncertainty of whether the species is absent or just not found. It is difficult to determine whether absence can be concluded from foot surveys for detection relies on the reaction of nesting birds in an area. A crude method to determine the number of transects to ensure detection would be to replicate a foot survey effort many times as part of relative abundance methods and use the methods described in *Species Inventory Fundamentals* (Section 5, RIC 1998).

Relative abundance

- Sampling effort will best be determined by first doing some preliminary sampling.
- It is difficult to determine whether repeatable, precise data from foot surveys is possible to obtain for nesting birds in an area. However, it is doubtful that sample sizes would be adequate to allow estimation of nesting densities with a line transect method. Furthermore, if sample sizes are small with these surveys, it may be difficult to gain sufficient statistical power with any statistical tests that may be needed.
- See *Species Inventory Fundamentals* (Appendix G, RIC 1998), for many easy-to-use packages that are available to aid in the determination of sample sizes for trend analysis and comparison between areas.

Personnel

- Two workers are required; the crew leader should be a qualified biologist and possess raptor experience.
- Excellent hearing is essential.

Equipment

- Maps
- Waterproof Notebook
- Compass
- Binoculars
- Flagging tape

Field procedures

- Review the information in Conducting surveys on foot vs other transportation, Section 3.1.6.
- Conduct foot surveys during the breeding season, but take care to avoid unnecessary disturbance during courtship, egg laying or incubation periods as this may disrupt successful breeding of raptors (refer to Section 5, Species Accounts and Survey Notes).
- Consult the Species Accounts and Survey Notes, Section 5, for the appropriate time of day to conduct foot surveys depending on the species of interest.

- Walk transects slowly at a speed of between 0.5 - 2 km/hr, looking and listening for raptors en route.
- Separate listening stations as appropriate to survey target taxa (see Species Accounts and Survey Notes, Section 5).
- Wait a minimum of 2 minutes upon arriving at a listen station (Takats *et al.* 2001).
- Use this time to 'adjust ears' and to listen for spontaneous calling raptors. Note the noise from running water (e.g., from nearby stream) may cause interference in hearing vocalizations (particularly owls) and should be avoided.
- Record location and weather conditions.
- Wait for 5 minutes, listening and watching.
- For all raptors heard and/or seen, record relevant information such as species, sex, age, type of response, and its approximate location (take a compass bearing).
- If a nest search is warranted, follow protocols outlined in the , Ground Nest Search, Section 3.5.
- After listening and watching for 5 minutes, move on to the next station.
- Continue the above procedures until the transect is complete.

Data analysis
Presence / Not detected

- List the species detected in a given Study Area.
- Following each survey, plot raptor detections on a master map.

3.5 Ground Nest Search

Nest searches are used to supplement call playback, foot surveys, and roadside surveys to verify presence/not detected of breeding raptors. For example, after raptors have been heard and/or seen, searches are used to look for nests, cavity trees, roost sites, fecal wash, prey remains or any other sign of raptors inhabiting an area. As nest searches are not an inventory method on their own, they do not need to follow a strict sampling design. The success of nest searches is highly dependent upon observer effort, skill level and ability (Smith 1987).

Before conducting a nest search:

Confirm that the objectives of the study require that nests be located. This is important to consider due to the amount of time that it will take to locate nests, and the potential disturbance that it will cause to the birds.

Each species reacts differently to intruders at the nest site: some by calling, attacking, leaving, sitting tight, etc. Be aware that the presence of human intruders, particularly in the egg-laying and incubation stages may cause serious disturbance or nest failure. For these reasons, surveyors should take the following general precautions:

- When conducting a nest search during the breeding season, care should be given as to the approximate timing of nest visits. Try not to visit the nest sites early in the nest season. Site tenacity is weakest during the courtship and egg laying period, and is likely strongest once chicks are approximately seven days old. However, when the object of the survey is to find new nests (as opposed to checking historic nests) it is necessary to relax this constraint. When a nest is found, remain for as short a time as possible to record the necessary data.
- If approaching a cliff site do so from the most visible avenue, to prevent startling birds.

Be aware that polygamy sometimes occurs, and has been documented in species as diverse as Northern Harriers, Northern Saw-whet Owls, Boreal Owls, and Red-tailed Hawks. With polygamous species, one male may be maintaining two or more nests within a territory; therefore, be careful to observe and identify flight directions of the male.

Also be aware that birds often reuse nests or build new nests near old sites. However, nests that have failed in previous years may not be reused. Once nests are located, surveyors can use density estimates or spacing to establish where the next closest nest might be.

Search effort

- Return to an area and repeat a search up to three times before concluding that a nest is not there. Timing of these visits should be designed to cover the range of expected breeding dates of target taxa and include time periods when birds are most vocal or visible (see individual species accounts, Section 5).

Field procedures

- Review the information in Conducting surveys on foot vs other transportation, Section 3.1.6.
- If a nest search is going to be initiated, take a compass bearing in the direction a response was detected. This will aid in narrowing nest site location.

- If the response is visual, note whether the raptor is carrying prey. If so, take a compass bearing in the direction it is flying as it may be delivering food to its young at the nest.
- If a response (visual or vocal) was elicited during a call playback survey, do not continue playing the call when doing a nest search as this may frighten the bird and cause it to abandon or alter its territory. Also, response to call playback alters the time budget of the bird which may interfere with critical breeding behaviour (i.e., feeding, courtship, mating).
- Move in the direction of the response (toward the source of the call or in the direction the bird flew).
- If searching for nests after a detection - search within a radius of 300-400 m of the detection point.
- When searching for a nest, do not follow a strict sampling design but use clues such as raptor response, whitewash, prey pluckings and pellets as guides. However, in thick coniferous forests where nests are very difficult to see, search for clues by systematically combing the forest floor back and forth. Surveyors should separate themselves by approximately 10 m, depending on the terrain and visibility, to increase detection efficiency.
- Nests found may be inactive or fail later in the season. The observer must know how to 'read' behaviour of birds at a nest to determine its status. For example, some birds perch or forage closer to nests, while other species may not be around or displaying with humans present.
- In close proximity to active nests, there will be fecal wash that resembles splattered whitewash, moulted feathers from the incubating adults, the pluckings of prey, and ejected pellets.
- Once whitewash, pellets or prey pluckings have been detected, search the trees for nests.
- New nests can sometimes be distinguished from old nests because they have white ends of freshly broken sticks and daylight passing through (in old nests, leaves and other debris gather over the winter preventing daylight from passing through). Be aware though that it may be difficult to tell whether a nest is old or new as several raptors will build on old nests year after year causing the bottom layers of the nest to be compacted, while the top, newer layers are not.
- For cavity nesting species lightly tapping on snags or trees with suitable nest cavities, may bring adults to the entrance of the cavity. Look up and into potential nest holes for emerging adults. If a bird is seen, leave the area immediately to minimize disturbance.
- Record nest site data attributes on the Nest Site Description Dataform.

3.6 Roadside Surveys

Roads and secondary trails are used as transect routes along which a vehicle is driven at low speed in one direction while at least two observers scan the countryside for perched and soaring raptors (Kochert 1986). It is a good method for comparing long-term trends and for covering large areas.

Roadside surveys can be used to inventory conspicuous raptors during the breeding season. Many conspicuous raptor species scavenge along highways. As well, during migration periods, passerine birds may concentrate activity near roadsides (as roadsides often are the first to become snow), which may attract many diurnal raptors during the breeding season (Table 2). American Kestrels, Northern Harriers and Rough-legged Hawks can also be inventoried using roadside surveys during the non-breeding season (Table 2).

Roadside surveys can be used to inventory a few inconspicuous raptors such as Short-eared Owls and Barn Owls in the breeding season and Snowy Owls during the non-breeding season (Table 1). These three species use open habitat and will therefore be visible (conspicuous) during roadside surveys at the appropriate time of day (i.e., they are all crepuscular and can bee seen just before sunset or just before sunrise).

For presence/not detected (possible) all that is required is that the raptor be sighted and identified. To determine relative abundance, an encounter transect method should be employed and the number of raptors seen along the transect route (number of raptors/km) be recorded.

After a raptor has been detected during a roadside survey, a nest search may be conducted if the object of the survey is to find new nests (see Section 3.5, Ground Nest Search).

Office procedures

- Review the introductory manual No. 1, *Species Inventory Fundamentals* (RIC 1998).
- Obtain maps for Project and Study Area(s) (e.g., 1:50 000 air photo maps, 1:20 000 forest cover maps, 1:20 000 TRIM maps, 1:50 000 NTS topographic maps). Any map that is used to record data must be referenced to NAD83.
- Outline the Project Area on a small to large-scale map (1:250 000 – 1:20 000).
- Determine Biogeoclimatic zones and subzones, Ecoregion, Ecosection, and Broad Ecosystem Units for the Project Area and Study Areas from maps.
- Delineate one to many Study Areas within this Project Area. Study areas should be representative of the Project Area if conclusions are to be made about the Project Area. For example, this means if a system of stratification is used in the Sampling Design then strata within the Study Areas should represent relevant strata in the larger Project Area.
- Compile a list which includes all potential raptors for the Study Area.
- For each Study Area, identify on maps potential roads or trails that could be used as survey transects to try and locate raptors. Roads with high car volume should be excluded because of potential danger.

Sampling design

- Stratify area by habitat or based on expected densities of raptors (low, medium or high). Note that roads with telephone poles, power lines, fences or other artificial perching sites should be placed into the high strata because these objects tend to concentrate raptors.

- Randomly choose strata in which to conduct surveys.
  - If habitat or strata based inference is an objective, then equal survey effort between strata is recommended.
  - If detection of rare species is the objective then surveying strata with an expected high density is preferred.
- The Design Component for this survey is transects. Select roads (transects) to sample from each of the stratum of interest. These should be selected as randomly as possible, but in reality this likely can not be achieved and in many studies this criterion is ignored (see Andersen *et al.* 1985).

Presence/not detected

- For presence/not detected all raptor species observed are recorded regardless of their distance from transect line (there is no fixed-width).

Relative abundance

- A line transect would be ideal for this work, however, to estimate detection functions at least 40-60 observations are needed in each transect sample (Buckland *et al.* 1993). It is doubtful that this type of sample size can be obtained for raptors without very long transect lengths. Preliminary surveys should be conducted to determine likely sample sizes, and if possible line transect methods should be incorporated.
- If line transects are not possible, then a modified fixed-width transect (contingent on raptor species being detected) should be used. Perpendicular sighting distance (from the transect line) of raptors should always be recorded to estimate the strip width for different raptor species. (New advances in laser rangefinders may help in the estimation of distances of raptors from the transect line.) It is important to remember that an inherent assumption with this method is that there is a constant probability of detection of raptor species each time the survey is replicated.
- It is important to consider raptor detectability in different habitats, so if a fixed-width transect is being run, the width of these transects can be adjusted (Kochert 1986, Fuller and Mosher 1987). Road transect counts are most appropriate for sampling raptor populations in open vegetation (Millsap and LeFranc 1988).

Sampling effort

- If habitat or strata based inference is an objective, then equal survey effort between strata is recommended. If detection of rare species is the objective then surveying strata with an expected high density is preferred over surveying areas with lower expected density.
- To keep sampling effort similar between surveys, all surveys should be run at the same time of day, under similar weather conditions, at similar speeds and similar distance. Crews should be rotated evenly between transect routes and Study Areas to minimize observer bias in the data.

Presence/not detected

- Conduct at least one roadside survey, completely covering the area of interest during the breeding or non-breeding season (depending on raptor species).

Relative abundance

- Refer to the manual, *Species Inventory Fundamentals* (Sections 2.5 and 5, RIC 1998), to determine sample effort required to calculate relative abundance using this type of survey method.

Personnel

- A minimum of two people are required for roadside surveys.
- Crew members must have a valid Class 5 drivers license.
- The crew leader should be a qualified biologist with excellent raptor identification skills. Other crew member(s) should also have excellent raptor identification skills.

Equipment

- Vehicle that provides good vision to surrounding countryside. It should have extensive windows and ride high enough above the road surface so that the observers can see into open fields without their vision being prohibited by bushes at the field's edge.
- 7-10x binoculars for each observer
- 1 spotting scope (minimum 20x) per crew
- Maps
- Pencils
- Compass

Field procedures

- The time of day the survey is conducted will depend on the species of interest. Some raptors are better seen while soaring in thermals (later in morning/afternoon).
- Surveys may begin shortly after dawn (as soon as normal daylight conditions allow unrestricted visibility when compared to later in the day).
- Survey route, date, speed and weather conditions should be recorded for future replication.
- Set odometer to zero at transect initiation.
- Vehicle speed should not exceed 40 km/hr.
- When a raptor is detected, stop when safe to do so, and record:
- species, sex, relative age, and whether it is perched or flying.
- distance traveled along transect (from odometer).
- If a road double backs or contains hairpin turns it is easy to double count or miss raptors completely in the surrounding area. Decide ahead of time how you will count this section of road to minimize miscounts. For relative abundance surveys, adjustments to the distance traveled may have to be made as well, if the portion of road that double backs is significant.
- If a nest search is warranted, follow protocols outlined in Section 3.5, Ground Nest Search.

Data analysis

Presence/Not Detected

- List the species detected in a given Study Area.

Relative abundance

- Number of raptors seen/heard along transect. Calculate the number of raptors/km per stratum type.

3.7 Standwatches

Standwatches may be used to supplement call playback, foot and roadside surveys when determining presence/not detected (possible) of either conspicuous or inconspicuous raptors or their nest sites during the breeding season. As standwatches are not an inventory method on their own, they do not need to follow a strict sampling design. In general, standwatches require surveyors to position themselves at selected vantage points where suspected nesting habitat is searched for raptors rising out of the canopy.

Before conducting a standwatch:

- Identify sites and access routes to potential standwatch locations in your Study Area(s).
- Understand that standwatches are used to supplement other inventory techniques as deemed necessary. Standwatches are not used on their own since data collected may be difficult to interpret since most of the raptors will be detected while soaring and may not actually be from the Study Area.
- The duration of a standwatch and the number of standwatches performed will vary according to the surveyor and the success rate.
- Standwatches can be used as a reconnaissance approach to a Study Area followed by call playback, foot, or roadside surveys, and/or conducted during these inventory surveys

Field procedures

- Only one person is required at a standwatch, but two workers are optimal. If more than one person is surveying, partition the standwatch slope so that each observer surveys a different area of the slope. It is recommended that vantage points face upslope as the small silhouette of a soaring bird is most visible against the sky.
- It is most useful for observers to survey without the aid of optics, however, when a bird is detected, use binoculars or a spotting scope to assist with raptor identification.
- When a raptor is identified, continue watching the bird until it enters the forest on the slope. Try to mark this location by referring to other landscape features around it and by taking a compass bearing for direction. Often raptors will enter into the canopy within their territory, which may be useful for locating a nest on foot.

3.8 Migration Surveys

This method is limited to presence/not detected unless it is done with a banding program.

During spring and fall migration, raptors become concentrated along specific flyways such as shorelines and mountain ridges at which time they can be counted much more easily then when they are dispersed during the breeding season. Depending on the species and season, anywhere from a handful to hundreds of raptors can be seen per day.

The accuracy of migration survey data to indicate population trends remains questionable. Hussel (1981) cites two main reasons for this:

1. difficulty with relating migrants to specific breeding and non-breeding populations; and
2. multiple factors other than population change which contribute to variability in migration counts (e.g., weather).

Solving the first problem requires banding of the raptors and hopefully recovering the band or sighting the banded birds on their breeding and/or non-breeding grounds. The second problem is resolved by identifying and separating the components that contribute variability in migration survey counts. Studies conducted by Hussel (1981), on migratory counts of small passerines, reported 27-63% (depending on the species) of the count variation was explained by year, date, site and weather variables.

In British Columbia only one informal fall hawk watch station has been established: in East Sooke Park on southern Vancouver Island. Other migration corridors in the province exist and are known but no formal monitoring stations have been established. Because censusing of breeding raptors over a large area is difficult and because funds will probably never be available to survey nesting populations of all species, hawk migration routes should be identified and monitoring stations set up.

Nocturnally migrating owls have also been successfully censused at hawk watch stations using an AN/PVS-3A night vision scope (Russel *et al.* 1991). On 25 nights at Cape May Point, New Jersey, 210 owls of the species Barn Owl, Northern Saw-whet Owl and Long-eared Owl were recorded migrating at night with most detections occurring within the first two hours after sunset.

To conduct migration surveys for raptors follow the standards established by the Hawk Migration Association of North America.

3.9 Aerial Surveys

Aerial surveys are efficient for searching large areas in a short period of time. During the breeding season aerial surveys can be used to locate nests of conspicuous raptors: Ospreys, Bald Eagles, Golden Eagles, Gyrfalcons, Peregrine Falcons and Prairie Falcons. Boat or foot surveys should be used at least in part of the census area as a correction factor and to verify nest site locations (see Munro 1988, Anthony *et al.* 1999). Aerial surveys can be supplemented with nest searches if the object of the survey is to find new nests (see Section 3.5). During the non-breeding season, aerial surveys may also be used for locating Osprey, Bald Eagle and Golden Eagle nests.

This method can be used to determine presence/not detected or abundance estimates if survey replicates are conducted. The estimation of absolute abundance is possible but only for conspicuous raptors during the nesting period and thus pertains only to the nesting population and does not count floaters or non-breeders.

Generally, active nest sites can be described as being:

- An occupied site - indicated by the presence of at least 1 adult, or eggs or young, during any of the survey flights
- A productive site - a nest where a minimum of 1 chick is present and is assumed to have fledged at the time of the productivity surveys. Productivity is defined as the mean number of known or assumed young fledged per occupied site.

Full definitions to describe occupancy and activities at nesting areas can be found in Poole and Bromley (1988), Postupalsky (1974), Postupalsky (1983) and Steenhof (1987).

Office procedures

- Review the introductory manual No. 1, *Species Inventory Fundamentals* (RIC 1998).
- Obtain maps for Project and Study Area(s) (e.g., 1:50 000 air photo maps, 1:20 000 forest cover maps, 1:20 000 TRIM maps, 1:50 000 NTS topographic maps). Any map that is used to record data must be referenced to NAD83.
- Outline the Project Area on a small to large-scale map (1:250 000 – 1:20 000).
- Determine Biogeoclimatic zones and subzones, Ecoregion, Ecosection, and Broad Ecosystem Units for the Project Area from maps.
- Delineate one to many Study Areas within this Project Area. Study areas should be representative of the Project Area if conclusions are to be made about the Project Area. For example, this means if a system of stratification is used in the Sampling Design then strata within the Study Areas should represent relevant strata in the larger Project Area.
- Obtain 1:5 000 air photo maps for use in identifying flight lines.

Sampling design

- Stratify area by habitat or based on expected densities of raptors (low, medium or high). Randomly choose strata in which to conduct surveys.
  - If habitat or strata based inference is an objective, then equal survey effort between strata is recommended.

  - If detection of rare species is the objective then surveying strata with an expected high density is preferred.
- Delineate quadrats within the strata to be surveyed (a quadrat can include the whole stratum or just part of it). The Design Component for this survey is quadrats. Determine Biogeoclimatic zones and subzones, Ecoregion, Ecosection, and Broad Ecosystem Units for quadrats.
- In terms of optimal quadrat size, Krebs (1989, p.67) suggests methods to determine optimal quadrat size, or nested quadrats, for species dependent on what assumptions can be made about spatial dispersion and other factors. Krebs (1989) states that there is no single quadrat shape, size or number that is universally recommended.
- Plan flight routes within each quadrat to cover the area. Flying transects within quadrats is preferable to concentric circles from a statistical perspective. Transects should also provide a more uniform coverage of each quadrat.

Sampling effort

- Note that forestry plans should treat occupied and productive nests with equal significance as occupied and unproductive nests; thus, the additional effort required to determine productivity has limited benefits. A survey in Vanderhoof (Poole 1998 Unpubl. Rep.) that examined Bald Eagle and Osprey nest site occupancy and productivity reported that from the perspective of stand/site level management to minimize conflicts near nests, the occupancy flights in May are more important than the productivity surveys.

Presence/not detected

- If habitat or strata based inference is an objective, then equal survey effort between strata is recommended. If detection of rare species is the objective then surveying strata with an expected high density is preferred.
- If birds are sitting on nests, then one survey will probably provide presence/not detected information, especially if helicopter noise is sufficient to flush cliff-nesting raptors (this assumption depends on whether birds are on nests at the time of survey).
- Search time, search area, and search routes should always be detailed so that efforts can be replicated in future surveys.

Relative Abundance and Absolute Abundance

- Set up sampling in a way that will improve survey precision and subsequent statistical power.
- Variance is almost always proportional to mean count in quadrat counts.
- To appraise survey precision, calculate the coefficient of variation (standard deviation of replicated counts divided by mean of replicated counts). If this is done, it is found that survey precision is usually lower in the lower density (i.e., lower population abundance) strata.
- In general, survey precision as reflected by the coefficient of variation will be proportional to $1/A$ where A is the absolute abundance when quadrat or line transect counts are employed (Seber 1982, Gerrodette 1987, Krebs 1989, p.177).
- Krebs (1989, p.216) discusses how to allocate sample sizes in stratified sampling and in particular how to determine what fraction of samples to put in what strata.
- Sample effort should be evaluated in terms of project objectives using power analysis packages as described in Section 4 and *Species Inventory Fundamentals* manual (Section 5 and Appendix G, RIC 1998). Preliminary survey data will help design studies in terms of optimal sample effort.

- *Absolute Abundance:* It is suggested that absolute abundance estimates be replicated over the course of a breeding season to ensure that all breeding birds are counted. Some raptors such as falcons will "sit tight" on nests during the incubation phase, and not be at nests at all times after the nestlings have hatched. Therefore, replicated efforts that correspond to knowledge about nest chronology will help ensure the thoroughness of surveys.

Personnel

- A pilot with previous raptor aerial survey experience.
- Crew leader should be a qualified biologist with experience in aerial raptor surveying
- Other crew members should have previous experience in aerial raptor surveys or be properly trained.

Equipment

- Aircraft
- Aircraft should be fitted with bubble windows enabling better visibility for observers
- Fixed-wing aircraft are sufficient for surveying tree nesting conspicuous raptors
- Helicopters are recommended for surveys in canyons and cliff sites. Helicopters are more slow-moving and highly maneuverable and therefore efficient for finding raptor nests compared to fixed-wing aircrafts. This should be considered in the objectives, survey design and budget of the project.
- Intercom (with spare batteries) and headsets
- Low power binoculars are recommended to minimize the effects of vibration (7x to 8x is best, probably no more than 10x)
- Topographic maps (sufficient to cover identified Study Area)
- Expandable file folders for map storage and dataforms
- Clipboards
- Coloured pencils, number 2 lead pencils, large eraser

Field procedures

Timing – nonbreeding season

Aerial surveys can be used to locate inactive nests in the non-breeding season. It may be easier to do this earlier in the year in areas where there are deciduous trees, as nests are often difficult to detect after the leaves flush due to the foliage density.

Timing – breeding season

- Usually aerial surveys are conducted to determine the presence or obtain an abundance estimate of active nests.
- Note that nests in aspen are particularly visible in early spring before leaf-out, and nests from previous years (often closely spaced) can alert ground or air surveyors to the fact that the area is used.
- Try and avoid surveying during inclement weather as to minimize risk to eggs or young in the nest and to allow for the best visibility for observers.

Presence/not detected

- Conduct surveys when birds are sitting on nests. This will provide presence/not detected information, especially if helicopter noise is sufficient to flush cliff-nesting raptors.
- If an occupied site is found then one survey of the Study Area will be enough.

Abundance

- Attempt to time the first flight late enough in the nesting season to decrease the potential for nest abandonment, yet still obtain a reasonable estimate of total active nests.
- If determining productivity is a goal then conduct subsequent flights to determine nesting success and productivity of previously surveyed nests when chicks should be present and assumed to have fledged. Surveys should include flights in late June to confirm late nestling survival (Witt 1996).
- Surveys designed to census more than one species (e.g. Bald Eagles and Ospreys) may compromise data collected on one or the other species, resulting in lowered estimates of density, site occupancy and productivity. Ideally, surveys will only census one species at a time.
- Since spring phenology varies among years, optimal survey timing also varies on a year to year basis.
- One method of refining survey timing would be to monitor several bald eagle and osprey nest sites on a proposed study area in the spring that are easily accessible from the ground or boat. This would enable an estimate of the dates of initiation of incubation, hatch and fledging, to ensure optimal timing of occupancy (early in the incubation period) and productivity (in the mid to latter part of the nestling period) surveys (Fraser *et al.* 1983).
- In populations that do not nest synchronously, it may be necessary to conduct more than one count of large chicks to more accurately estimate population productivity.

General

- Conduct surveys from 2 hours after sunrise to 2 hours before sunset to avoid contrasting and confusing shadows.
- A survey should last no more than 7 hours per day with a one-hour break period in the middle of the day.

Flight

- Before conducting the search, the observers should lightly trace the planned routes on maps. Flying transects within quadrats is the preferred technique to flying concentric circles.
- During the survey the navigator must chart the actual path flown on the map (this may differ from the planned routes) for later documentation.
- Low flights over potential nest sites should be avoided during courtship, egg laying or early incubation.
- Flights should be conducted at a minimum of 50 m above the nest height and between 30-130 km/h (Elliot *et al.* 1998, Anthony *et al.* 1999, Bowman and Schempf 1999, Jacobson and Hodges 1999, McIntyre and Adams 1999). Fixed wing and helicopter speeds differ but should be kept within this range. For species-specific variations in survey flight speed and altitude recommendations see Section 5, Species Accounts and Survey Notes.
- For cliffs, outcrops and high soil banks (preferred nesting habitat for a number of raptors) approach the Study Area along a path visible to the bird, permitting an incubating or brooding adult to leave unhurried.

- When an active nest is encountered, try to maintain a safe distance from the nest to minimize the risk of nest abandonment due to disturbance from the helicopter.

Observations

- The pilot may assist observers in locating birds/nests if s/he is comfortable doing so.
- Actively search all potential nesting habitat (rather than stare fixedly into a predetermined space).
- Record all raptor or nest observations directly on 1:20,000 maps or orthophotos. If raptors are at high density, tape-recorders can be used to record data.
- If a raptor or its nest is observed:
- Record plumage and behaviour of birds observed if known. This will be useful for interpreting breeding status.
- Record nest and site information on Nest Description Form (*Species Inventory Fundamentals No. 1 [Forms]*). This will include information such as location, whether the nest is active or inactive, nest condition, how many chicks or eggs are in the active nests (if possible); tree species and estimated distance from the top of the tree.
- Photograph each nest tree encountered (optional). It is best to take photos from all 4 cardinal directions to be able to examine tree structure and to assist in locating the nest tree in the future.
- Record the distance flown so that the number of raptors or active nests per km may be calculated.
- Transfer data from maps or tape-recorders to dataforms.

Supplementary Surveys

- For supplementary surveys refer to protocol outlined in the Boat, Foot, and Nest Survey sections (see Sections 3.10, 3.4, and 3.5, respectively).

Data analysis

Presence/Not Detected

- List the raptor species detected in a given Study Area. Indicate whether detections were based on active nest and/or bird observations.

Relative and Absolute Abundance

- Data only refers to the "abundance of breeding birds" as opposed to all birds. This is because estimation of abundance pertains only to the nesting population of raptors and does not count floaters or non-breeders. Thus it will always be negatively biased.
- The average density of occupied (active) nests for the project area in km^2 (area from quadrats).
- Lineal nesting density: number of occupied nests found per 100 km of shoreline. This is calculated based on the length of shoreline in major lakes (perimeter measurement) and rivers (lineal measurement) surveyed.

3.10 Boat Surveys

Boat surveys may be used to supplement aerial surveys in determining nest site locations of some conspicuous raptor species. Boat surveys follow water courses and survey the surrounding shoreline habitat with a look and see approach. Thus, the drawback to this method is that usually only the immediate shoreline is censused. For this reason, boat surveys are limited to censusing raptors which nest adjacent to the shoreline in trees (Bald Eagles, Ospreys, and Peregrine Falcons) or on cliffs in river canyons (Peregrine Falcons, Gyrfalcons, and Golden Eagles). During the non-breeding season, boat surveys may be used for locating Osprey, Bald Eagle and Golden Eagle nests.

Office procedures

- Review the introductory manual No. 1, *Species Inventory Fundamental* (RIC 1998).
- Obtain maps for Project and Study Area(s) (e.g., 1:50 000 air photo maps, 1:20 000 forest cover maps, 1:20 000 TRIM maps, 1:50 000 NTS topographic maps). Any map that is used to record data must be referenced to NAD83.
- Outline the Project Area on a small to large-scale map (1:250 000 – 1:20 000).
- Determine Biogeoclimatic zones and subzones, Ecoregion, Ecosection, and Broad Ecosystem Units for the Project Area from maps.
- Delineate one to many Study Areas within this Project Area. Study areas should be representative of the Project Area if conclusions are to be made about the Project Area. For example, this means if a system of stratification is used in the Sampling Design then strata within the Study Areas should represent relevant strata in the larger Project Area.
- Compile a list which includes all potential raptors for the Study Area.
- Obtain 1:5 000 air photo maps for Study Area (if available). Identify on maps, potential cliffs where nests/birds may be located and the survey route (transect).

Sampling design

If using boat surveys as a supplement:

- If using boat surveys to determine a correction factor or to verify nest site locations as a supplement to an aerial survey, choose survey routes (transects) in areas where quadrats were flown. The Design Component for this survey is transects.

For stand-alone boat surveys:

- Stratify area by habitat or based on expected densities of raptors (low, medium or high). Randomly choose strata in which to conduct surveys.
  - If habitat or strata based inference is an objective, then equal survey effort between strata is recommended.
  - If detection of rare species is the objective then surveying strata with an expected high density is preferred.

General

- Choose survey transects that follow potential shoreline habitat for nesting raptors

Sampling effort

Presence/not detected (for stand-alone boat surveys)

- If habitat or strata based inference is an objective, then equal survey effort between strata is recommended. If detection of rare species is the objective then surveying strata with an expected high density is preferred over surveying areas with lower expected density.
- Due to low detectability of raptors it is preferable to conduct survey more than once.
- It should be possible to determine presence but not necessarily absence by conducting one boat survey completely covering the area of interest during the breeding season, when adults are sitting on nests.
- Keep detailed notes on time spent observing, weather, and other factors that influence sightability to ensure that survey efforts are kept consistent.

Relative abundance

- Boat surveys are probably not as rigorous as aerial surveys for determination of relative abundance, since potential raptor habitat is surveyed less uniformly, and raptors are less likely to flush from areas with no aircraft noise. For this reason, boat surveys will probably need to be replicated frequently if they are to be used for relative abundance measurement.
- Power analysis packages, as described in Section 4 and in *Species Inventory Fundamentals* manual (Section 5, RIC 1998) will help in determination of optimal sample effort.
- Detailed notes on time spent observing, weather, and other factors that influence sightability should be taken to ensure that survey efforts are true replicates.

Personnel

- Boat operator must have the Small Boat Training Certification.
- The crew leader should be a qualified biologist with boating and raptor experience.
- Crew members should have some raptor experience.

Equipment

- Boat - sufficiently large enough to carry two to three workers, with a motor size of at least 20 horsepower. The boat must meet the minimum standards as contained in the Canadian Coast Guard Safe Boating Guide. This handbook is available free of charge from Transport Canada, Canada Customs and most marine dealers.
- Life Jackets for each crew member and operator
- Two-way Radios
- Topographic maps
- Waterproof map holders
- Binoculars of 7-10x for each crew member
- Spotting scope of 20x mounted on to a gun stock
- A noise making device such as a megaphone (used to startle birds off of the nest ledge)

Field procedures

- Follow the water courses (transects) to survey the surrounding shoreline habitat using a look and see approach in combination with various tactics to startle birds from their nests.

- Navigate the boat along transects to potential nest sites and turn off the motor if safe to do so.
- Scan cliffs (or tree tops) for signs of raptor activity. On cliff faces fecal wash is a tell-tale sign of raptor presence.
- As some raptors will ignore passing boats and may be missed in the census, periodically get out of the boat (if possible) and walk towards the nest cliffs; attempt to alert the birds to your presence (e.g., talking, and other noise makers).
- Boat surveys for Peregrine Falcons have been supplemented with loud noises (megaphones) around potential eyries to startle the birds off of their nests and make for easy detection (Munro 1988). When preparing a noise blast, have observers looking without aid of optics at the potential nest site. Once the noise has been made watch for any flushing birds.
- If a raptor is spotted:
- quickly view through the binoculars for species identification, age (plumage) and sex (if possible), and
- estimate the height of the raptor nest.
- For relative abundance
- record linear distance travelled along each transect so that the number of raptors/km can be calculated as a measure of effort.
- Keep detailed notes on time spent observing, weather, and other factors that influence sightability to ensure that survey efforts are true replicates.
- Transfer data from mapsheets to dataforms after boat surveys are complete.

Data analysis

Presence/Not Detected

- List the species detected in a given Study Area.

Relative abundance

- Number of raptors seen/heard along transect. Calculate number of raptors/km per stratum.

4. DATA ANALYSIS

4.1 Presence/not detected

The presence/not detected and relative abundance methods are nearly identical for aerial surveys, boat surveys, roadside surveys, and call playback surveys. If relative abundance surveys are replicated then a simple graph of species detected as a function of number of surveys will give an approximation of the efficiency of a single survey. This relationship can be analyzed (using regression analysis) to estimate approximate sample effort needed to detect species (with some restrictive assumptions). Techniques for determination of sample size for presence/not detected are outlined in *Species Inventory Fundamentals* manual (Section 5, RIC 1998).

4.2 Relative Abundance

It is important that the main assumptions of relative abundance surveys are clearly stated. The main assumptions are:

1. Identical or statistically comparable methods are used when comparison between areas or monitoring trends in one area over time is an objective of inventory effort.
2. Environmental, biological, and sampling factors are kept as constant as possible to minimize differences in survey bias and precision between surveys.
3. Surveys are independent: one survey does not influence another.

If these assumptions are met then each replicate survey should show (on average) the same relative bias allowing calculation of trends and comparison between areas. A great number of methods are proposed for relative abundance estimation. It is important that biologists understand that these methods are not interchangeable and therefore studies should be designed with consistent methods across areas and through time.

The quantification of sampling intensity and effort is fundamental to the use of indices and relative abundance measures. This way the assumption of equal bias of surveys between areas and over time can be met. In addition, the usefulness of indices depends on the precision of estimates. It is strongly recommend that power analysis procedures be integrated into the study design of all these techniques. As described in *Species Inventory Fundamentals* manual (Appendix G, RIC 1998), programs such as MONITOR, POWER AND PRECISION, and NQUERY are user friendly, and can easily be used in an adaptive fashion to calculate sample sizes needed for the desired analysis questions.

It is important to remember that each of the relative abundance techniques proposed will have unique features that affect sample bias and sample precision. Therefore, power analysis and statistical analysis should be done for each method individually. If studies are designed appropriately the following general analysis methods can be used (Table 5).

Table 5. RIC objectives and analysis methods for relative abundance data

Objective	Analysis method[1]	Programs[2]
• Trends in abundance over time	• Sample methods • Regression techniques • Power analysis	• Generic statistical packages • MONITOR
• Comparison in abundance between areas	• ANOVA-type methods • Power analysis	• Generic statistical packages • Power analysis software
• Determine whether habitat modifications have altered population size	• ANOVA type methods • Power analysis	• Generic statistical packages, RT • Power analysis software

[1] See *Species Inventory Fundamentals* manual (Section 5, RIC 1998) for more details on analysis techniques.
[2] See *Species Inventory Fundamentals* manual (Appendix G, RIC 1998) for more detail on software packages.

Appropriate analysis of strata: If comparison of areas and detection of trends is an objective of efforts, then each strata should be analyzed separately or as different factors in an ANOVA rather than pooling strata which may differ markedly in terms of counts obtained. A key assumption of parametric methods is similarity of samples in terms of variance, and also a normal distribution of counts. Therefore, a sample design that groups similar habitat areas and densities into strata is best for these tests. If low density strata are combined with high density strata, a highly non-normal distribution of counts would result which would make analysis using parametric methods more difficult.

Difficulties with count data: One inherent problem with count data is that it is rarely normally distributed making the applicability of parametric methods with raw data risky, especially if sample sizes are low. Before data are used in parametric tests the assumptions of normality, equal variances, and independent samples should be investigated.

Trend analysis: The basic method for the determination of trends is linear regression. There are a variety of refinements to linear regression techniques that can be used with data dependent on sampling assumptions and other characteristics of the data.

Comparison between areas: A variety of statistical methods can be used to compare areas if surveys are conducted concurrently. If surveys are conducted non-concurrently (such as in different years) then the results might be biased by population fluctuations and the variance among years is confounded with the variance among areas.

Habitat based inference: Logistic regression or similar methods can be used to describe habitat associations but this approach requires that habitat units be the primary sample unit as opposed to population units.

4.3 Absolute Abundance

Inferences about recruitment, and other life history parameters might be made indirectly by the determination of the number of breeding pairs in absolute abundance studies. However, banding and nest observation would be needed to estimate life history parameters accurately. Otherwise, the statistical techniques described in the relative abundance section pertain to analysis of absolute abundance data.

5. SPECIES ACCOUNTS & SURVEY NOTES

5.1 Introduction

The following sections provide some introductory life history characteristics of raptors, which are relevant to surveying these birds. To be effective, the techniques described will require repeated practice in the field.

Each page in these species accounts is designed to provide a relatively quick reference to those details directly related to finding the bird, or some feature related to the bird, rather than identification alone. For identification purposes, references to the birds in some of the more common identification and life-history handbooks[1] (with page numbers) are provided below the species name and code.

The species account section includes a species description, information on the species diet, breeding, and preferred habitat[2] within breeding and non-breeding areas of the province. The next section contains species-specific survey notes including information on how to locate nests and the possible risks to species and surveyor. Although many details are given here, it is recommended that a thorough literature search be undertaken for the species or species group that is to be inventoried. Citations given in the text of this document will give a broad base to the literature review but are not exhaustive.

Information was obtained from the field guides and life-history handbooks listed below as well as Cannings *et al.* (1987), Ehrlich *et al.* (1988) and Campbell *et al.* (1990).

[1] **Field guides and life-history handbooks listed by abbreviations:**

BoBC = The Birds of British Columbia, Vol. II Nonpasserines (Campbell *et al.* 1990).

BH = The Birder's Handbook (Ehrlich *et al.* 1988).

NGS = National Geographic Society Field Guide to the Birds of North America (Scott, ed. 1983).

PWB = Peterson Field Guides Western Birds (Peterson 1990).

HAWK = Peterson Field Guides Hawks (Clark and Wheeler 1987).

PGNAR = A Photographic Guide to North American Raptors (Wheeler and Clark 1996).

[2] **Ecoprovince abbreviations used in habitat section:**

Coast and Mountains - CAM; Georgia Depression - GED; Southern Interior - SOI; Southern Interior Mountains - SIM; Central Interior CEI; Sub-boreal Interior - SBI; Northern Boreal Mountains - NBM; Taiga Plains -TAP; Boreal Plains - BOP.

5.2 Turkey Vulture and Osprey

5.2.1 Turkey Vulture B-TUVU *Cathartes aura*

BoBC–8; BH–216; NGS–182; PWB–182; HAWK–15; PGNAR–I

Species Description

Plumage: The Turkey Vulture is black overall, with light grey to silver flight feathers. Feathering in the neck area often appears iridescent. The head is red and naked and the legs are pinkish. The two-toned underwing of this bird is distinctive; silvery flight feathers may appear white against the black underwing coverts.

Immature: Young have a dark beak and a dark grey fuzzy head, which turns first pink, then red.

Flight: This long narrow bird flies almost entirely by soaring or glidingwith wings held in a strong dihedral (Kirk and Mossman 1998). The tail appears long and slim. In flight the bird may appear to be rocking or teetering on its wings.

Distinguishing Features: Though the Turkey Vulture is nearly eagle size, its diminutive head and slim tail are distinctive, as is the V-shaped flight silhouette and two-toned underwing.

Voice: Normally silent, but may grunt or hiss when disturbed.

Habitat

In British Columbia, the Turkey Vulture tends to breed as a solitary pair, often in isolated locations (such as remote cliffs, caves and forests) along the southern inner coast of the province and in the Okanagan Valley. The Turkey Vulture is distributed across the extreme southern part of the province, and is most abundant in the Georgia Depression (ecoprovinces GED, SOI).

The Turkey Vulture is a rare winter resident. In winter, the southern tip of Vancouver Island is a staging area for migrating Turkey Vultures, which gather there in the hundreds in tall conifers. It is most often seen soaring in the air over bluffs, cliffs, and open country.

Diet

The Turkey Vulture eats carrion of any kind.

Locating Nests

Nest sites are often reused and most sites in British Columbia are known. These sites and other potential nesting habitats can be surveyed using spotting scopes early in the breeding season (April to May) when the display flights of the birds are at their peak. Egg laying is from early April to late June and young are at the nest from early May to early September. Nests are found in areas with rocky outcrops and cliffs with protected crannies, sometimes in mixed forest. Most nests in British Columbia and throughout its range in North America have been found in caves or crevices in rock cliffs (Kirk and Mossman 1998). Occasionally, tree nests in a suitable snag have been used and one tree nest was found in British Columbia in a mixed forest of Douglas-fir, Garry oak, and arbutus (Campbell *et al.* 1990). Nests have been

found on the ground and up to 34 m high in cliffs.

Survey Notes

The RIC recommended methods for surveying the Turkey Vulture are roadside surveys during the breeding season and migration surveys during the non-breeding season. Migration in British Columbia peaks in early September and goes until late October (Campbell *et al* 1990).

Like other soaring raptors, the Turkey Vulture may remain perched in early morning until the air warms. Surveys should take into consideration appropriate weather and time of day for best viewing soaring birds. That is, soaring occurs as the land is warmed by the sun, creating thermals of rising warm air. On most clear days, this will occur from mid-morning onwards. The Turkey Vulture performs conspicuous aerial and ground displays prior to the onset of breeding. These display flights take place in the nesting area. During incubation, adults become inconspicuous; there is very little display activity observed during the first seven weeks of nesting (Davis 1983).

5.2.2 Osprey B-OSPR *Pandion haliaetus*

BoBC–10; BH–242; NGS–200; PWB–184; HAWK–21; PGNAR–9

Species Description

Plumage: The Osprey has dark brown upper parts and is white below with black markings on the wing linings at the wrists. The head is white with a dark eye stripe and crown. Females often display a 'necklace' of dark streaking on the breast.

Immature: Juveniles are similar to adults, but display more streaking on underparts, and pale feather edges on the back.

Flight: Large (Raven-sized) birds with long, narrow wings that have a pronounced crook at the wrist, giving birds a 'gull-like' look in flight. The Osprey often soars with wings raised at the elbow and drooped at the tips. In flight, the head appears small.

Distinguishing Features: The dark wrist patches and eye stripes of this bird are good field marks.

Voice: The most common call, used by both sexes, is described as *w-cherk w-cherk w-cherk*, and alarm calls are a single-syllable *piu piu piu* uttered in rapid sequences (Beebe 1974), or *kip kip kip kiweek kiweek*, or a whistling *kyew, kyew, kyew*.

Habitat

The Osprey is almost always found near water. In coastal areas it is found in lagoons, inlets and bays, and elsewhere near lakes, rivers and sloughs. The Osprey is widely distributed throughout British Columbia, most often breeding south of latitude 56° N (Campbell *et al.* 1990), (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, BOP).

In non-breeding seasons it is present in low numbers in the southern parts of province; associated with open bodies of water (ecoprovinces: CAM, GED, SOI).

Diet

The Osprey eats fish, which it captures by plunging into the water and grasping the fish with its talons.

Locating Nests

Nests are generally large, obvious structures of twigs, sticks and branches, which are added to year after year. They are built near the tops of trees (most often dead trees) near water, and in trees on wooded islands, but also on cliff ledges or boulders. Nests are also often situated atop human structures in and near lakes and rivers, such as pilings, power poles, wharves and navigation lights. The Osprey sometimes reuses nests for many consecutive years. This bird often indicates an active nesting area, as it is very vocal near nest sites, particularly during courtship. Flight displays occur in early spring when the Osprey returns to nest sites and consists of dives, plunges, and fish carrying and hovering while calling. Egg laying is from mid-April to early July and young are at the nest from late May to early September.

Osprey are distinct from others raptors by their ability to accept artificial nest platforms. This is a widely accepted practice throughout North America. If recommendations for artificial platforms are deemed necessary, Ewins (1994) (a construction manual for artificial platforms) and Witt (1997) may be considered for potential platform designs. If platforms are present in the study area(s) and need to be considered in the survey design, Witt (1997) has conducted surveys, which incorporated this into the survey design and in the statistical analysis.

Survey Notes

The RIC recommended methods for surveying the Osprey are aerial and boat surveys for nests during the breeding and non-breeding season and migration surveys during the non-breeding season.

Aerial surveys

- When surveying for ospreys stratification of quadrats based on expected raptor densities is often based on the number of kilometres of shoreline within each quadrat (Grier 1977, Hodges *et al.* 1984).
- Fly survey routes at speeds between 30-80 km/hr within 100 m of the shoreline and 50-200 m above the treetops.
- Helicopter flights should be flown a minimum of 50 m above the nest and should be terminated if birds are becoming agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.
- If a nest site is not seen to be occupied during the time the aerial survey is taking place, the origin of a nest site can be determined primarily by the location of the nest in the tree and the size and shape of the nest. Bald eagle nests are typically larger and cone-shaped, and are located below the crown; Osprey nests are typically smaller and rounder, and are located at the top of the tree (Mathisen 1968).

5.3 Eagles

5.3.1 Common ID Problems: Eagles

Immature Bald Eagles and Golden Eagles are commonly misidentified and their ranges frequently overlap, particularly during periods of migration. Refer to Table 6 below for the most diagnostic features to use in the field to identify these species. Note that the Bald Eagle has five recognizably different plumage patterns that are associated with age classes (Table 7).

Table 6. Diagnostic features to use to identify eagles in the field.

	Head Projection	Plumage
Bald Eagle	Head projects in front of the wings more than half the length of the tail.	Underneath white feathers found on the body and under wing coverts.
Immature Bald Eagle		Un-feathered lower tarsi.
Golden Eagle	Head projects in front of the wings less than half the length of the tail.	Underneath white/grey feathers only found in a blotch under the primaries. Completely feathered lower tarsi, unlike above.
Immature Golden Eagle		Distinguished from above by a distinct white tail with a broad black band and white markings on the wing at the base of the inner primaries and outer secondaries.

Table 7. Bald Eagle plumage patterns that are associated with age classes.

Classes	Age	Plumage Characteristics
Juvenile	1 year	Overall dark brown, dark belly (often tawny), some white paneling on underwings. Dark bill and cere, tail longer and wider than adults.
Basic 1	2 years	Overall dark brown inverted light coloured "triangle shaped" area in the centre of the back. White paneling on underwings, large white areas on belly. Rough edge on trailing edge of wing. Dark eyes, beak and cere.
Basic 2	3 years	Same as BASIC 1. With yellowish bill and cere. Smooth trailing edge of wing.
Basic 3	4 years	Similar to adult but dark streaking on head, often with a dark eyestripe. Immature tail with white mottling.
Adult 1st	5 years	Characteristic dark body with white head and tail. May have eyestripe, may have dark band on tip of tail. Some whitish feathers still visible underneath.

5.3.2 Bald Eagle B-BAEA *Haliaeetus leucocephalus*

BoBC-14; BH-220; NGS-184; PWB-180; HAWK-81; PGNAR-116

Species Description

Plumage: The adult is chocolate brown with a white head and tail. The legs are orange yellow.

Immature: Young are dark brown with highly variable white mottling. They have longer tails and wider wings than adults. They have a dusky head and tail and a dark bill. The body, wings, and tail of juveniles are marked with dirty white. All non-adult plumage has white breast spotting and white diagonal lines on the underwing.

Flight: As with the Golden Eagle its great size and long wings set it apart from all other raptors. The proportionately large head of the Bald Eagle protrudes beyond the body more than half of the tail length. The tail is short, and the wings appear uniformly wide, almost rectangular. The Bald Eagle soars with flat wings, and flies with slow, powerful wingbeats. It is usually associated with water.

Distinguishing Features: The large head and bill of the Bald Eagle are distinctive in flight.

Voice: Makes harsh, squeaky chitters and screams.

Habitat

The Bald Eagle is usually associated with aquatic environments including seashores, lakes, rivers and marshes. Migration occurs along seacoasts and river valleys, and large aggregations of birds occur in fall and winter (ecoprovinces: CAM, GED, SOI, SIM). It can be found in salmon spawning areas and near areas of surface-feeding fish on the ocean in summer.

Dense populations of eagles nest on the Queen Charlotte and Gulf Islands, however, they do breed throughout the rest of the province (Campbell *et al.* 1990). (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, TAP, NBM, BOP)

Diet

The Bald Eagle has a varied diet that includes fish and waterfowl. It also scavenges kills from other birds and fishing boats, and this opportunist will eat any available carrion.

Locating Nests

Nests are massive, cup shaped platforms, constructed of dead sticks and branches placed in the crotch or crown of the tree near the trunk. They are lined with grass, moss, bark, or conifer boughs. Nests are primarily found in coniferous forests near water. Large trees are important for nesting and roosting birds. Most nest sites have an unobstructed view of the surrounding landscape. Coastal nest sites are typically in live or dead trees including Douglas-fir, western red cedar, western hemlock, lodgepole pine, and black cottonwood. Interior nests have been found in black cottonwood, trembling aspen, and balsam poplar (Campbell *et al.* 1990, Buehler 2000). The Bald Eagle also occasionally nests on cliff ledges, and it has been known to nest on the ground on islands without trees.

Local residents and wildlife clubs often know of nest sites, so they should be contacted about nest locations before an extensive survey is conducted. For example, the Conservation Data Centre has maps of many Bald Eagle nests. If no prior knowledge is available, look for nests in the larger trees close (< 200 m) to water. Eagle pairs will evenly distribute along lakes, rivers or shoreline if nest sites and available food permit. As nest sites are approached, eagles will indicate a nest is near by circling and uttering a weak, gull-like alarm call. Egg laying is from early February to late June and young are at the nest from early April to early September.

Risks

The Bald Eagle is very sensitive to human activity. An eagle disturbed in feeding areas tends to leave and not return for several hours after human disturbance ceases (Stalmaster and Newman 1978). It is also easily disturbed in nesting areas, and will sometimes abandon nests disturbed at egg stage, or move to a new location in succeeding years.

Survey Notes

The RIC recommended methods for surveying the Bald Eagle are aerial surveys for nests and boat surveys during the breeding season, and migration surveys during the non-breeding season.

Aerial surveys

- When surveying for eagles stratification of quadrats based on expected raptor densities is often based on the number of kilometres of shoreline within each quadrat (Grier 1977, Hodges *et al.* 1984).
- Fly the survey route at speeds between 60 and 100 km/hr within 100 m of the shoreline and 20-100 m above the treetops (Bowman and Schrempf 1999, Jacobson and Hodges 1999).
- Helicopter flights should be flown a minimum of 50 m above the nest and should be terminated if birds are becoming agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.
- If a nest site is not seen to be occupied during the time the aerial survey is taking place, the origin of a nest site can be determined primarily by the location of the nest in the tree and the size and shape of the nest. Bald eagle nests are typically larger and cone-shaped, and are located below the crown; Osprey nests are typically smaller and rounder, and are located at the top of the tree (Mathisen 1968).
- Surveys should be conducted at least twice throughout the breeding season to ensure breeding success for a nest or nesting territory (Elliot *et al.* 1998, Gende *et al.* 1998, Anthony *et al.* 1999). First flights range from late March in the Georgia Basin to late April early May in the northern areas of the province. Second flights should be timed to count nestlings 5-8 weeks old before they fledge but when survivorship is higher (Elliot *et al.* 1998, Gende *et al.* 1998, Anthony *et al.* 1999).
- For verifying survey results detection rates applicable for coastal British Columbia can be found in Bowman and Schempf (1999).

Boat surveys

- Look for the white heads of adult birds standing out like a beacon from the dark forest foliage. Sightings of birds perched regularly in the same location over a number of days (March to April) often indicate an active territory or nest.
- Boat surveys can be conducted simultaneously with aerial surveys to help determine detection rates making survey results more precise.

5.3.3 Golden Eagle B-GOEA *Aquila chrysaetos*

BoBC–44; BH–218; NGS–184; PWB–180; HAWK–88; PGNAR–123

Species Description

Plumage: The adult Golden Eagle is evenly dark below, occasionally with a slight lightening at the base of the tail. The crown and nape are golden and the tail is slightly banded grey and brown.

Immature: Young seen from below have white markings on the wing at the base of the inner primaries and outer secondaries. They have a white tail with a broad dark terminal band.

Flight: Flat -winged gliding and soaring are characteristic of the Golden Eagle, though this bird sometimes soars with slightly upraised wings. Its great size and long wings set it apart from all other raptors except the similar sized Bald Eagle. In certain lights, the golden wash on the hind neck is discernible as the bird soars. The head of this bird projects less than one half the tail length. Flight displays occur in spring, and are mostly silent, sometimes accompanied by faint mewling cries.

Distinguishing Features: The head of the Golden Eagle projects less distance from the body than that of the Bald Eagle. The legs are feathered to the toes. The young Golden Eagle's sharply banded tail is distinctive. Young only rarely have white spotting on the body or wing coverts.

Voice: Typically silent, will occasionally make a yelping bark or *kya*.

Habitat

The Golden Eagle forages in a variety of open habitats from mountain slopes to valley and prairie pastures. In general, it is a bird of hilly country, found near open sloping terrain. In winter it moves to lower elevations. Migration is not well known. The Golden Eagle is found throughout the interior of the province, the Fraser Lowlands, and the east coast of Vancouver Island. Greatest numbers occur in the Northern Boreal Mountains ecoregion (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, BOP).

Breeding takes place in mountainous areas, along deep river canyons, and on large coastal islands (Campbell *et al.* 1990), (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, BOP).

Diet

The Golden Eagle preys upon mammals, including hares, ground squirrels and marmots. It will also scavenge dead animals, including road kills. This large raptor often hunts from a soaring position, using air currents and updrafts along sloped terrain.

Locating Nests

Nests are generally on cliff ledges, but also in trees, on bluffs and in caves. Tree nests have been found in Douglas-fir and ponderosa pine. Nests are large, built of thick branches and sticks and lined with green boughs, grasses, bark, and moss. The Golden Eagle is very shy of humans, and tends to sneak away from nesting territories rather than betray its presence (Beebe 1974). Therefore, the use of a spotting scope should be used to ascertain if a nest is present and active. Egg laying is from late March to early June and young are at the nest from early May to late August. Nests and nest sites are regularly reused and since good sites may contain several old nests, local wildlife organisations should be contacted before surveying new areas. Cliff nests will be streaked with whitewash. In places where whitewash accumulates, there is often growth of distinctive orange lichen, which can serve as a nest or perch site marker for this and many other cliff-nesting species.

Survey Notes

The RIC recommended methods for surveying the Golden Eagle are aerial surveys for nests, boat surveys during the breeding and non-breeding season, and migration surveys during the non-breeding season.

Despite their large size, the Golden Eagle is typically found only in more remote habitats (mountain/tundra) and therefore populations may go unnoticed even when they are relatively abundant within a region. Within a region their population density and productivity may both be relate to the abundance of prey, and consequently to cycles in prey density. Flight displays near nest areas are frequently seen in the spring, these displays are mostly silent, but occasionally are accompanied by faint mewling cries.

Aerial surveys

- Aerial surveys are more effective for estimating nesting populations than extrapolating based on numbers of adults seen soaring from below. Long-occupied territories may contain several old nests.
- When surveying for eagles stratification of quadrats based on expected raptor densities is often based on the number of kilometres of shoreline within each quadrat (Grier 1977, Hodges *et al.* 1984).
- Surveys should be conducted at least twice throughout the breeding season to ensure breeding success for a nest or nesting territory (McIntyre and Adams 1999). The first should be conducted before hatching and after laying in late April/early May. The second should be conducted when chicks are >51 days old but before fledging in late July/early August.
- Surveys should be flown at 30-40 km/hr with periodic hovering and a minimum of 65 m should be maintained between the helicopter and nest structures (McIntyre and Adams 1999). Flights should be terminated if the birds become agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.

5.3.4 Northern Harrier B-NOHA *Circus cyaneus*

BoBC-22; BH-226; NGS-188; PWB-170; HAWK-35; PGNAR-28

Species Description

Plumage: The adult male and female Northern Harrier are strikingly contrasting in plumage marking and size. The adult male is grey above, and mostly white below, with black wingtips. The female is brown above and whitish below, with brown streaking. Both sexes have a white rump patch. Females are noticeably larger than males.

Immature: Juveniles resemble females but are rich rufous brown in colour below and streaked only on the breast. In their second year males will have the characteristic basic plumage of mature male birds, but will also have many scattered immature rufous feathers especially on the back.

Flight: A medium sized hawk, the Northern Harrier has a slim body, and the wings and tail are long and narrow. Wings are held above the body in flight (dihedral). Northern Harriers glide buoyantly and unsteadily, and hunt with a slow, quartering flight. These birds generally perch and fly low to the ground, rarely soaring.

Distinguishing Features: The white rump patch is distinctive. This bird has an owl-like facial disk - the dark head of the female appears hooded. The dark wingtips of the male are distinctive when the bird is seen flying overhead.

Voice: Nest alarm call is a rapid, nasal, *ke ke ke ke ke*.

Habitat

The Northern Harrier frequents almost any type of open territory. It uses marshes, fields, grasslands, and meadows. It will also use human-altered habitats like airports, agricultural fields and golf courses. The Northern Harrier is widely distributed throughout British Columbia. In winter, large numbers can be found in the Fraser Lowlands. During the spring and fall, migrating birds can be seen flying above all types of habitat (ecoprovinces: CAM, GED, SOI, SIM).

The Northern Harrier nests in a variety of habitats including savannahs, sloughs, marshes, open fields and bums (ecoprovinces: CAM, GED, SOI, SIM, CEI, NBM, BOP).

Diet

Voles and mice are the main food of the Northern Harrier but it will also take other small mammals and birds.

Locating Nests

The Northern Harrier courtship displays can be seen over nest areas in April and May, with both birds are circling over the nest area. Two birds at a site are indicative of a breeding territory. Egg laying is from mid-April to early July and young are at the nest from mid-May to early August. Perch sites are low to the ground: stumps, fence posts, hummocks or low trees. Pellets can be seen at the base of these sites in occupied territories.

Nests are found on the ground in the open, often in areas of bulrush and cattails. The nests are concealed by shrubs, reeds, or grasses and are often on a raised hummock surrounded by water (Campbell *et al.* 1990). The location of Northern Harrier nests requires careful observation of the female's behaviour. Nests are best located in the early nestling period, mid-May to mid-June. Females will fly off the nest to preen in the very early morning. Once the chicks have hatched, prey deliveries are key to locating the nest. The male will fly in to the nest area with food. The female Northern Harrier flies off the nest to meet the male, and the transfer of prey items takes place in the air. The female then returns to the nest. These activities are best observed from afar, when birds are unaware of the viewer's presence. Once the general nest area is ascertained, it is a matter or walking along a sight line or bearing towards it. Alternatively if hand held radio transmitters are available, then the observer who has pinpointed the nest location can walk another observer in to the nest site. This is best accomplished when the female is sitting; if both birds are circling and calling in the air the nest will be difficult to find. Otherwise, walk in to the suspected location until the female flushes (often not until the surveyor is a metre or less from the nest itself). In later stages of nesting, chicks will 'run' from the nest to hide in nearby vegetation. The Northern Harrier will chase off other predators who stray into the nest area.

Risks

The Northern Harrier rarely, but occasionally, hits humans when approaching nests. Ground-nesting species are particularly vulnerable to predation. Time spent by humans in the nest area must be kept at a minimum, as calling and diving Northern Harriers may alert predators to nest location.

Survey Notes

The RIC recommended methods for surveying the Northern Harrier are roadside surveys during the breeding and non-breeding season and migration surveys during the non-breeding season.

5.4 Accipiters

5.4.1 Common ID Problems: Accipters

From central British Columbia south to the United States border there is the possibility of encountering all three species of accipiter, and further north both Northern Goshawks and Sharp-shinned Hawks can be present in the same area. It is therefore important to know the characteristics that will distinguish between these very similar looking species.

Sharp-shinned Hawk versus Cooper's Hawk

The Sharp-shinned Hawk is the smallest accipiter found in British Columbia, but females are comparable in size to male Cooper's Hawks. Both adults and juveniles of each species have very similar plumage patterns, and the subtle differences between them are often difficult to discern in field.

In flight or perched the Sharp-shinned Hawk has angular corners to the tail, while the Cooper's Hawk has rounded corners. With experience, it becomes apparent that the extension of the head in front of the wings in the Cooper's Hawk is noticeably further than that of the Sharp-shinned Hawk.

Northern Goshawk versus Cooper's Hawk

This bird is larger than Cooper's Hawk and the plumage of the adults is distinctive with a light grey breast, a slate grey back and a white eyestripe which contrasts with their dark crown.

Accipiters in Flight

In flight all three birds have very similar shapes, which makes it difficult to identify the birds when seen high in the sky, where no reference to scale can be gained. In this situation one of the key aids to identification is the appearance of the flight itself.

Accipiter Species	Flight
Sharp-shinned Hawk	Buoyant, rapid flight.
Cooper's Hawk	Heavier, slightly slower flight.
Northern Goshawk	Fast, powerful, minimal wing flapping

5.4.2 Sharp-shinned Hawk B-SSHA *Accipiter striatus*

BoBC–24; BH–226; NGS–190; PWB–172; HAWK–38; PGNAR–32

Species Description

Plumage: The adult Sharp-shinned Hawk is dark blue grey above. Its white underparts are barred with rufous or cinnamon. The crown of the head is slate or dusky grey, blending into the back. The undertail coverts are white. Straight dark bands with a thin white terminal band cross the tail. Females are separably larger. For a similar sized species refer to the Merlin description.

Immature: Young are brownish above, with minimal white mottling. The underparts are streaked with tear-shaped reddish brown markings.

Flight: The Sharp-shinned Hawk is the most buoyant, fast flying of the accipiters. Like the others it flies with several quick wingbeats and a glide. Sharp-shinned hawks have the typical long tail and rounded wings of an accipiter, but although they are the smallest, they are also the most robust of the family. Thus in flight they have a chunky appearance.

Distinguishing Features: The tail of the Sharp-shinned Hawk can be distinguished from that of the remarkably similar Cooper's Hawk because the Sharp-shinned Hawk's tail is square or notched at the tip when folded, and even when fanned shows the presence of 'corners'. When gliding, the head of the Sharp-shinned Hawk does not extend far beyond the wrists.

Voice: Alarm is a high, shrill *kik kik kik kik*. It is similar to that of the Northern Goshawk, only much higher in pitch.

Habitat

The Sharp-shinned Hawk is primarily found in semi-open and forested areas, most commonly frequenting dense immature stands with an open understory. Breeding is more common at higher elevations, and also near water sources, including creeks, bogs, and lakes. This species is widely distributed throughout British Columbia, breeding throughout the province (ecoprovinces CAM, GED, SOI, SIM, CEI, TAP, NBM, BOP).

Wintering areas are along the southwestern coast of Vancouver Island, the Fraser Lowlands and the Okanagan valley (Campbell *et al.* 1990). The Sharp-shinned Hawk is very common during migration (ecoprovinces: CAM, GED, SOI, CEI).

Diet

The Sharp-shinned Hawk preys primarily on small passerine birds and some small mammals. The alarm calls and mobbing action given by such birds often indicates that a Sharp-shinned Hawk is in the area. During its nesting period it takes a high proportion of its diet in passerine nestlings from open cup nests and fledglings (Bildstein and Meyer 2000).

Locating Nests

Generally the habitat is indicative of the nesting area of this particular accipiter. Ground searches of the area should then be conducted to locate plucking sites, which are commonly

found on low-lying logs or stumps, scattered around the nest area. Another sign is whitewash streaks, which although similar within the accipiter group, are smaller for Sharp-shinned Hawks. Nests are built of small twigs and are up to 30 cm in diameter. Nests are usually well concealed near the base of the canopy and placed next to the trunk of a tree, usually less than 6 m from the ground. However, on Vancouver Island nests have been observed as high as 30 m above ground (E. McClaren pers. obs.). The species' secretive nature and dense vegetation of its nesting habitat make it difficult to find and study during the breeding season (Bildstein and Meyer 2000). Egg laying ranges from late May to early July and young are at the nest from June to mid-August.

Risks

Disturbance of breeding birds should be kept to a minimum, therefore limit searching for nests until after the young have hatched.

Survey Notes

The RIC recommended method for surveying Sharp-shinned Hawks is call playback during the breeding season. Additionally, standwatches may be used to supplement call playback surveys and to aid with locating nests during the breeding season. Migration surveys can be used during the non-breeding season, when the bird is best seen and large numbers of individuals concentrate along major migratory corridors and bottlenecks (Bildstein and Meyer 2000).

Call playback surveys

- Although playback has been recommended as a survey method for Sharp-shinned Hawks, not all birds will respond. (Do not use for relative abundance).
- Timing
  - It is important to note that some raptor species have more than one call and they will respond to these calls differentially, depending on the time of year.
  - Conduct surveys from daybreak to sunset.
- Interstation Distance
  - Distance between call playback stations suggested by Mosher *et al.* (1990) for Sharp-shinned Hawks is 0.8 km.

5.4.3 Cooper's Hawk B-COHA *Accipiter cooperii*

BoBC–26; BH–228; NGS–190; PWB–172; HAWK–41; PGNAR–35

Plumage: The Cooper's Hawk is dark blue-grey above. The white underparts are barred with fine rufous markings. The tail is crossed by straight dark bands and has a broad white terminal band. The blackish crown of this bird contrasts with its pale nape and grey back.

Immature: Young are brownish above, often spotted with white on the back, and creamy below, with brown streaks. They are distinct from those of the Sharp-shinned because this streaking is neat and fine, and restricted to the chest area.

Flight: The Cooper's Hawk is crow-sized. Its shape is characterized by short, rounded wings and a very long rounded tail. In flight, the head of the bird protrudes well ahead of the wings. It flies with the typical five-flaps-and-a-glide flight of the accipiter (Beebe 1974). Wing beats

are slower than Sharp-shinned Hawks, and flight movements appear almost stiff. Cooper's Hawks will also soar frequently, particularly in the early part of the breeding season. When hunting, this hawk flies beneath the tree canopy, close to the ground, but may be seen flying above the canopy when carrying prey.

Distinguishing Features: The best field marks for the Cooper's Hawk are the rounded tail, dark crown, and the broad white terminal band on the tail. This bird is larger than the Sharp-shinned Hawk and smaller than the Northern Goshawk, however this is often very difficult to distinguish when the bird is seen in the field.

Voice: Alarm call is a harsh, raspy *cac cac cac cac*

Habitat

The Cooper's Hawk uses a wide range of habitat, but are usually found in mixed deciduous/coniferous forests. It is relatively tolerant of human disturbances and habitat fragmentation; it breeds in urban settings such as parks and golf courses, and in winter is sometimes found in gardens, particularly in the vicinity of bird feeders. The Cooper's Hawk is found breeding throughout the southern half of British Columbia, including Vancouver Island (ecoprovinces: CAM, GED, SOI, SIM, CEI).

In winter, many of the birds move south but some birds overwinter in the southern part of the province. The Cooper's Hawk is observed most often on southern Vancouver Island, the Fraser Lowlands and the Okanagan in mixed habitats (ecoprovinces: CAM, GED, SOI, SIM).

Diet

The Cooper's Hawk primarily preys on passerines, but will take any birds ranging in size from chickadees up to pheasants and mallards (Beebe 1974).

Locating Nests

Courtship displays begin from mid-April to early May, and on sunny days both male and female birds can be seen soaring and diving over the nest area, with both sexes often flying with slow, exagerated wing beats, and fanned undertail coverts (Rosenfield and Bielefeldt 1993). These displays are brief; the birds then drop into the trees (Beebe 1974). Nest building or repair also takes place during this period. Egg laying is from late April to late July and young are at the nest from early June to late August.

The Cooper's Hawk generally nests in the same area each year, and sometimes in the same nest. Preferred nest areas often contain several old nests. Nests in deciduous trees are most easily identified before leaf-out. Most nests that have been located in British Columbia are in coniferous trees, but the top three species are Douglas-fir, birch, and black cottonwood (Campbell *et al.* 1990). Nest heights are generally 8–15 m, and nests are often in a tree crotch close to the trunk. Nests are made of twigs and are flat-topped with a shallow cup, and can be distinguished from other hawk nests because they are often lined with bark flakes (Craighead and Craighead 1969). Many breeding Cooper's Hawks are inconspicuous, neither vocalizing nor behaving aggressively in human presence. Instead, they will sometimes silently leave the nest vicinity when it is approached (Rosenfield and Bielefeldt 1993). Plucking sites are usually within site of the nest, usually on a large horizontal limb or on a low stump or leaning

log. Listening for the alarm calls of its avian prey can also indicate the possible presence of these hawks.

See below for use of the dawn vocalization technique in locating nests during the pre-incubation stage (Stewart *et al.* 1996). Rosenfield *et al.* (1985) found broadcasting conspecific calls useful for eliciting responses and as an aid in finding nests of breeding Cooper's Hawks. They found that broadcasts during pre-incubation (from the time of arrival at nesting areas until egg-laying) and post-incubation (nestling to fledgling period) were more likely to elicit a response and thus lead to the discovery of a nest than broadcasts during incubation. This is likely due to the fact that males spend more time away from the nest and females are reluctant to leave or call from the nest during incubation (Rosenfield *et al.* 1988).

Risks

The Cooper's Hawk can be pugnacious at the nest, and some individuals will occasionally strike at human intruders.

Survey Notes

The RIC recommended method for surveying the Cooper's Hawk is call playback during the breeding season. Migration surveys can be used during the non-breeding season. As well, dawn vocalization surveys are effective at locating nest sites in small, accessible forest patches during courtship and for determining reoccupancy of known breeding areas and locating alternative nest sites within these sites (Stewart *et al.* 1996).

Call playback surveys

- Rosenfield *et al.* (1988) found broadcasting conspecific calls useful for eliciting responses during pre-incubation (from the time of arrival at nesting areas until egg-laying) and post-incubation (nestling to fledgling period) than during incubation. This is likely due to the fact that males spend more time away from the nest and females are reluctant to leave or call from the nest during incubation (Rosenfield *et al.* 1988).
- Timing
- It is important to note that some raptor species have more than one call and they will respond to these calls differentially, depending on the time of year.
- Cooper's Hawks are vocal near nests particularly in the pre-incubation stage (Rosenfield and Bielefeldt 1991). During this stage, vocalizations and nest-building activities are most pronounced at dawn (Rosenfield and Bielefeldt 1993).
- Conduct surveys from daybreak to sunset.
- Interstation Distance
- Distance between call playback stations suggested by Mosher *et al.* (1990) for Cooper's Hawk is 0.8 km.
- For intensive presence/not detected surveys Mosher and Fuller (1996) suggest stations be placed about 0.5 km apart (i.e., it is not critical that stations are independent of each other).
- Repeat surveys every 5-10 days because breeding chronology varies among pairs and there is a relatively low probability of detection (Mosher and Fuller 1996).
- Mosher and Fuller (1996) found that a relationship existed between the number of Cooper's Hawk responses to Great Horned Owl calls and the number of Cooper's Hawk

pairs present and thus were able to obtain relative abundance estimates for Cooper's Hawks.

Dawn vocalization surveys

- Stewart *et al.* (1996) found this technique to be effective in detecting territorial and breeding Cooper's hawks in urban areas where nest sites were in small isolated woodlands (e.g. parks, golf courses), where hawks were habituated to the presence of humans; and where nests were concealed in tall coniferous trees.
- Cooper's Hawks are vocal near nests particularly in the pre-incubation stage (Rosenfield and Bielefeldt 1991). During this stage, vocalisations and nest-building activities are most pronounced at dawn (Rosenfield and Bielefeldt 1993). With ideal weather (e.g. no wind or rain), and low noise (e.g., traffic), Stewart *et al.* (1996) reported these calls were audible at distances of up to 150 m.
- Stewart *et al.* (1996) took advantage of this conspicuous behaviour and surveyed for Cooper's Hawks nesting in the Victoria area during the first 30–90 minutes of daylight. Using this 'dawn vocalisation technique' they found Cooper's Hawks to be readily detectable with vocalizations being most pronounced from late March through early April and decreasing as egg laying approached in late April. Earlier surveys were useful to detect single and paired birds, but repeated visits were required to confirm nesting. When a breeding pair was detected, surveyors watched for nest building activity to locate the actual nest tree.

5.4.4 Northern GoshawkB-NOGO *Accipiter gentilis*

BoBC–28; BH–228; NGS–190; PWB–172; HAWK–43; PGNAR–38

Species Description

Plumage: The back and upperwing coverts of the Northern Goshawk are slate blue in colour. The head is black with a thick white eye stripe. Underparts are pale blue-grey with fine grey barring. The tail is dark grey with indistinct dark banding. The undertail coverts are white and fluffy. Females are larger, darker and have coarser barring on the underparts.

Immature: Young are brown above, with buffy underparts heavily streaked, particularly on the flanks and undertail coverts. The cream-coloured stripe over the eye is distinctive. The tail has wavy brown streaks and ends in a narrow white band. When perched near to or on the ground their general appearance and size is very similar to the female Northern Harrier, but the Northern Harrier has a distinctive facial disc and lacks the Northern Goshawk's eye stripe.

Flight: This is the largest accipiter (Raven-sized). It flies with powerful, stiff wingbeats. The Northern Goshawk soars on level wings, sometimes appearing buteo or harrier like. Their tapered wings are long for an accipiter. The tip of the tail is wedge-shaped when folded.

Distinguishing Features: The pale grey breast, large size and pronounced white eye stripe of the Northern Goshawk are distinctive.

Voice: Alarm call is a loud, high pitched, non-raspy *ki ki ki ki ki*.

Habitat

The Northern Goshawk generally nests in dense coniferous mature forest (though sometimes in aspen groves), which can be described as mossy and dark, with little undergrowth and ample low flying room. The Northern Goshawk often uses areas of dense forest near open waterways or glades, which allow access to nest area and travel routes to hunting areas (ecoprovinces: CAM, GED, SOI, SIM, CEI, NBM, BOP).

Year round Northern Goshawks reside in habitat similar to breeding habitat (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, TAP), however they may use a greater variety of habitats for hunting during the winter when prey levels are lower (i.e. alpine areas, estuaries, farm fields, sagebrush). The Northern Goshawk is widely distributed throughout British Columbia, yet are seen much less often than other raptors because it does not generally soar or circle above the forest canopy.

Diet

The Northern Goshawk appears to be an opportunistic hunter feeding on medium-sized birds and mammals including: jays, thrushes, crows, snowshoe hare, ground squirrel, red squirrel, grouse, and (at higher elevations) ptarmigan. Early in the nesting period, the female broods while the male hunts; later both birds hunt. The male returns to the nest with food, flying low along an access route to the nest area and then in a direct line to the nest.

Locating Nests

Egg laying is from early April to mid-July and young are at the nest from late May to late August. Nests are made of sticks and are placed in crotches near the trunk. In deciduous trees, the nest is often at the base of the crown (Siders and Kennedy 1996). In conifers, the nest is usually located next to the trunk at the base of the crown. Nests in aspen are particularly visible in early spring before leaf-out, and nests from previous years (often closely spaced) can alert ground or air surveyors to the fact that the area is used by Northern Goshawks, who may return to breed.

If a bird responds to playback, the area from which the bird called or the direction from which the bird flew towards the playback should be searched thoroughly. If you are close to the nest the birds will often fly around the area calling and may attack. The whitewash 'streak' of the Northern Goshawk is an identifying feature. The area around the nest site is decorated with long thin white streaks beneath perch sites and plucking sites. These plucking sites, where the birds dismember and eat their prey, are low branches, stumps, deadfall logs, or even mounds of earth. Visual searches of suspected nesting areas are aided by the presence of scattered feathers, pellets, and bones, especially hare and grouse feet. Pellets of Northern Goshawks can be distinguished from those of other accipiters by their size (about 5 cm x 2 cm), and from those of other raptors by their location under dense forest canopy.

Risks

The Northern Goshawk can be pugnacious at the nest, and some individuals will strike at human intruders.

Survey Notes

The RIC recommended method for surveying the Northern Goshawk is call playback during the breeding season. Migration surveys can be used during the non-breeding season. Aerial surveys of deciduous habitats before leafout are also used to locate potential goshawk nest sites.

Northern Goshawk populations are known to be tied in with the snowshoe hare cycle, and "invasions" of this species are seen periodically on a 1–2 year lag with peak hare populations. During this time the Northern Goshawk is seen in large numbers south of their usual range and on migration surveys (Mueller *et al.* 1977).

Call playback surveys

- Utilise information from anecdotal Northern Goshawk sightings by local residents and forestry workers. Catalogue these sightings for potential follow-up surveys at the beginning of the field season and for use in establishing potential Northern Goshawk areas.
- Dense patches of forest can be surveyed by using playback on nearby hills, ridges, or eskers as playback often causes an adult Northern Goshawk to fly up and perch above the nest site, where its 'silver' breast will be clearly visible from a nearby vantage point. Northern Goshawks will respond with greater speed and frequency to conspecific playback than to Great Horned Owl hooting playback.
- Timing
- Conduct playback surveys through the nestling and post-fledgling periods (dates may vary with latitude). The likelihood of locating active nest sites is greater during the nestling period because adults respond closer to their nest sites whereas juvenile responses during the post-fledgling period may be at great distances from active nest sites.
- Conduct surveys from daybreak to sunset. Kimmel and Yahner (1990) tested the influence of time of day on detection rates using the alarm call and reported no influence of time of day. However, if using the juvenile begging call it may be more effective broadcasted in the early morning, which is the 'peak hunger' time for nesting females and chicks.
- Interstation Distance
- Transects should be spaced 400 m apart.
- Distance between call playback stations should be 400 m (Kennedy and Stahleker 1993) when the objective is to cover as large an area as possible. In denser, coastal forests, spacing transects and broadcast stations 200-m apart may elicit higher detection rates if the survey objective is to conduct intensive surveys of an area of interest (McClaren 2001).
- It is important to note that the Northern Goshawk has more than one call and will respond to these calls differentially, depending on the time of year.
- Note that playing calls during incubation may result in addled eggs and goshawks are less responsive to calls during this time. It is ideal to determine the breeding chronology for a specific area before broadcasting calls.
- Use the alarm call during the nestling period (May 15 to July 1) as it elicits the highest detection rates from Northern Goshawk adults. Broadcasting using the alarm call was tested on Vancouver Island and resulted in a 60% detection rate (McClaren 2001).

- Use the begging call during the fledgling dependency period (July 1 to August 31), as this call elicits the highest detection rates from juveniles, as well, adults are less responsive to the alarm call during this time. Broadcasting using the juvenile begging call was tested on Vancouver Island and resulted in a 75% detection rate during the fledgling-dependency period (McClaren 2001).
- If your project objective is to thoroughly survey an area (i.e. proposed cutblocks; known territories for alternative nest sites) then you may want to consider surveying the area using both calls (each at the appropriate time of year). On Vancouver Island, crews have often had detections when using the begging call during the second survey even though no adults were detected during earlier surveys in the same area. These surveys also allow the crew to document whether young fledged in an area, however, it is often more difficult to locate the nest during this time period (E. McClaren, pers. comm.).
- Surveyors must be vigilant and scan in all directions as a response to call playback may merely be a silent bird gliding in for a closer look. Emphasis should be on quality of the call stations, not quantity to achieve accurate detection results. Some researchers have reported that the most valuable part of call playbacks may be that it forces surveyors to walk through a stand and systematically stop and listen every few hundred metres. This has resulted in the detection of many nests, particularly after the young have fledged; a time at which they become very vocal, frequently emitting begging calls independent of call playback responses.
- Northern Goshawks should be surveyed over several years to determine presence/not detected in suitable habitat (Doyle and Smith 1994) because their breeding cycle may fluctuate with that of prey and they may not call or respond to call playback in every year.

Standwatches

- Standwatches have been used often as a supplemental survey technique for detecting Northern Goshawks.
- Preliminary results indicate that standwatch surveys are more successful at detecting Northern Goshawks in the pre-nesting season (during a period which coincides with high levels of courtship activity) (Chytyk *et al.* 1997) and post-fledgling (E. McClaren, pers comm.) periods than during the incubation and nestling phases.
- Conducting call playback surveys and nest searches in conjunction with pre-nesting standwatch detections (after strong territorial behavior or goshawks carrying prey are observed) will likely be necessary as follow-up techniques to locate active nest trees.
- If standwatches are to be conducted, select days when weather conditions may be expected to encourage display activity above the canopy (warm and dry), and days when birds are readily seen and heard (not cloudy, rainy or windy conditions), (F.Doyle pers. comm.).

5.5 Buteos

5.5.1 Common Identification Problems

Red-tailed Hawk and Rough-legged Hawk

These two species of buteo overlap in distribution throughout British Columbia in the spring and fall months as Rough-legged Hawks migrate to and from their breeding grounds in northern Canada. Both species have multiple variations in both body and wing plumage patterns, which can overlap 100 % with each other. However, they do have typical plumage patterns individual to the species, which are discussed in the species identification notes below (Table 8).

Table 8. Diagnostic features to use to identify Rough-legged Hawks from Red-tailed Hawks in the field.

Species	Tail	Legs	Wings and Flight
Rough-legged Hawk	Broad black band	Feathered legs	Long wings, buoyant flight, occasionally hovers
Red-tailed Hawk	Black band is small, faint or absent	No feathers on legs	Shorter wings, heavier flight, rarely hovers

5.5.2 Broad-winged Hawk B-BWHA *Buteo platypterus*

BoBC–30; BH–230; NGS–192; PWB–176; HAWK–56; PGNAR–56

Species Description

Plumage: The upperparts of the Broad-winged Hawk are a uniform dark-brown in colour. Underparts are white with rusty barring. Underwings are white with dark tips forming a dark border around the wing. The tail is black, banded with several white bands, the last white band being wide and distinct. A rare dark morph of this hawk breeds in Alberta and may be seen in British Columbia. This bird has a dark brown head, body and underwing coverts, and the same dark band on the trailing edges of silvery flight wings. The tail is similar to that of the light morph.

Immature: Young typically have a black facial whisker stripe. Their underparts are cream with dark blotches. The tail banding is indistinct, but the dark-bordered underwings are characteristic. Its tail is shorter than that of juvenile and immature accipiters, and it lacks their white eye stripes.

Flight: This crow-sized hawk is much smaller and stockier than other buteos. The wings are broad, but very pointed for a buteo. Active flight is with strong, stiff wingbeats. The Broad-winged Hawk soars and glides on flat wings and does not hover. It often perches low to the ground.

Distinguishing Features: The black wing borders and thick white tail band are the best field marks for the Broad-winged Hawk, apart from its small size.

Voice: Call is a thin, shrill, descending whistle: *pee-teee*.

Habitat

The Broad-winged Hawk inhabits deciduous woodlands of trembling aspen and birch. It nests in continuous deciduous or mixed forest with clearings, and nearby water. In recent years, the Broad-winged Hawk has established itself in the Peace Lowland area of British Columbia, particularly near Fort St. John (Campbell *et al.* 1990), (ecoprovince: BOP). Breeding has recently been recorded in this region of the province (Fraser *et al.* 1999).

The Broad-winged Hawk is rare, but regular fall migrants are seen on extreme southern Vancouver Island. The Broad-winged Hawk migrates to southern United States, Central and South America.

Diet

The Broad-winged Hawk perch-hunts for insects, voles, amphibians and small birds.

Locating Nests

Nests are located most often in the first main crotch of deciduous trees or on a platform of horizontal branches against the trunk of a conifer, usually in the lower third of the canopy. Prior to incubation, active nests can be identified by the presence of fresh conifer sprigs (Goodrich *et al.* 1996). Nests can be located by the use of standwatches to indicate the regular presence of birds, and then searching of suitable nest sites. Before leaf-out, a survey of stands may reveal the presence of old nests, these are sometimes reused, and any stand that has a nest is also more likely to be used by the hawks in subsequent years. Another technique that may help locate specific nests in areas where pairs of hawks are known to breed is the use of call playback. In 14 of 90 instances, breeding Broad-winged Hawks responded to call playback, usually by vocalising and flying low towards surveyors (Balding and Dibble 1984, Mosher *et al.* 1990).

Survey Notes

The RIC recommended method for surveying the Broad-winged Hawk is migration surveys during the non-breeding season.

Territorial Broad-winged Hawks give a plaintive whistle (*peee mm*) while making occasional soaring flights above the forest canopy. These calls are given from the nest and in flight throughout the year. The Broad-winged Hawk will defend the nest site against other hawks.

5.5.3 Swainson's Hawk B-SWHA *Buteo swainsoni*

BoBC–32; BH–234; NGS–194; PWB–174; HAWK–61; PGNAR–63

Species Description

Plumage: The plumage of the Swainson's Hawk is extremely variable which makes it difficult to distinguish from other species. The upperparts of the adult are a smooth dark brown in colour. The **light morph** has a white throat patch above a dark brown breast band or bib. The underparts are otherwise whitish. Light wing linings contrast with dark barred flight

feathers, which are darkest at their tips. The **dark morph** has wings that are dark throughout, including the flight feathers, and a narrowly banded tail. The tail is slightly lighter towards the base; combined with uppertail coverts, the base of the tail may appear whitish, especially in flight. Intermediate colorations of the Swainson's Hawk include a reddish plumage. The legs are half feathered versus the fully feathered Ferruginous and Rough-legged Hawks (England *et al.* 1997).

Immature: Young have white spotting on upperparts, and often a white rump band. The light morph young have a dark whisker streak and whitish eyebrows. They show less contrast between wing lining and flight feathers than adults.

Flight: The Swainson's Hawk has long tapering to pointed wings (not as extreme as those seen in falcons). It hunts from posts and low trees, and soars over open areas. The flight is teetering and vulture-like, with wings held above the horizontal in a V shape and in a dihedral during soaring (England *et al.* 1997).

Distinguishing Features: A buteo about the size of a Northern Harrier, with a slim appearance and only three notched primary feathers as opposed to the four or five of other buteos. The long wings of this hawk, with their distinctive pointed tips, are a good field mark. The dark steely grey of the flight feathers is also a key to identification, as is the white undertail coverts in the dark morph. The Swainson's Hawk lacks the Red-tailed Hawk's pale mottling on the shoulders.

Voice: Makes a shrill, plaintive whistle - *kreeeeer*- that is higher-pitched than the Red-tailed Hawk's and fades off toward the end.

Habitat

Generally a bird of open country, the Swainson's Hawk inhabits grasslands and rangelands, burns and clear cuts. It breeds in open mixed forests and groves near such areas, throughout the Thompson-Okanagan plateau and has been noted in the Bulkley Basin Ecosection (F. Doyle pers. obs.) (ecoprovinces: CAM, CEI, SOI, Campbell *et al.* 1990). This migratory bird is found mainly in the southern and central interior of British Columbia, and winters predominantly on the Pampas in Argentina.

Diet

The Swainson's Hawk feeds mostly on small mammals, birds and reptiles during the breeding season and on large invertebrates, especially dragonflies and grasshoppers at other times (England *et al.* 1997). It hunts from perches such as utility poles or fence posts. It forages in open grassland, shrub steppe and agricultural areas. Most prey is captured on the ground, but is sometimes chases down insects on the run or with short leaps (England *et al.* 1997).

Locating Nests

As with many of the hawks, nests can be located by surveying wood lots for old nests prior to leaf-out. These nests or wood lots will often be re-used by a pair of birds however, England *et al.* (1997) found that more than 50% of nests were freshly built. After leaf-out or in areas of coniferous trees, standwatches and roadside surveys can be used to detect the presence of birds in the area, a concentration of activity often indicating a nest site. Nest sites in British

Columbia are usually in upland areas of foothills and valleys (Campbell *et al.* 1990). These hawks often reuse nests, building large stick structures in both conifers (often ponderosa pine) and deciduous trees like cottonwood and aspen. The nest appears more flimsy or ragged than that of other Buteo's. It can be any height but is usually near the top of the tree within the crown on a small limb (England *et al.* 1997). The Swainson's Hawk is a fairly silent bird. When disturbed on nest sites, it makes a call similar to that of the screech of the Red-tailed Hawk, but less raucous. Young birds have a sustained wailing cry during the latter part of the nestling period and prior to leaving the nest. Sprigs of greenery in nests indicate active sites. Egg laying is from early May to early July and young are at the nest from early June to mid-August.

Survey Notes

The RIC recommended methods for surveying the Swainson's Hawk are roadside surveys and standwatches during the breeding season and migration surveys during the non-breeding season.

The Swainson's Hawk is a relatively non-aggressive, even gregarious bird in interactions with other Swainson's Hawks, sometimes even hunting in a group (Beebe 1974 and England *et al.* 1997).

5.5.4 Red-tailed Hawk B-RTHA *Buteo jamaicensis*

BoBC–34; BH–232; NGS–194; PWB–174; HAWK–69; PGNAR–82

Species Description

Plumage: The plumage of this commonly seen hawk is extremely variable. In British Columbia the plumage patterns of the Red-tailed Hawk range from the classic light morph bird to the very dark "Harlan's Hawk", with many inter-gradations in between. The **light morph** Red-tailed Hawk adults display a bellyband of dark streaks on whitish underparts or a rufous wash over the entire belly. A dark bar on the leading edge of the underwing contrasts with pale wing linings. There is also often a dark carpal patch or 'comma'. Primaries and secondaries are often crossed with narrow dark bars. The tail is reddish above, pale red underneath, with a narrow black subterminal band. The undertail appears reddish, particularly in strong light. The **dark morph** Harlan's Hawk, subspecies *harlani*, is common in British Columbia, particularly in northern parts of the province. This is a brown or blackish bird with a dusky-white or mottled greyish tail, and diffuse black terminal band. There may be white streaking on the dark breast and back. The silvery flight feathers contrast with dark coverts. The upperparts of the Red-tailed Hawks range in colour from grey brown to dark brown or rufous.

Immature: Young tend to look more slender than adults, with longer wings and tails. All immatures have grey-brown tails, many with narrow blackish bands. They are heavily brown-streaked and spotted on the underparts.

Flight: The Red-tailed Hawk is a large, stocky, usually dark-headed buteo. The wings are broad and faintly rounded. This hawk is commonly observed soaring, or hunting from a perch overlooking an open area. It often soars with wings in a slight dihedral and glides on flat wings.

Distinguishing Features: The spotted breast band, dark shoulder markings, dark carpal marks (also present on Rough-legged Hawks), and pale inner primaries of light morph are all good field marks for the Red-tailed Hawk, but are not present on all birds. The white-mottled or barred tail of the Harlan's or the rufous tail of others is also distinctive.

Voice: Call is often heard — a harsh, raspy, descending *keeeeer*, or *tseeeer*.

Habitat

The Red-tailed Hawk can be found breeding throughout the province in any habitat which provides mature trees big enough to support a nest (ecoprovinces: CAM, GED, SOI, SIM, CEI, BOP). Nest sites can be a single tree in an open area or a tree in the centre of a large stand.

In winter, most birds migrate south, but some birds over-winter in the Fraser Lowlands, and throughout much of southern British Columbia (ecoprovinces: CAM, GED, SOI, SIM).

Diet

The Red-tailed Hawk is an opportunistic generalist, typically taking smaller mammals and birds.

Locating Nests

These birds build a large stick nest 50-cm in diameter, located in the crown of deciduous or coniferous tree. They are often on the edge of a forest stand and usually in a tree with good all round visibility. In deciduous habitat, aerial or ground transects can be used before leaf out to locate old nest sites. These nests may be reused, or a new nest may be built in the same stand. Birds will often be seen perching in tall trees (offering a good all round view of the area) adjacent to the nest site. In sunlight, the breast of the bird can be easily observed through binoculars, and in this way, observers can locate nests by scanning an area using a vantage point.

Early in the breeding period, both birds will display high in the sky, over the top of the nest area, circling and making short dives towards the nest site. Repeated calls of the Red-tailed Hawk's distinctive raspy screech will often alert surveyors to the presence of a nest site in the area. Egg laying is from late February to late June and young are at the nest from early April to early August. The best time to search for Red-tailed Hawk nests is after the eggs are hatched. During egg stage females will often sit quietly on nests, even when the observer passes close by. After chicks have hatched, adult birds become very vocal in the presence of human intruders. However, birds will try to draw intruders away from the nest by circling away from it. Look for a large stick nest decorated with whitewash, feathers or white chicks. The female's begging call is also a clue, and later in the nesting period so are the calls of the hungry chicks. If the birds are giving alarm calls, the female is typically already off the nest and subsequently the nest will be difficult to locate. If the general location of the nest is known, it is best to return to the nest area later. At this time, the nest may be located by quietly moving in, then locating the nest as the female flushes and typically calls as she takes flight. It should be noted that once a nest has been subject to human disturbance (trying to locate the nest etc.), the birds will often begin screaming when the observer is a kilometre or more from the nest. It is therefore recommended that as much information as possible about the nest area be obtained by non-intrusive means (interspecific interactions, display etc.), to

successfully locate the nest and to minimise disturbance. It is helpful to watch for territorial disputes between Red-tailed Hawks and ravens, eagles etc. These disputes are typically followed by display flights over the nest. Also look for males carrying prey across roadways, taking note of how high they are flying and in which direction; low direct flight indicates the nest may be nearby.

Risks

The Red-tailed Hawk is very susceptible to disturbance when the birds are incubating eggs or have very young chicks. The eggs and young are vulnerable to dying of overheating or hypothermia when they are left exposed while the female defends the nest.

Survey Notes

The RIC recommended methods for surveying the Red-tailed Hawk are roadside surveys during the breeding season and migration surveys during the non-breeding season.

5.5.5 Ferruginous Hawk B-FEHA *Buteo regalis*

BoBC–38; BH–236; NGS–196; PWB–176; HAWK–74; PGNAR–100

Species Description

Plumage: The Ferruginous Hawk has a rusty back and shoulders, pale head, and a white tail washed with pale rust. Most birds are **light morph**, with the reddish brown shoulders and back and mainly white underparts with contrasting dark-chestnut feathered thighs. The tail is unbanded plain white or greyish, sometimes with a reddish tip. The rare **dark morph** is similar to the dark Rough-legged Hawk, but the pale tail does not have dark banding.

Immature: Young are dark-brown above with some white spotting. They have white underparts and white-feathered legs — thus they do not exhibit the distinctive dark V on the belly in flight.

Flight: This is the largest buteo, with long, tapered wings and large head and chest. The dark V formed by the rusty feathered legs against the white underparts is a good field mark. Also a whitish primary patch on the upperwing often flashes in flight. They are sluggish when taking flight, which is characterized by slow, strong wingbeats, like a small eagle. They soar and circle with slightly up tilted wings, and they alight and roost on the ground more so than other hawks.

Distinguishing Features: On the light morph Ferruginous Hawk the brown thighs are feathered to the toes; in flight, giving adult hawks a distinctive dark V shape on the belly.

Voice: Less vocal than other buteos. Alarm call is a sharp, descending *kree-a-aah*.

Habitat

The Ferruginous Hawk has been only very rarely recorded in British Columbia, most often in late spring and early summer (Campbell *et al.* 1990). Small numbers migrate through British Columbia. They have been seen in the central southern interior of the province, mainly in the Okanagan and Nicola regions of the Thompson-Okanagan plateau (ecoprovince: SOI). There

is only one winter record for British Columbia. The Ferruginous Hawk winters from the southwestern USA to central Mexico (Campbell *et al.* 1990).

Ferruginous Hawks inhabit almost exclusively, open country with scattered trees and rock bluffs. They use grasslands, rangelands, and agricultural fields. There is only one confirmed breeding record for this species in British Columbia.

Diet

The Ferruginous Hawk feeds on lagomorphs and large rodents: rabbits, hares, marmots, gophers and ground squirrels.

Locating Nests

Nests are commonly found in isolated trees in grassland; though these hawks prefer elevated sites, they will also nest on the ground, usually on slight rises or bluffs. One British Columbia nest was 14 m above ground in a ponderosa pine (Campbell *et al.* 1990). The nests of these hawks are very large, and made up of large dry sticks. Unlike other hawks, the Ferruginous Hawk rarely uses green sprigs to line the nest. If the presence of birds in an area is confirmed, repeated sightings of individuals in the same location is a good indication that the nest is close by. Both male and female Ferruginous Hawks share incubation, but gradually the male spends more time perching and patrolling near the nest site (Powers 1981). These generally silent hawks are vocal during the breeding season, giving alarm calls from the nest when humans approach. Calling also accompanies flight-displays (Bechard and Schmutz 1995). The alarm call (*kaah kaah*) is quieter and lower pitched than that of other hawks, and is described as gull-like and plaintive.

Risks

The Ferruginous Hawk is very sensitive to human disturbance, and even one visit to a nest site before or during egg laying can result in abandonment of the nest (Jensen 1995).

Survey Notes

The RIC recommended method for surveying the Ferruginous Hawk is the roadside survey in the breeding season. This search for territories is best in early April during the 3 weeks of territory establishment by northern populations (Olendorff 1993, Zelenak 1996, Zelenak and Rotella 1997).

The Ferruginous Hawk is wary of humans, and it often roosts on the ground, rendering it inconspicuous. However, the white belly of light-morph birds reflects sunlight, making even ground-perching birds quite visible (Bechard and Schmutz 1995). These hawks will defend territories against other birds of the same species, and frequent aggressive interactions can be seen in such cases.

5.5.6 Rough-legged Hawk B-RLHA *Buteo lagopus*

BoBC–40; BH–234; NGS–196; PWB–176; HAWK–77; PGNAR–108

Species Description

Plumage: The plumage of the Rough-legged Hawk is extremely variable, with many intergradations. Most birds are the classic **light morph**. These birds are brownish or greyish above, with buff feather edgings. The pale head contrasts with the dark back and dark bellyband. The breast is cream or buff with scattered brownish spots and a dark brown bellyband. There is often a pale, unmarked U between the breast and bellyband. In flight, the wing lining shows whitish with dark brown spotting and very dark carpal patches. The tail is white at the base, sometimes with dark spotting or incomplete bars, and a broad, black subterminal band. Legs are feathered to the toes. **Dark morph** birds vary from dark brown to black above and below, though black wrist patches are often still visible. These birds lack the extensive white at the base of the tail, but from below show much white at base of flight feathers. The tail may have multiple dark bands, but still shows the broad dark subterminal band.

Immature: Young are similar to adults, but have more black on the belly and show small white patches of the base of upperwing primaries. The tail has a single broad brown tail band.

Flight: This is a large buteo with long wings. It is an open country hawk that often hovers on rapidly beating wings when hunting. When gliding or soaring, wings are held above the horizontal.

Distinguishing Features: The long white tail of the Rough-legged Hawk, with its broad dark subterminal band is key to identification. The dark belly and carpal patches of the light morph birds are also distinctive. The wings are longer than those of the Red-tailed Hawk, with whom it is often confused. The feathered legs are a good field mark.

Voice: Makes a squealing or mewing screech - *kee-we-uk* - that ends on a lower note.

Habitat

The Rough-legged Hawk frequents flat, open areas, with sparse ground cover. It can be seen in grasslands, marshes, fields and meadows. The Rough-legged Hawk perches in the open, often in prominent locations low to the ground. It migrates singly or in small flocks. In winter it can be found anywhere in the southern half of province and many of these hawks winter in the Fraser Lowlands (Campbell *et al.* 1990), (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, BOP). The Rough-legged Hawk breeds outside of the province on the tundra, or in open coniferous forests.

Diet

The Rough-legged Hawk feeds on lemmings, voles, mice and shrews.

Survey Notes

The RIC recommended methods for surveying the Rough-legged Hawk are roadside surveys during the breeding and non-breeding season, as well as migration surveys during the non-breeding season.

The Rough-legged Hawk is generally a silent bird when not breeding. In winter ranges it is non-aggressive, sharing territory with other hawks and transient birds. Populations appear to fluctuate in association with the lemming cycle in the far north (Beebe 1974). No birds are recorded breeding in British Columbia.

5.6 Falcons

5.6.1 Common ID Problems: American Kestrel and Merlin

The American Kestrel and the Merlin are similar-sized falcons whose ranges overlap in many parts of British Columbia. Both will perch on telephone wires, posts, and trees in open areas of farmland, grassland, and meadow.

The main features to consider when identifying these small falcons are the following:

1. The American Kestrel has very distinctive black moustache markings on the face. The Merlin's markings are indistinct, washed out with grey. Thus the facial pattern is much less striking.

2. The tail of the American Kestrel is rufous with multiple fine black barring on the female and one thick black terminal band on the male. The Merlins have a dark tail with a whitish terminal band and several light grey bands.

3. As most of the Merlins in British Columbia are the dark *suckleyi* subspecies, their overall appearance is much darker than that of the American Kestrel. American Kestrels are the only small hawks with rufous backs. Males in flight (particularly on bright days) display a distinctive series of white dots on the trailing edge of the wing.

5.6.2 American Kestrel B-AMKE *Falco sparvarius*

BoBC–48; BH–244; NGS–202; PWB–186; HAWK–96; PGNAR–130

Species Description

Plumage: The American Kestrel is the smallest and most colourful of British Columbia's falcons. It has a grey head with a rufous crown patch, white cheeks and two black moustache marks. The male's crown and upperwing coverts are blue grey, and the back is rufous with narrow black barring. The black primaries are spotted with white. The tail is reddish with a wide black subterminal band. The underparts are buff with variable black spotting. Females are reddish brown above with black barring. Their underparts are buff blotched with brown. The reddish brown tail has narrow dark brown banding.

Immature: Young are similar to adults. Juvenile males have heavily streaked breasts and completely barred backs and tails.

Flight: Typical of falcons, it has long pointed wings that are visible when the bird is in flight. It soars on flat wings and will often hover on rapidly beating wings. In flight, this bird appears paler than the similar-sized Merlin. The American Kestrel sits erect, perching on poles, posts, wires and snags. It often dips or pumps its tails when perched.

Distinguishing Features: No other small hawk has the rufous back and tail of the American Kestrel. The white cheeks and moustache are distinctive. The male in flight often displays a row of translucent white dots on the trailing edges of his wings. The similar-sized Sharp-shinned Hawk has rounded wings, and both it and the Merlin have darker grey or brown backs and tails.

Voice: Alarm is a rapid *killy killy killy*.

Habitat

The American Kestrel uses semi-open or open habitat throughout the province. It can be found in burned and cleared areas of forest and in any open habitat from sea level to tree line throughout the province (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, BOP).

The American Kestrel is largely migratory. Some areas such as the Fraser Lowlands and the Southern Interior have overwintering populations (ecoprovinces: CAM, GED, SOI, SIM).

Diet

The American Kestrel preys upon large insects, voles, and occasionally small birds.

Locating Nests

The American Kestrel nests in cavities, usually those made by the larger woodpeckers (Flicker and Pileated), as well as natural cavities. It will also readily use nest boxes. Regular sighting of a female or a pair of birds at the same locale over a number of weeks indicates a nest site is near. Pellets and whitewash splatters will be found beneath favourite perches. Another common sign of a nearby nest site is the American Kestrel mobbing other predators such as eagles, hawks and corvids who have strayed near their nest. Location of the actual nest site should take place after hatching to avoid nest disturbance that may result in nests being abandoned. The nest can be located by observation of perching females or pairs from a blind until a flight to the nest hole is observed. Active nests can also be located by inspecting suitable holes for down feathers around the outer edge. An active nest cavity will not have spider webs across its opening. Often, small flies will be seen flying in and out of the hole. Tapping on the tree may induce the bird to look out of the nest hole. Intruders in the nest area often cause birds to give alarm calls and flight display. Territorial flights consist of rapid wing beats, wing tips pointed downwards. Egg laying is from the first of April to mid-June and young are at the nest from early May to the end of August.

Survey Notes

The RIC recommended methods for surveying the American Kestrel are roadside surveys during the breeding and non-breeding season and migration surveys during the non-breeding season.

Roadside surveys

- Conduct roadside surveys in the early morning to locate pairs of birds and individual female American Kestrels.
- These birds will reliably perch in the highest snag adjacent to the nest hole particularly in the few hours around sunrise in the pre-egg laying and laying period.
- Repeated observations of perching females and pairs in the same area over several mornings are a good indication of a nearby nest.

5.6.3 Merlin B-MERL *Falco columbarius*

BoBC–50; BH–246; NGS–202; PWB–186; HAWK–100; PGNAR–136

Species Description

Plumage: The adult male Merlin is charcoal grey to dark brown above. The dark grey crown is streaked with black. The tail is dark with several faint greyish bands and a whitish terminal band. Underparts are buff with brown streaking. Females are similar in appearance, but dark brown or black above, and heavily streaked with brown below. Most Merlins found in British Columbia are "Black Merlins" of the subspecies *suckleyi*, but some are the paler "Prairie Merlin", subspecies *richardsoni*.

Immature: Immature plumage is similar to that of the adult female.

Flight: The Merlin does not hover. Its flight is direct, with quick wing beats, flicking the wing tips backward at the end of each stroke. Merlins soar on flat wings with tails slightly fanned. In flight, the bird appears stocky and angular.

Distinguishing Features: The Merlin is slightly larger than the American Kestrel, and lacks that bird's bold moustache marks. The dark underwings and broad dark bands on the tail are distinctive. Its stocky size and large head sets the Merlin apart from the Sharp-shinned Hawk (Beebe 1974).

Voice: Alarm call is a rapid, high-pitched *ki ki ki ki*.

Habitat

Though the Merlin may be found in almost any area of the province, it prefers open areas. During migration it uses seacoasts, river valleys and lakeshores. In winter it inhabits lowlands, valley bottoms, farmlands, marshes, parks, and residential areas in the southern portions of the province (ecoprovinces: CAM, GED, SOI, SIM, CEI, BOP).

The Merlin breeds most often in woodlands bordering open areas or waterways. It is widely distributed throughout British Columbia and is found breeding from the timberline to sea level, from southern British Columbia and up through the interior of the province (Campbell *et al.* 1990), (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, BOP).

Diet

The Merlin preys on small birds, which they capture in short, dashing flights.

Locating Nests

Most nests are those abandoned by crows or magpies, as well as ravens, jays, and woodpeckers. The Merlin will attack potential predators near the nest site, which it guards by perching in tall trees nearby. It will attack crows, ravens and other raptors, climbing to great heights to intercept and harass them. Males often react to humans as far as 800 m from the nest (Craighead and Craighead 1940), and their increasing agitation as the nest site is approached, aids in its detection (Beebe 1974). However, females are likely to 'sit tight' on the nest during incubation and brooding, and pairs nesting in urban areas show little reaction to humans. During incubation, the male hunts, brings food to the female, and calls. The

female takes prey and leaves the nest to eat it, while the male incubates until she returns and calls. During the nestling stage, the female will fly off the nest to take food from the male away from the site (Sodhi *et al.* 1993). Egg laying is from mid-April to early July and young are at the nest from mid-May to mid-August.

Survey Notes

The RIC recommended method for surveying the Merlin is call playback during the breeding season. Migration surveys can be used during the non-breeding season.

Call playback surveys

The most common call of the Merlin is described as *ki-ki-kee*, and accompanies courtship displays as well as territorial and aggressive encounters.

- Paul James (pers. comm.) recommends call playback surveys be done prior to incubation for Merlins.
- Conduct surveys from daybreak to sunset.
- It is important to note that some raptor species have more than one call and they will respond to these calls differentially, depending on the time of year.

5.6.4 Peregrine Falcon B-PEFA *Falco peregrinus*

BoBC–54; BH–246; NGS–204; PWB–186; HAWK–107; PGNAR–149

Species Description

Plumage: The crown and nape of the Peregrine Falcon are black, with a black wedge extending well below the eye, forming a distinctive black helmet, or hood. The adult is slate-backed, pale below, with bars and spots. It displays a gleaming white throat. The *anatum* subspecies has a pale rufous wash on the chest.

Immature: Young are dark brownish above, with heavily streaked underparts. The immatures of the subspecies *pealei*, found on the Queen Charlotte Islands, could be mistaken for Gyrfalcons.

Flight: This bird is slightly larger than the Prairie Falcon and has the pointed wings, narrow tail, and quick pigeon-like wingbeats of the typical falcon. It soars on flat wings. The Peregrine Falcon appears uniformly dark in flight.

Distinguishing Features: Other falcons lack the bold facial markings of the Peregrine Falcon. The heavy moustache is particularly distinctive.

Voice: Usually silent but a variety of wails and cries can be heard during the breeding season. Alarm call of the adult birds is a grating *kree-aak*, *kree-aak* or *ki ki ki* (Beebe 1974).

Habitat

The Peregrine Falcon uses open habitats that support large populations of suitable birds as prey. For breeding populations it needs the presence of suitable nest sites, which are typically on cliffs and occasionally in abandoned tree nests of other species (ecoprovinces: CAM, GED, SOI, CEI, BOP). On the coast they inhabit beaches, tidal flats, islands, lagoons and marshes (in close proximity to breeding colonies of seabirds). In the interior it uses lake shores, and river mouths and valleys. These birds have also taken to nesting on human-made structures and forage on pigeons (Johnstone 1999).

In winter the Peregrine Falcon uses human altered habitat like golf courses, parks, farmlands, airports and cities. Small numbers of birds winter in the southern interior (ecoprovinces: CAM, GED, SOI).

Diet

The Peregrine Falcon feeds on shorebirds, waterfowl, and other small or medium-sized birds. They strike, kill and often capture these on the wing in spectacular dives and aerial chases. The Peregrine Falcon often hunts at dawn and dusk, as well as during the day.

Locating Nests

Nests are placed on any flat surface on a cliff, bluff or in the abandoned nest of another species. In more recent developments, birds have also taken to nesting on human-made structures, and several cities in North America have pairs of birds nesting on skyscrapers. Locating active nest areas can be aided by conducting standwatches in suitable nest areas. The prolonged and spectacular flight displays take place when birds return to nesting territories. These courtship flights involve both birds swooping, chasing and calling, particularly on windy days (Beebe 1974). Courtship displays end when eggs are laid. Egg laying is from late March to early July and young are at the nest from the first of May to late July.

Because nest locations usually occur in areas where the prey base is high, both sexes can be found at or near the nest site throughout the breeding period. Females are mostly silent and difficult to disturb during incubation and the early nestling period, and will tolerate or ignore approaching humans (Beebe 1974). From this period on, Peregrine Falcons are noisy and demonstrative. The large fluffy white chicks of the Peregrine Falcon are quite visible in nest aeries. Young also have a loud wailing call given when adult birds come into sight. The presence of active aeries is often indicated by whitewash splattered beneath the nest and below favourite perch sites of the adults.

Survey Notes

The RIC recommended methods for surveying the Peregrine Falcon are aerial surveys for nests, and boat surveys in the breeding season. Migration surveys can be used in the non-breeding season.

Most surveys for the Peregrine Falcon are conducted from the air or by boat (Fyfe *et al.* 1976), where cliff ledges are checked for the presence of nests and birds. Many nest sites are re-used and are known to local wildlife organisations, and they should be contacted before surveying any new areas.

Aerial surveys

- When surveying for cliff-nesting falcons stratification of quadrats based on expected raptor densities is often based on the number of kilometres of shoreline within each quadrat (Grier 1977, Hodges *et al.* 1984).
- Falcons often sit with their feet under or between their eggs/young, and if startled may accidentally eject them when vacating the nest. Helicopter flights should be flown a minimum of 50 m above the nest and should be terminated if birds are becoming agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.
- Two surveys should be conducted during April and May to determine nest occupancy, with minimal disturbance, and again in late May to July to determine number of young late in nestling stage (Wilson *et al.* 2000).

Boat surveys

- Peregrine Falcons are likely to flush only from nest areas during certain times in their nesting chronology, which are during incubation and early nestling period.
- At other times they will flush only if there are loud noises or substantial disturbance occurs near their aeries (e.g., aircraft noise). Boat surveys for Peregrine Falcons have been supplemented with loud noises (megaphones) around potential aeries to startle the birds off of their nests and make for easy detection (Munro 1988).

5.6.5 Gyrfalcon B-GYRF *Falco rusticolus*

BoBC–58; BH–248; NGS–204; PWB–184; HAWK–111; PGNAR–145

Species Description

Plumage: There is considerable variation in the colouring of the Gyrfalcon. Upperparts range from white with streaking to uniform black or dark brown with pale feather edges. Typically underparts of adults are lighter than upperparts and have streaked breasts and spotted bellies. Most birds are grey or brownish. Gyrfalcons are more uniformly coloured than other falcons.

Immature: Young are similar to adults but are more heavily streaked on the underparts.

Flight: The Gyrfalcon shows broader, less pointed wings and a longer tail than other falcons. The tail is wide and noticeably tapered. It is the largest and most powerful falcon, and flies with slow, deep wing beats. Gyrfalcons soar and glide on level wings. In grey and dark morphs, the underwing is two-toned.

Distinguishing Features: The very large size (Raven-sized), paler head (with no obvious dark hood and moustaches) and more uniform coloration distinguish the Gyrfalcon from the Peregrine Falcon. For a similar species, see Northern Goshawk.

Voice: Call is similar to that of the Peregrine Falcon but louder and harsher.

Habitat

In winter, the Gyrfalcon is found in open country wherever food is plentiful. It uses tidal flats, lake shores, marshes, golf courses, wet fields, ponds and river mouths. During the summer the bird is associated with open tundra and areas above tree line. The presence of breeding

birds is closely linked to the abundance of food supply. It breeds in the northwestern part of the province (Campbell *et al.* 1990), (ecoprovince: NB).

The Gyrfalcon is widespread in western British Columbia in winter (Campbell *et al.* 1990), except on the Queen Charlotte Islands. Periodic invasions occur in the southern parts of the province when northern ptarmigan populations crash (ecoprovinces: CAM, SOI, GED).

Diet

Birds make up the most part of the Gyrfalcon's diet. In the breeding range, ptarmigan is the principle prey, and populations appear to cycle in relation to its availability (Clum and Cade 1994). In southern areas in winter, the Gyrfalcon preys upon shorebirds, waterfowl and gulls.

Locating Nests

No nest is built. The eggs are laid on flat ledges or abandoned nests of other large cliff nesting species. Nests are typically on cliffs, rock outcrops and river bluffs. Most nest sites found in British Columbia are on bare cliff ledges or in unused Golden Eagle nests, and are protected by overhangs (Campbell *et al.* 1990). For signs of active nests, look for Gyrfalcons performing aerial displays near nest sites during the egg laying period, as well as the presence of fresh whitewash on cliff faces. Egg laying is from the first of April to the first of June and young are at the nest from the first of May til mid-July. The birds will give a *kak* call in the nest vicinity, and both sexes will chase and strike avian intruders during breeding. They have killed Ravens, Rough-legged Hawks and Peregrine Falcons in this way (Clum and Cade 1994).

Risks

The Gyrfalcon is not particularly aggressive to human intruders at nest sites, often flying away and circling silently. It has been shown to be disturbed by helicopters flying lower than 600 m above the nest site, and are often less likely to re-use such sites (Clum and Cade 1994).

Survey Notes

The RIC recommended methods for surveying the Gyrfalcon are aerial surveys for nests and boat surveys in the breeding season.

The Gyrfalcon is most readily surveyed on its breeding range when an annual survey of known nest sites will give an index of abundance. As with Golden Eagles, nest sites are frequently re-used, and are often known by local wildlife organisations. These organisations should therefore be contacted before surveying new areas.

Aerial surveys

- When surveying for cliff nesting falcons stratification of quadrats based on expected raptor densities is often based on the number of kilometres of cliff/bluff edge within each quadrat (Grier 1977, Hodges *et al.* 1984).
- Falcons often sit with their feet under or between their eggs/young, and if startled may accidentally eject them when vacating the nest.
- Gryfalcons has been shown to be disturbed by helicopters flying lower than 600 m above the nest site, and are often less likely to re-use such sites (Clum and Cade 1994), so

disturbance should be kept to a minimum. Helicopter flights should be terminated if birds become agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.

5.6.6 Prairie Falcon B-PRFA *Falco mexicanus*

BoBC–60; BH–246; NGS–204; PWB–186; HAWK–114; PGNAR–141

Species Description

Plumage: The Prairie Falcon is a large (crow-sized) pale falcon. The moustache mark is narrow and indistinct. The long tail has faint banding. The back feathers of the adult are dark brown with light brown bars and edges. The whitish underparts are faintly spotted or barred in adults. Wing tips don't reach tail tip when perched (Steenhof *et al.* 1998).

Immature: The back of the young lacks the light brown barring like that found with adults and so appears darker. The underparts are more heavily streaked.

Flight: The dark triangular patches on the inner core area of the Prairie Falcon's otherwise the pale underwing is distinctive in flight. It has a slimmer build than the Peregrine Falcon.

Distinguishing Features: The head of the Prairie Falcon is square or blocky. It is similar to the Peregrine Falcon in appearance, but is paler, sandier in colour, and the facial markings are less distinctive. A white area between the eye and the dark ear patch are diagnostic.

Voice: Alarm call is a yelping *kik kik kik*. As part of a ledge display at potential nest sites, at food transfers, aggressive interactions and mostly during courtship, both sexes emit a characteristic *Eechup* call, also known as *chup* or *kiduchip* (Steenhof *et al.* 1998).

Habitat

The Prairie Falcon is a bird of arid plains and desert landscapes, wherever cliffs or bluffs are present for nesting sites. It uses dry, open country: shrub-steppe desert, sagebrush plains, grasslands, mixed shrub and grasslands, and alpine tundra. The Prairie Falcon is found throughout the central and southern interior of British Columbia, and occasionally elsewhere in the province, including the south coast (ecoprovinces: CAM, GED, SOI).

It appears to breed only in the south-central interior, but may be expanding their range (Campbell *et al.* 1990), (ecoprovinces: SOI, CEI).

Diet

Ground squirrels are a key prey item during the breeding season. Birds, particularly the Horned Lark, Western Meadowlark, and Mourning Dove, are secondary in the Prairie Falcon's diet in the breeding season but relied on in winter (Steenhof *et al.* 1998). This falcon does much of its hunting from perches, particularly in winter, and may use cliffs or hillocks, or utility poles and power-line towers as scanning stations (Beebe 1974). It also hunts by soaring or 'prospecting' and with low active flight (Phipps 1979). They (females more the males) cache prey in clumps of vegetation and in rocky areas within the nesting territory

Locating Nests

Nesting territories include valleys (sometimes caves in the southern interior including the Okanagan and Nicola Valley) and river canyons with rocky cliffs, buttes, and escarpments. Cliffs used by nesting Prairie Falcons are relatively low to moderate in height. Nest sites are bare scrapes on such cliffs, usually with a protective overhang, and are often near water. Noisy aerial nest displays occur several weeks prior to egg laying, and seem to be stimulated by strong winds against the nest cliff (Beebe 1974). Egg laying is from early March to mid-May and young are at the nest from mid-May to early August. The Prairie Falcon nest site is marked by yellowish whitewash and prey remains beneath the nest and favourite perch sites. They are known to nest at higher densities than most other large North American falcons (Enderson 1964).

Risks

Studies of the Prairie Falcon on the Canadian Prairies found that many birds were aggressive in nest defence, making direct attacks on intruders, but an almost equal number were moderate or weak in their nest defence, merely calling or leaving the site (Fyfe *et al.* 1976). The Prairie Falcon rarely strikes humans, but is aggressive with raptors and will attack normally tolerated nearby Ravens when human presence agitates them (Beebe 1974).

Survey Notes

The RIC recommended methods for surveying the Prairie Falcon are aerial surveys for nests, boat surveys, and roadside surveys in the breeding season. Migration surveys can be used in the non-breeding season. Standwatches are also suitable for this species. Steenhof *et al.* (1998) surveyed by walking along canyon rim and observing from observation points along the bottom of the cliff: 1 in March/early April, 1 in May and 1 in June.

The Prairie Falcon is a noisy bird near its nest, and is vocal throughout the winter in interactions with other raptors.

Aerial surveys

- When surveying for cliff nesting falcons stratification of quadrats based on expected raptor densities is often based on the number of kilometres of cliff edge or canyon rim within each quadrat (Grier 1977, Hodges *et al.* 1984).
- Falcons often sit with their feet under or between their eggs/young, and if startled may accidentally eject them when vacating the nest. Helicopter flights should be flown a minimum of 50 m above the nest and should be terminated if birds are becoming agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.
- Two surveys should be conducted with minimal disturbance during April and May to determine nest occupancy, and again in late May to July to determine number of young that are in the late nestling stage (see Wilson *et al.* 2000 for methods).

5.7 Owls

5.7.1 Barn Owl B-BNOW *Tyto alba*

BoBC–352; BH–288; NGS–238; PWB–198

Species Description

Appearance: The Barn Owl (crow-sized) has a white, heart-shaped (monkey-like) facial disk, and dark eyes. It is a medium-sized, slender-bodied owl with long legs. Both sexes have golden or rusty upper plumage. Their underparts are whitish or cinnamon and are unstreaked but are finely speckled with black. Juveniles are similar to adults.

Identification: The Barn Owl in flight has the typical owl-like large head and slow moth-like wingbeats. The heart-shaped, white face of this owl is distinctive. In flight, the pale, unstreaked breast is a good field mark. The bird is typically observed hunting near farm buildings and farmland at dusk and early in the morning.

Voice: Makes a shrill, rasping hiss — *kschh shhish*

Habitat

The Barn Owl prefers open country, especially agricultural areas or grasslands. Habitat use is restricted to open areas with available nest and roost sites. It is found in the Fraser lowlands and lower mainland to Hope, southeastern Vancouver Island, and in the southern interior (ecoprovinces: GED).

In the Fraser Lowlands the population is predominately resident. There are records for this species throughout the Okanagan Valley (ecoprovinces: GED, SOI). Populations are generally sedentary, though numbers fluctuate with prey cycles.

Diet

The Barn Owl feeds on small mammals, particularly voles. In British Columbia, *Microtus* voles make up most of the diet, followed by shrews (Campbell *et al.* 1987). During peak vole years, the Barn Owl breeds prolifically throughout the year. This species hunts at night, making low flights over open habitat.

Locating Nests

Egg laying and rearing young is year round, particularly when there are plenty of voles available. Roosting Barn Owls are generally well hidden, however they roost for long periods in the same places, thus leaving behind an accumulation of feces and pellets. Barn Owls flushed from roosts in daylight are often mobbed by corvids (Marti 1992).

The Barn Owl commonly roosts and nests in human-made structures such as barns, sheds, aircraft hangers and silos. Where they are available it will also use large natural tree cavities and suitable holes in cliffs. Most nests found in British Columbia were in human-made structures including nest-boxes (Campbell *et al.* 1990). No nest is built. The birds lay eggs on

any available flat surface, but down feathers and old pellets usually surround the nest area, with the eggs often lying on a layer of old pellets (Bunn *et al.* 1982)

Survey Notes

The RIC recommended methods for surveying the Barn Owl are call playback surveys or foot surveys during the breeding season and migration surveys during the non-breeding season.

- Conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise.
- Barn Owls call most frequently at and just after dusk. During the breeding season, the main periods of activity are just after sunset and just before sunrise. Advertising males call repeatedly and make display flights in and out of potential nest sites (Bunn *et al.* 1982).

5.7.2 Flammulated Owl B-FLOW *Otus flammeolus*

BoBC–356; BH–300; NGS–244; PWB–204

Species Description

Appearance: The Flammulated Owl is a small owl with dark eyes. It is grey and tawny reddish in colour, with inconspicuous ear tufts.

Voice: Song is a long series of notes: a mellow *hoot* or *hoo-hoot*, low in pitch for such a small owl, repeated steadily at 2–3 second intervals.

Habitat

The Flammulated Owl in British Columbia appears to be restricted to mountainous and valley-side areas of the interior, where mature Douglas-fir are dominant and ponderosa pine are present. Regenerating thickets are used for roosting. The highest densities of owls occur in tree stands aged 140–200+ years (Howie and Ritcey 1987, Groves *et al.* 1997). Breeding occurs in areas of well-spaced Douglas-fir with open understory on moderate to steep slopes. In British Columbia the Flammulated Owl breeds in the Thompson-Okanagan plateau area (ecoprovince: SOI). There are no valid winter records for this species in the province.

Diet

The main diet of the Flammulated Owl includes insects, primarily moths and beetles. All hunting is done at night.

Locating Nests

Nests are in tree cavities, usually in old woodpecker nests and have been found between 610 and 1210 m (sub-boreal/Douglas Fir Ponderosa Pine line) elevation, ranging from mature to mixed aged Douglas Fir and Ponderosa Pine stands (Campbell *et al.* 1990, Grove *et al.* 1997). The Flammulated Owl will also use nest boxes (Campbell *et al.* 1990). Egg laying is from mid-April to mid-July and young are at the nest from mid-May to mid-August.

Survey Notes

The RIC recommended method for surveying the Flammulated Owl is call playback during the breeding season.

Call playback surveys

Like many owls, Flammulated Owl populations are not evenly distributed throughout their British Columbia range, and are thus difficult to estimate (Campbell *et al.* 1990). As well, territorial occupancy can not be estimated from density estimates due to bias from the possibility of recording the same male at more than one station or recording surplus birds en route during migration (Woudenberg and Christie 1997).

- The hoarse, low-frequency notes of this species are often ventriloquial and difficult to locate, especially in variable habitat like that found in British Columbia (Woudenberg and Christie 1997). The impression given by this call is that of a larger owl calling from a distance (the vocal repertoire of the Flammulated Owl is similar to that of the Long-eared Owl), (McCallum 1994).
- Woudenberg and Christie (1997) found that mimicked calls by surveyors worked better than tape recordings during their surveys for Flammulated Owl in the southern interior of British Columbia. This technique should only be attempted by field crew that are experienced in owl calling and know the Flammulated owl call well.
- Timing:
  - Flammulated Owls are heard more often than seen. Males sing (typically from the crown of a mature tree) for hours on end early in the breeding season (and more sporadically later), and unmated males continue to sing throughout the summer. In British Columbia singing begins in early May (Cannings and Cannings 1982).
  - Male Flammulated Owls may give vocal response to call imitations. Call playback survey transects have been used in May, June and early July to elicit responses. Paired males may not respond later in the nesting period (Reynolds 1987).
  - Conduct surveys between 2200 and 0100 hours (Howie and Ritcey 1987, Johnson and Zwank 1990, Groves *et al.* 1997).
  - At the beginning of the breeding season the greatest calling intensity for the Flammulated Owl is during much of the evening, and then after nestling hatching singing is "later at night" (Reynolds and Linkhart 1987).
- Interstation Distance
  - Recommended distance between call playback stations for the Flammulated Owl is 0.5 km (Howie and Ritchie 1987).
- Stop Duration
  - Listening time at a station should follow the standard 5 minutes after broadcasting calls. Other surveys have waited longer (e.g.,Woudenberg and Christie 1997).

Locating Nests

Tree cavities used by the Flammulated Owl in British Columbia have generally been old Northern Flicker nests but other similar sized cavities will be used. Observations from a blind or by stealthily approaching calling birds, can be used in the spring to locate nests. During the nest selection process the male enters and calls from potential nest cavities within the territory, in the hope of attracting a mate. Later in the breeding season, frequent visits to the nest with food will take place most frequently one hour after sunset and one hour before sunrise. Dry, chitinous pellets are sometimes found nearby or in nest boxes.

Woudenberg and Christie (1997) took compass bearings to calling owls from playback stations and then used triangulation of the bearings to help identify areas used by calling owls and thus possible nest areas. Parallel transects 50 m apart through areas where owls were detected were surveyed in June and early July to try and find nest site locations. Confirmation of a nest site was made if a female Flammulated Owl was observed at a cavity entrance. Multiple surveys, starting when migrants arrive until nesting is underway, is also important to ensure that most calling males are detected so fewer nest sites are likely to be missed during nest surveys.

Risks

After fledging, both sexes will hoot and swoop close to human intruder's heads if the fledged young are approached (McCallum 1994).

5.7.3 Western Screech-Owl B-WSOW *Otus kennicotti*

BoBC–358; BH–296; NGS–242; PWB–200

Species Description

Appearance: The Western Screech-Owl is a small owl with conspicuous ear tufts (when raised) and yellow eyes. It is grey or brownish in colour. The underparts are marked with blackish streaks and thinner bars.

Voice: Two common calls. The first is a series of hollow whistles on one pitch, at first distinct building to a trill, then slurring together with the rhythm of a small ball bouncing progressing to a standstill (Tyler and Phillips 1978). The second is a short trill followed immediately by a longer trill.

Habitat

The Western Screech-Owl is found in many forest habitats, but prefers mixed forests near water. In the interior, these owls use deciduous woods near lakes and streams. It roosts in tree cavities, on branches, in nest boxes, and in cliff crevices. Breeding habitats include rivers, bogs, lakes, creeks, and marshes. It utilises orchards, parks and gardens. The Western Screech-Owl breeds on Vancouver Island, the Gulf Islands, the Fraser Lowlands and the southern Okanagan valley (ecoprovinces: CAM, GED, SOI), (Campbell *et al.* 1990).

The Western Screech-Owl occurs year round on Vancouver Island and the mainland coast through the Fraser Lowlands to Hope. It is also a likely resident on the northern coast and in the interior below 600-m elevation from the Kootenays south and throughout the Okanagan. It is essentially non-migratory, and can be found in the same habitats as breeding habitats (ecoprovinces: CAM, GED, SOI, SIM).

Diet

The Western Screech-Owl's diet includes a wide spectrum of prey including small birds and mammals, insects, and amphibians.

Locating Nests

Nests can be found in nest boxes, or in natural cavities or holes created by Pileated Woodpeckers and Northern Flickers. Most nests found in British Columbia have been between 3 and 4.5 m above ground, and many nest boxes have been used (Campbell *et al.* 1990). Male and female owls engage in a courtship duet in springtime soon after dark, from perches close to the nest cavity. Nests can be located by listening for these duets and walking in to this area during daytime to locate possible nest cavities. Egg laying is from late April to late July and young are at the nest from mid-May to mid-August.

Risks

The Western Screech-Owl is relatively passive at nest sites in the egg stage, but will attack humans during the nestling period when approached at night (Tyler and Phillips 1978).

Survey Notes

The RIC recommended method for surveying the Western Screech-Owl is call playback during the breeding season.

Call playback surveys

Screech-Owls appeared to accommodate themselves to playback, however, they responded with less frequency when surveyed repeatedly at short intervals (Smith *et al.* 1987). Phases of the moon show no affect on detection rate, however, a decrease in detection rate was seen with increasing wind speed, temperature and cloud cover (Hardy and Morrison 2000). Responses occur more rapidly in winter and owls take the longest to respond in spring (Carpenter 1987).

- Documented response rates to call playback for the closely related Eastern Screech-Owl is 91% (Smith *et al.* 1987).
- Timing
- Conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise. Hardy and Morrison (2000) started surveys within 0.5 hours after sundown and completed them in 4 hours. Greatest calling intensity for the Western Screech-Owl is anytime after dark, with the greatest response after midnight (D. Fraser, pers. comm.).
- In Idaho, male Western Screech-Owls appear to defend their territories year round and respond to playback calls (Herting and Belthoff 1997).
- It is recommended to do surveys 4-5 times per year between mid-March to late May (Hardy and Morrison 2000), mid-April to August in more northern regions.
- Interstation Distance
- Recommended distance between call playback stations for this inconspicuous owl species is 0.8 km (Hardy and Morrison 2000).

5.7.4 Great Horned Owl B-GHOW *Bubo virginianus*

BoBC–360; BH–292; NGS–238; PWB–200

Species Description

Appearance: The large size (46-63 cm), bulky shape, distinctive ear tufts and white throat patch or bib of this owl are distinctive. It is dark brown/grey brown, with heavy barring underneath. In flight, the Great Horned Owl approaches buteos in size. Like other owls, in flight it appears to have no neck and a large, stubby head.

Voice: Gives a series of 3-8 loud, deep hoots, the second and third often short and rapid. The pattern for males is *hoo, hoo-oo, hoo, hoo* (sounds like: *Who's awake? Me too*), for females *hoo, hoo-hoo-hoo, hoo-oo, hoo-oo*, uttered more rapidly, and in a higher pitch. It is only one of two North American owls to give multinote hoots (Houston *et al.* 1998). It also snaps or claps its bill vigorously when angry, disturbed, stresses or as a warning or aggressive sound (Houston *et al.* 1998).

Habitat

The Great Horned Owl is able to live in virtually all types of treed habitat from sea level to tree line. It has been found in British Columbian cities, usually near parks or golf courses with treed areas. It requires only a nest tree, perch sites, and hunting area. Hunting areas are typically relatively open, but often include scattered trees for perching (ecoprovinces: CAM, GED, BOP). It is less common at higher elevations, and populations appear to decrease northward through the province (Campbell *et al.* 1990).

It breeds throughout its range, except on the Queen Charlotte Islands (Campbell *et al.* 1990), (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, NBM, TAP, BOP).

Diet

The main prey of the Great Horned Owl is hares and rabbits, particularly in the northern parts of its range. However, this species has a wider range of prey than that known for any other North American raptor (Johnsgard 1988). Mammals appear to be the preferred food, but when these are scarce, birds form a large part of the diet.

Locating Nests

Egg laying is from mid-February to late May and young are at the nest from late March to mid-September. Signs of a Great Horned Owl nest or roost site include the presence of whitewash blobs, prey remains, or pellets. Owls do not pluck their prey before eating it, instead swallowing bone and meat together. Therefore they do not leave plucked skeletal remains, as other predators do, but instead leave scattered appendages. The Great Horned Owl often uses a regular feeding roost, which may be on a stump, fallen log, or wide flat tree branch. These sites are littered with bones, feathers, fur, droppings, and pellets. Unbroken Great Horned Owl pellets are 5–10 cm in length and 3–4 cm in diameter. The pellets of this owl usually contain sizeable bone fragments, unlike those of hawks, whose digestion is more complete. The current spring's whitewash is easily distinguished from winter specimens, which will be crumbly blobs, formerly atop snow, or have been washed away by rain. The presence of fresh whitewash in several sites, large 'velvety' feathers, and pellets underneath

several roost sites indicates that Great Horned Owls are using the area regularly; a nest may be nearby.

Nests are generally in coniferous, sometimes deciduous trees, also rock cliffs and clay banks, and the tops of broken snags. On the coast, the most common nest sites are in broken-top snags. The Great Horned Owl does not build its own nests. It usually uses old nests of other large raptors or atop parasitic vegetative growths, or 'witches brooms'. Previously used nests utilised by the Great Horned Owl in British Columbia includes those of Red-tailed Hawks, crows, herons, eagles, ravens, and Northern Goshawks. Over half of recorded nests in British Columbia were at heights of between 7.6 and 14 m (Campbell *et al.* 1990). The home range may include open habitat including fields, wetlands, pastures or croplands (Houston *et al.* 1998).

In deciduous forests, the Great Horned Owl uses old nests of other species and these can be detected with the use of systematic searches from the air or ground in late winter. Rohner and Doyle (1992) have outlined a method of locating Great Horned Owl nests in the boreal forest that may also be applied to other locales, such as British Columbia's temperate rainforest. The first step involves an acoustic triangulation of the nesting area. By taking bearings of the hooting birds, the general locality of the nest can be ascertained. Males regularly roost in the immediate vicinity of the nesting female. They begin hooting in this area just after sunset, and again hoot in the nesting area about an hour before sunrise (Rohner and Doyle 1992). Females generally join in from the nest, with one or several hoots at the beginning and end of each activity period. The second step is a careful visual search of the probable nesting area. In areas where there are many witches brooms or old nest sites, the best distinguishing feature of an active nest is the presence of fresh down feathers at the edge of the nest or in nearby branches. These feathers are especially visible in sunlight, or when waving in a breeze. Both birds will hoot in the daytime when a nest is approached.

Risks

The Great Horned Owl varies in behaviour when the nest or young are disturbed. In general, this species is very aggressive and will attack intruders, particularly when the nest tree is climbed. Hooting and barking alert visitors to the fact that they are near a nest site. Both male and female owls will defend the nest, striking intruders with their talons. Caution must be taken, including wearing protective clothing and helmets. It is helpful to have a bystander to alert a tree climber when an owl is incoming; these owls often hoot just before they strike.

Health risks associated with handling Great Horned Owl pellets are minimal; the digestive process tends to kill harmful bacteria. However, although mice are uncommon prey, wearing gloves when handling pellets can lessen the risk of contracting Hantavirus.

Survey Notes

The RIC recommended method for surveying the Great Horned Owl is call playback during the breeding season.

Population densities of Great Horned Owls in the northern and interior parts of the province have been shown to parallel snowshoe hare cycles, with dispersal taking place during the hare population crash (Rohner 1996).

Call playback surveys

Great Horned Owls are known to respond to call imitations or playback. Documented response rates to call playback for Great Horned Owl is 75-85% (Springer 1978).

Call playback is not necessarily valuable for locating the nests of this species. These birds will fly large distances to respond from all parts of their home range, or may follow the surveyor from call playback station to call playback station. Great Horned Owls have been shown to cease calling and not respond to call playback during periods of low prey abundance (Doyle 2000).

- This technique is most effective in February and March, but these owls will also respond at other times of the year.
- Conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise. Greatest calling intensity for the Great Horned Owl is dawn and dusk (D. Fraser, F. Doyle pers. comm.), which corresponds to male and female calling duet and territorial calling (Rohner and Doyle 1992).
- Interstation Distance
  - Recommended distance between call playback stations for this owl species is 1 km (F. Doyle pers. obs. in Boreal Forest Yukon with a breeding pair every 2 km in peak prey years (Doyle 2000).

A call series, followed by the listening period, may be repeated up to a maximum of 3 times for this species. If birds are going to respond to playback it will typically be within 20 minutes of starting playback. (Rohner pers. comm.)

5.7.5 Snowy Owl B-SNOW *Nictea scandiaca*

BoBC–362; BH–296; NGS–240; PWB–198

Species Description

Appearance: The Snowy Owl is a large white owl with a rounded head and yellow eyes. It is bulky in stature. Most birds have variable black markings; adult males are markedly smaller and paler than females; females have more dark bars and spots, and juveniles are the most heavily marked with dark streaks.

Identification: This almost unmistakable owl will fly during the day or perch on drifts, posts, haystacks, etc. It does not have ear tufts or a large facial disk.

Voice. Usually silent outside of its breeding range.

Habitat

The Snowy Owl is a circumpolar species that lives and breeds in open tundra north of the tree-line. In British Columbia, they winter in southern portions of the province, and in years of population irruption (Parmelee 1992), it can also found in the northern and southern interior (ecoprovinces: CAM, GED, SOI, SIM, CEI, BOP). In British Columbia it is usually seen roosting or perching on the ground or on slight rises such as raised drifts, stumps, posts, and rocky headlands.

Principal wintering areas in the interior are the open country of the Peace Lowlands near Fort St. John and the northern Okanagan Valley near Vernon. Habitats in the Okanagan include grasslands, lake shores and alpine meadows (Campbell *et al.* 1990). Along the southern coast in the winter, the Snowy Owl is primarily found in open country. It is often seen in urban areas where it can be found in parks, marshes, and airports.

Diet

In coastal areas on southern Vancouver Island, the Snowy Owl feeds mainly on wintering waterfowl and small passerine birds (Guiget 1954). Waterfowl (grebes and ducks) also comprise most of the diet in the Fraser Delta area (Campbell *et al.* 1990). Reports from many other wintering areas in Canada, which would match more northern areas of British Columbia, show mice and voles as the main component of the winter diet. This owl is largely diurnal and hunts in all kinds of weather.

Survey Notes

The RIC recommended method for surveying the Snowy Owl is roadside survey during the non-breeding season.

Visits to the Fraser Delta area are useful for wintering bird counts. The Snowy Owl often remains at a commanding perch for long, uninterrupted spells. In flight, it suggests a buteo or harrier, with jerky, swaying movements caused by quick upstroke and slow down stroke of the wings (Parmelee 1992). Surveying the birds is easiest when there is no snow on the ground.

Risks

The Snowy Owl is known to attack viciously when approached in its breeding range, and has seriously wounded humans. In its wintering areas this owl is described as exhibiting anything from docility to skittishness. As with all raptors care should be taken when in close proximity to the birds. The Snowy Owl hisses when threatened (Parmelee 1992).

5.7.6 Northern Hawk Owl B-NHOW *Surnia ulula*

BoBC–362; BH–306; NGS–246; PWB–202

Species Description

Appearance: The upperparts of the Northern Hawk Owl are dark brown and spotted with white. The chest and abdomen are sharply brown-barred. The pale greyish facial disks are black-bordered, appearing like sideburns. This black border of the facial disk extends down on to the chest. The eyes and bill are yellow.

Identification: The Northern Hawk Owl is a medium-sized (pigeon-sized with a long tail), slender, hawk-like owl with pointed wings that often flies by day. It does not have ear tufts. Its long, rounded, tapered tail and falcon-like profile is distinctive. It is often seen perched high in a spruce tree, and is known to jerk its tail like a American Kestrel. The flight of the Northern Hawk Owl is low and swift, with rapid wing beats. It occasionally hovers. The flight pattern of this species (direct, quick flight often beneath canopy height) is surprisingly

like that of the accipiters, and a good view of the head is often needed to distinguish between them.

Voice: Alarm call is a rapid series of *kip kip kip* or *kleep kleep kleep* or a raspy *skree-e-e-e-e-yip*. Territory call of the male is a bubbling whistle *ululululululul* that lasts up to 14 seconds. (Mikkola 1983).

Habitat

The Northern Hawk Owl uses semi-open and open areas for hunting, including fields, lake shores, and burns. Nesting habitat is fairly open coniferous and mixed forests, typically in boreal and sub-alpine forest areas, and most often in northern parts of the province (ecoprovinces: SOI, SIM, SBI, BOP).

During the non-breeding season, it is found throughout the province, east of the coast and mountains ecoprovince with highest densities occurring above 56 degrees latitude (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, BOP).

Diet

The Northern Hawk Owl's summer diet consists primarily of voles. However, it will take a variety of prey including grouse, ptarmigan and both adult and juvenile hares in winter.

Locating Nests

Nests are located in the tops of broken snags, and occasionally in natural and woodpecker cavities. They do not add fresh material to the nest (Duncan 1998). The Northern Hawk Owl is widespread throughout the interior of British Columbia, but is rarely seen at the coast (Campbell *et al.* 1990). Birds will perch in an open location near the nest site and repeated sightings at the same location, particularly of pairs indicates that a nest site is near. Egg laying is from mid-April to the first of June and young are at the nest from late May to early August. Often when nests are at the top of a snag, the brooding owl's head can just be seen rounding off the usually jagged tops of snags. Nests can be located by watching hunting birds who will fly directly to the nest with prey. Take a compass bearing and follow. Birds will actively mob other predators when they are near the nest or recently fledged chicks. Northern Hawk Owls will leave pellets and whitewash under perch sites. They have been known to swoop and attack intruders, including people.

Risks

These birds will try to hit intruders to the nest, so suitable protection should be worn. In particular, birds will fly at the head and eyes so a full-face crash helmet and goggles are recommended.

Survey Notes

The RIC recommended method for surveying the Northern Hawk Owl is roadside surveys during the breeding season.

Roadside surveys

- Conduct surveys during the day as this owl is diurnal. There are no recommended calling times currently for this species.
- This species fluctuates in numbers often dramatically, and it is recommended that several years of surveys may be needed to ascertain its status in a particular area (Rohner *et al.* 1995).

5.7.7 Northern Pygmy-Owl B-NPOW *Glaucidium gnoma*

BoBC–366; BH–302; NGS–244; PWB–204

Species Description

Appearance: The Northern Pygmy-Owl is a very small owl (sparrow-sized) with no ear tufts. The upperparts are rusty or grey brown, spotted with buff white, particularly on the head and wings. It has sharp dark-brown streaks on white underparts. The long tail is dark brown with six or seven pale crossbars. The eyes are yellow. This owl has a distinctive black patch on either side of the hind neck — appearing like a second set of eyes.

Identification: The Northern Pygmy-Owl is often heard calling or seen flying during the day, but is most active at dawn and dusk. It is a favourite target for songbirds and can often be identified by the pack of mobbing birds surrounding it. The flight is straight and direct. When perched the tail is often held at a crooked angle (Tyler and Phillips 1978). The head of this owl is proportionately smaller than that of the Western Screech-Owl or Northern Saw-whet Owls.

Voice: Call is a single mellow whistle, *hoo*, repeated every 2 seconds (sounds like a submarine sonar to some). It also uses a rolling series of hollow *too-too-too-too-too-too-too-too-took-too-took* notes, the last three of these being emphatic.

Habitat

The Northern Pygmy-Owl prefers the edges of open coniferous forests or mixed woodlands, using logged areas, thickets, meadows, parks, farmlands and orchards. It also inhabits river and lakeshores. This diurnal owl is widely distributed in northwestern British Columbia and southwest Alaska, but appears to be a year-round resident only in southern parts of the province and rare elsewhere (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI).

The Northern Pygmy-Owl breeds on Vancouver Island (commoner on the west coast than the east), the mainland coast, as far north as Prince Rupert, and in the southern interior (ecoprovinces: CAM, GED, SOI).

Diet

The Northern Pygmy-Owl eats songbirds, even ones greater in size than the owl itself, often striking them in the air during steep dives. The Northern Pygmy-Owl also takes small mammals like mice and chipmunks, and insects. It is diurnal, feeding in early morning and late afternoon. It caches food during breeding and non-breeding seasons (Holt and Petersen 2000).

Locating Nests

Nests are in natural tree cavities, or those made by the smaller woodpeckers. Nest trees are often found on steep hillsides, slopes, or ravines near water. During courtship, the Northern Pygmy-Owl calls soon after dusk, where the female calls (a low trill) from a perch near the nest, and is joined by the male. In daytime, look for mobbing behaviour by small birds, in locations where owls had previously been heard. This often indicates the presence of the owl and a possible nest site. Egg laying is from mid-April to mid-June and young are at the nest from early June to late August.

Survey Notes

The RIC recommended method for surveying the Northern Pygmy-Owl is call playback during the breeding season.

This owl often perches on tree limbs quite inconspicuously, but also sits on top of treetops conspicuously. It often darts through the bushes like any other small bird and may not be recognised for what it is.

- Timing
  - Greatest calling intensity for the Northern Pygmy-Owl is at dawn and dusk, but it will call at night (D. Fraser, pers. comm.). This is the best time to conduct surveys.
  - The the Northern Pygmy-Owl shows a fairly uniform peak in detections one-half to four hours after sunset, (Deal and Lamont 1996a unpubl.)
- Interstation Distance
  - Recommended distance between call playback stations is 0.8 km (Deal and Lamont 1996s unpubl.).

5.7.8 Burrowing Owl B-BUOW *Athene cunicularia*

BoBC–368; BH–306; NGS–246; PWB–202

Species Description

Appearance: This is a small, round-headed, short-tailed, ground-dwelling owl. The Burrowing Owl is very long-legged, and its thin legs are mostly bare of feathers. The adult is sandy-brown in colour and is boldly speckled and barred, with white eyebrows and throat. Its yellow eyes appear large, and it has a poorly developed facial disk. Juveniles have a cream to buffy unbarred breast.

Identification: This open-country owl is often seen by day standing on the ground or on fence posts. It bows or bobs when agitated, and has a preference for running rather than flight.

Voice: A rapid, chattering *quick quick quick*. At night, the call is a mellow *co-hoo*, pitched higher than a mourning dove.

Habitat

The Burrowing Owl lives in loose colonies in open habitat. It frequents short-grass areas of agricultural lands, airports, golf courses, and coastal sand dunes. It has been found roosting in hollow logs, culverts and barns. In the interior of British Columbia, it lives in open areas of short-grass and sagebrush with rolling hills, plains, range lands and valley bottoms (Campbell

et al. 1990). The Burrowing Owl occurs mainly in the south Thompson and Okanagan in the interior of the province, and also rarely on the Fraser River Delta (ecoprovinces: GED, SOI). This migratory owl arrives in March and departs in September (Campbell *et al.* 1990), though some reintroduced owls have over-wintered in the Kamloops area (Dundas 1995).

The Burrowing Owl virtually disappeared from British Columbia in the late 1970s, and recent attempts have been made to reintroduce owls into the Okanagan (thirteen returned to area in 1992), combined with attempts to protect and extend suitable habitat (ecoprovinces: GED, SOI).

Diet

The Burrowing Owl is an opportunistic feeder, primarily eating arthropods, and occasionally small mammals and birds. It hunts by running, walking, and hopping over the ground, flying from a perch, or hovering and fly catching in the air (Haug *et al.* 1993).

Locating Nests

Nests can be located by watching suitable nest sites for activity, especially birds carrying food to holes. Nests are in ground burrows, either natural or those of burrowing mammals. Burrowing Owls will also use human-made burrows. Nests in British Columbia have included a marmot hole, a badger den, a striped skunk den, and an old drain pipe (Campbell *et al.* 1990). Egg laying is from late March to late May; and young are at the nest from early May to late September.

This species is Red Listed and no attempt should be made to inspect or locate nests without prior permission from the appropriate authorities.

Survey Notes

The RIC recommended method for surveying the Burrowing Owl is roadside surveys in the breeding season.

The Burrowing Owl is vocal during the breeding period, and in defence of nests. The male's primary song is described as *coo-cooo* (Haug *et al.* 1993). Haug and Didiuk (1993) used recordings of this song to elicit responses from territorial pairs. Songbirds will dive at and harass Burrowing Owls, thus giving away their location.

5.7.9 Spotted Owl B-SPOW *Strix occidentalis*

BoBC–372; BH–294; NGS–240; PWB–204

Species Description

Appearance: The Spotted Owl is a medium to large, dark-eyed owl with a puffy round head. It is chestnut brown, with round white spots on head, neck, back, and under-parts. It does not have the barring and streaking of the similar Barred Owl.

Voice: A series of 3 or 4 hesitant dog-like barks and cries. Vocalizations are loud and carry over great distance.

Habitat

South of Downton and Carpenter Lakes to Lillooet, eastern boundary follows the Fraser River from Lillooet to Lytton. South of Lytton its range extends east of the Fraser River to Manning Park. On the west it extends from Downton Lake to the Squamish River Valley and surrounding areas to the US border. Since surveys began in 1985 there have been over 60 occupied sites found. Survey results from 1992 to 2000 suggest a 6.85% annual decline in the number of occupied sites. Currently there are less than 30 occupied sites known (I. Blackburn pers. comm.).

The Spotted Owl inhabits a variety of dense forest habitats. Preferred habitat in British Columbia is Douglas-fir or Douglas-fir/western hemlock forests with varying amounts of western red cedar and amabilis fir. Such forests typically exhibit high canopy closure and multiple canopy layers, dominated by large diameter trees. Roost sites are in dense vegetation, and usually in cool, shady spots near streams. This owl casts pellets at roost sites in early evening during summer, and away from diurnal roost sites during the night in winter. The roost sites are often marked with extensive whitewash, pellets, or moulted feathers.

The Spotted Owl prefers to live and nest in mountainous areas, often in shady ravines near water. It is non-migratory; adults generally occupy the same home range year-round. It tends to nest in thick, multi-layered, older portions of forest with relatively high canopy closure. The majority of Spotted Owl pairs do not breed every year, and have been known not to breed for 5 or 6 years. However, they show a strong fidelity to breeding sites even when not nesting (Gutierrez *et al.* 1995).

Diet

The Spotted Owl mainly eats small and medium-sized mammals, primarily rodents. In British Columbia, Northern flying squirrels predominate, but other important prey includes deer mice, bushy-tailed woodrats, red tree voles, and red-backed voles.

Locating Nests

This species is Red listed and location of nests should only be done with appropriate permission. Nests are in broken-top trees and cavities, or platforms such as abandoned raptor nests, squirrel nests, or witches broom. Nests are often reused. Attempts to locate nests should be conducted between mid-March and early June. Egg laying is from mid-March to late June; and young are at the nest from late April to late July. Males, who roost near nest sites during the day are located with call playback surveys and then given a live mouse, the male will return to the nest with the mouse, revealing its location (Forsman 1983, Blackburn 1995, Franklin *et al.* 1996). Another method involves calling near the nest location to elicit a response from the female.

Risks

It is important for surveyors to note that stimulating owls to move around increases an owl's risk of predation. Further, bringing females off a nest increases risks for eggs and young. Therefore, surveys must be undertaken with caution.

The Spotted Owl has often attacked researchers capturing fledged young, especially near the nest. Both male and female parents strike at the head and upper body with talons. Goggles or a facemask should be worn when climbing a nest or when near fledged young.

Survey Notes

The RIC recommended method for surveying the Spotted Owl is call playback during the breeding season. For a full outline of survey methodology please refer to Blackburn and Lenihan 1995 and USDA 1988.

5.7.10 Barred Owl B-BAOW *Strix varia*

BoBC–374; BH–292; NGS–240; PWB–198

Species Description

Appearance: The Barred Owl is a medium to large, tuft-less, chunky-headed, dark-eyed owl. It is grey-brown with dark barring on the upper breast and dark streaking below.

Voice: More likely than other owls to be heard in the daytime. It gives a rhythmic series of loud hoots that sounds like *who-cooks-for-you, who-cooks-for-you-all*. Also it gives a drawn-out *hoo-ah*, sometimes preceded by agitated barking.

Habitat

This owl prefers deep forest habitats, both mixed and coniferous. Near human settlements it has been found near farmland, towns and parks, roosting in railroad bridges, balconies, awnings, and thickets. The Barred Owl is found through eastern and southern British Columbia, with one record from the north west part of the province. Northern populations are believed to be may be partially migratory while the southern populations are considered residents (ecoprovinces: CAM, GED, CEI, SOI, SIM).

Breeding usually takes place in mature forests near water, including lakeshores, swamps, and creek valleys. It breeds in coastal areas, and in the south-central part of the interior e.g., Kamloops, Okanagan, Campbell *et al.* 1990), (ecoprovinces: CAM, GED, CEI, SOI, SIM, CEI, SBI, NBM, TAP, BOP).

Diet

The Barred Owl eats mice and other small mammals, and will also capture amphibians like frogs and salamanders when these are available. It hunts at twilight and through the night, and is occasionally seen active on cloudy days Tyler and Phillips 1978).

Locating Nests

Nests are found in hollow tree tops or tree cavities south of 55 degrees latitude. Egg laying is from mid-March to late June; and young are at the nest from late April to late July.

Risks

The Barred Owl actively defends nest sites and young and will strike humans. There are records of lacerations, and at least one person losing an eye to a Barred Owl defending its nests.

Survey Notes

The RIC recommended method for surveying the Barred Owls is call playback during the breeding season.

Call playback surveys

- The Barred Owl is a very vocal bird. It shows a high response rate to vocal imitation or call playback during the breeding season, but shows a much lower response in other times of the year.
- Francis and Bradstreet (1997) found that the use of call playbacks increased Barred Owl detections by 50% in the first 2 minutes after playback.
- Documented response rates to call playback for Barred Owls is 82.4% (Bosakowski 1987).
- Timing:
  - Conduct surveys during the breeding season.
  - Surveys can be conducted during the day or during the night. Response by these birds appear to be equal during daylight hours as it is during the night, which makes it easier to survey them on rugged terrain (Bosakowski 1987).
  - Nocturnal surveys: conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise. Takats and Holroyd (1997) found no significant difference in response rate among 3 time intervals: 20:00-23:59, 00:00-03:59 and 03:59-07:59. Deal and Lamont (1996b unpubl.) found the peak of Barred Owl activity was between 1 to 2 hours after sunset during nocturnal surveys.
  - Daylight surveys: surveyors should attempt to remain hidden at stations as this owl may flush or remain secretive if aware of human presence.
- Stop Duration
  - Listen for 15 minutes after broadcasting a series of calls. It is important to allow more than the standard 5 minutes after broadcasting to allow time for this species to respond (pers. comm. D. Fraser, McGarigal and Fraser 1985, Deal and Lamont 1996a unpubl.). Surveyors believe that some Barred Owls fly in relatively close to the tape player without vocalizing, then wait several minutes (5 to 15) after the taped calls end to respond (Deal and Lamont 1996a unpubl.).
  - If a raptor responds, record the number of minutes the detection was made after the calls had been broadcasted. This can later be used to determine the optimal amount of time that a surveyor should wait after broadcasting calls. For example, Takats and Holroyd (1997) found that most of the owl calls in their study in Alberta were recorded in the first 7 minutes suggesting stops do not need to be longer.
  - The surveyor will need to determine whether the time to broadcast more than one call series per station is warranted.
- Interstation Distance
  - Barred Owl song is audible at up to an 800-m distance (Bosakowski 1987). Call playback often brings birds into view without any audible response.
  - Recommended distance between call playback stations is 1.6 km (Bosakowski 1987, Takats and Holroyd 1997). When interstation distance increased from 0.8 to 1.6 km, Francis and Bradstreet (1997) found no change in the number of Barred Owls that observers thought to be at more than one station. However, they did feel the variance associated with the judgement differences of observers to determine whether the same owl was being heard at the next station or not may have decreased.

5.7.11 Great Gray Owl B-GGOW *Strix nebulosa*

BoBC–376; BH–294; NGS–240; PWB–198

Species Description

Appearance: The largest of the North American owls. It has a heavily ringed dark facial disk and yellow eyes. It is dusky grey in colour, and striped lengthwise on the underparts. The Great Gray Owl has a noticeable black chin spot, and white throat patch. It does not have ear tufts.

Identification: The tail of the Great Gray Owl is long for an owl. It hunts in open fields or clearings from fence posts, trees, and other low perches. This bird is much larger than the similar Spotted or Barred Owls, both of which have brown eyes. The Great Horned Owl is of similar size, but it has distinctive long ear tufts and is brown in overall plumage colour.

Voice: A distinctive voice that is deep and booming but not far-reaching. The call is a series of deep, booming *whoo*'s. The territorial call of both sexes is a series of low, evenly spaced '*hoos*' in repetition. This call is used mostly during breeding near the nest.

Habitat

The Great Gray Owl is essentially sedentary, but winter irruptions occur into southern areas; possibly due to lack of prey, competition, deep snow or icy crusts. In the forest, this owl perches against tree trunks, its grey colour rendering it inconspicuous. It also perches on fence posts, telephone wires, and snags in rural areas. The Great Gray Owl is widespread throughout the interior of British Columbia, and is occasionally found in southwestern British Columbia in winter (Campbell *et al.* 1990), (ecoprovinces: GED, SOI, SIM, CEI, TAP, BOP).

It breeds in coniferous, deciduous, or mixed woodlands, usually in the vicinity of water, including marshes, lakes, muskegs, pastures and wet meadows (ecoprovinces: SOI, SIM, CEI, SBI, TAP, BOP)

Diet

The Great Gray Owl feeds on small mammals (voles, mice, young rabbits, and squirrels), and occastonally birds.

Locating Nests

As with most owls these birds do not build their own nests, but use abandoned nest of other species and any available flat surface in riparian and muskeg habitat. Many nests are in abandoned Northern Goshawk nests, witches brooms or the tops of large broken snags. Nest sites are often reused for several years. Daylight searches for nests are best conducted in early spring, when the snow is nearly gone and leaves are not yet out. Researchers should search an area intensively for old Northern Goshawk or Raven nests, or suitable snags, then return to check each possible nest for signs of Great Gray Owl activity. These signs could include whitewash, moulted owl feathers, begging chicks, or the presence of hooting, bill-snapping (territorial) adult owls (Nero 1980). Young chicks defecate in the nest; older chicks over the edge, leaving whitewash on the forest floor later in the breeding season. Egg laying is from late March to the middle of May and young are at the nest from late April to early August.

Risks

While often described as relatively 'tame', Great Gray Owl females are particularly savage in defending small nestlings (Nero 1980). Use a helmet and face mask when in nest vicinity, people have lost eyes.

Survey Notes

The RIC recommended method for surveying the Great Gray Owl is call playback during the breeding season.

The Great Gray Owl remains unseen in many years because, by its nature, it is retiring and fond of deep secluded woods and bogs. It is most conspicuous during the non-breeding season when it comes out of the deep woods to perch and hunt along the edges of clearings and roadways. Many people report that it will appear in windbreaks near roads and in rural areas in harsh winters. Following population increases or when food is scarce, it emerges from the forest in search of prey. Birds are often nomadic, and breeding populations fluctuate.

Most surveys of Great Gray Owls in Canada have been done opportunistically, and the researchers knew the owls were in the area and set out to find more information. Quinton (1988) would walk through suitable habitat in hopes of hearing the raspy screeching of begging immatures, or see an adult carrying a vole towards a nest. Nero (1980), studying in Manitoba, searched intensively in winter, spring and early summer to discover if Great Gray Owls were resident in an area. He reports hearing them call at night even in years when few owls were actually seen. Osborne (1987) surveyed for these owls in Alaska from a small aeroplane. He found that he could observe Great Gray Owls perched at meadow edges, or flushed from forest perches, but felt that the method was biased due to varying visibility and unpredictable individual reactions on the part of the owls.

Several studies have stressed the importance of 'plunge marks' as a clue to the winter habitat of owls. These holes are left as markers in the snow where Great Gray Owls have dived though the surface to capture rodents. Whether shallow or deep, plunge holes show distinctive crescent-shaped marks left by folded wings on initial impact. The bird also often leaves a tail impression and a fainter impression of spread primaries where it braced itself to lift out of the snow. Plunge holes have been used to identify feeding sites and presence of owls by observing roadside snowbanks when driving through owl country. This method is obviously limited by the frequency and depth of snowfall.

Call playback surveys

Some researchers found that Great Gray Owls would respond to call imitations, but not enough research has been done to fully assess this survey method. As is the case with other owls, Great Gray Owls may not respond to playback in low prey years.

- Conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise. Most frequent calling time for Great Gray Owls is a peak at 22:00 and a second peak at 01:00.
- Recommended distance between call stations for this species is 0.8 km (Duncan and Duncan 1997).
- Playback should be done over several years to determine the presence of Great Gray Owls.

- Playback is not recommended as a tool for finding owl nests because owls will respond from large distances over a wide home range and not from nest sites alone.

5.7.12 Long-eared Owl B-LEOW *Asio otus*

BoBC–380; BH–290; NGS–238; PWB–200

Species Description

Appearance: The Long-eared Owl is a medium-sized, slender owl with long, close-set ear tufts. It is brown/grey in colour and boldly streaked and barred on the underparts. The facial disk is rusty coloured. It is a nocturnal species that roosts in forest or thickets and hunts semi-open and open areas at night. Birds feeding young will also hunt in daylight hours. A similar species, the Short-eared Owl, is found hunting in similar habitat, but is seen hunting in daylight. The owl's flight is characterised by fast wing beats, interspersed with short glides.

Voice: Generally silent, except during the breeding season. The common call is one or more long, low, moaning *hooo*'s.

Habitat

The Long-eared Owl nests and roosts in dense forest and hunts in nearby open areas. It breeds in deciduous thickets of birch, willows, trembling aspen, hawthorn, and black cottonwood, usually near water and south of 55 degrees (ecoprovinces: GED, SOI, CEI, SBI). It prefers abandoned nests of crows, hawks and squirrels in small deciduous woodlands.

Though this species is said to roost in large groups in the winter, the only record of this in British Columbia is of six birds roosting together in the Okanagan (Cannings *et al.* 1987). It is found in a variety of habitats at low elevations and often associated with riparian zones. The Long-eared Owl is found throughout the southern third of British Columbia, with the centre of concentration in the Thompson-Okanagan plateau (ecoprovinces: GED, SOI, CEI).

Diet

Small mammals, especially *Microtus* voles, made up the majority of the diet of the Long-eared Owl in the Okanagan valley (Hooper and Nyhof 1986). This owl primarily hunts on the wing over open ground (Marks *et al.* 1994).

Locating Nests

Nests can be located by pinpointing the calling locations of the owl's first calls after sunset and last calls before sunrise. A detailed daytime search of that area should then be conducted to locate the nest. Most nests in British Columbia have been found in dense deciduous shrubs and trees including birch and willow. The Long-eared Owl nests in the old nests of other species. In British Columbia these are primarily crow nests, and sometimes those of the Black-billed Magpie. Most nests found in British Columbia were between 3.5 and 7.5 m above ground (Campbell *et al.* 1990).

The Long-eared Owls will use a 'broken-wing' act in an attempt to distract intruders from nestlings. When approached at roosts, it compresses feathers into a 'slenderized' position and elongates the body to resemble a long branch, but will assume a threatening posture, with fluffed feathers and raised wings, if the disguise fails Guiget 1970). Females on nests will

rarely flush until humans are within 2 m of the nest. Nest defence is weak during incubation and strongest when the young are 2–6 weeks old (Marks *et al.* 1994). Egg laying is from early March to early June and young are at the nest from early April to early August.

Risks

As is the case with all raptors, nests should not be disturbed, especially during the egg laying and incubation stages, or the nesting attempt may be abandoned. Observers should therefore leave the area if the birds are obviously being disturbed.

Survey Notes

The RIC recommended method for surveying the Long-eared Owl is call playback in the breeding season.

The Long-eared Owl has been surveyed during the winter by searching for favourable roosting sites in thickets and dense conifers. Because it tends to roost in the same area all winter long, pellets are found in concentration at these sites. Craighead and Craighead (1969) found that groups of Long-eared Owls would roost together and then scatter out to hunt in other open territories each evening.

Call playback surveys

Hooting Long-eared Owls studied in Finland were surveyed using the point-stop method as well as playback during March and April. Owlets begging calls can be heard at up to 500 m distance (Korpimaki and Norrdahl 1991). Adult Long-eared Owls have reportedly approached humans broadcasting calls of Barred Owl, Great Horned Owl and Northern Saw-whet Owl (Marks *et al.* 1994).

- Timing
  - Conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise.
  - Most calling is done in the breeding season, during which time wide ranges of noises are made by the owls. The advertising song of males can be heard up to 1 km and is given at night, beginning shortly after sunset (Marks *et al.* 1994). Territorial behaviour in the early breeding season comprises a set of acoustic signals and display flights by both the male and female (Voronetsky 1987).
  - The intensity of hooting and demonstrations on nesting territory rapidly decreases after egg laying. After about two weeks, male owls will generally not respond to other male's voices. However, females become more aggressive in response to playback of other female's voices during the nestling stage (Voronetsky 1987).
- Surveys in Alberta used an interstation distance of 1.6 km for this species (Takats *et al.* 2001).

5.7.13 Short-eared Owl B-SEOW *Asio flammeus*

BoBC–382; BH–290; NGS–238; PWB–200

Species Description

Appearance: This is a medium (almost crow-sized) owl with tawny brown, broadly streaked upperparts. The Short-eared Owl is boldly streaked on the breast and has a pale, lightly streaked belly. The dark facial disk emphasizes the yellow eyes.

Identification: This owl of open country is often active by day, particularly at dusk. It flies with erratic, flopping wingbeats and is typically found flying close to the ground, as it quarters an area while searching for prey. The large buffy wing patches on upperparts are visible in flight, and a distinct black patch below at the carpal joint. The complete lack of cross barring on the breast is distinctive. The Northern Harrier also has a wavering flight, but this hawk's conspicuous white rump patch identifies it to be other than the Short-eared owl.

Voice: Makes a raspy, high barking — a sneezy *kee-yow! Wow!*

Habitat

The Short-eared Owl inhabits open country with short vegetation grasslands, marshes, farmlands, tundra and forest clearings. This owl also uses human-altered habitats like golf courses and airports. It breeds in the central interior south of 54 degrees and on the southern mainland coast (ecoprovinces: GED, SOI, SIM, CEI, SBI, BOP). Most nests in British Columbia have been found in shrubby fields adjacent to agricultural areas, but also in airport fields, marshes and rangelands.

The Short-eared Owl is found throughout British Columbia in open habitats, though populations are nomadic and irregular, fluctuating with prey cycles (ecoprovinces: GED, SOI, SIM, CEI, SBI, BOP). The Fraser Delta is a main wintering area for this owl in British Columbia (Campbell *et al.* 1990). In the winter it can also be found in the south of the province near estuaries, sloughs, lakeshores, beaches and lagoons. The Short-eared Owl will roost in large communal groups in peak vole years, hidden in tall grass fields

Diet

The Short-eared Owl feeds almost entirely on small rodents, primarily voles, which it hunts in daylight as well as at night; most rodents are active at dusk and early evening. It hunts primarily on the wing. Foraging flights are described as buoyant and moth-like, with slow wing beats Holt and Leasure 1993).

Locating Nests

Nests are on the ground in large open areas and are usually placed at the base of grass clumps. The Short-eared Owl is most vocal around the nest. It will utter a bark-like '*keee-ow*' throughout the year, when intruded upon by humans (Holt and Leasure 1993). The male Short-eared Owl performs a conspicuous courtship flight over the nesting territory in early spring. These flights and the accompanying calls (*Voo-hoo-hoo-hoo-hoo*) have been used by surveyors as diagnostic features associated with nest sites. Nests are found by searching ground areas where Short-eared Owls have been seen 'sky dancing' and displaying above (Holt 1992). Later in the season, surveyors can listen for begging calls of owl chicks, which

can be heard at up to a distance of 200 m (Korpimaki and Norrdahl 1991). Females, however, rarely flush from the nest until humans are within a few metres of it (Holt and Leasure 1993). Egg laying is from late March to early July and young are at the nest from early April to mid-September.

Risks

The Long-eared Owl defends its nest, but rarely strikes humans. Ground-nesting species are particularly sensitive to human disturbance. Three out of four females flushed from nest by researchers apparently moved and re-nested a short distance away (Holt 1992).

Survey Notes

The RIC recommended methods for surveying the Short-eared Owl are roadside and foot surveys during the breeding season and migration surveys during the non-breeding season.

General

The Short-eared Owl sleeps and roosts primarily on the ground. Pellets left by roosting birds can be distinguished from those of the Northern Harrier because they are longer and show more bone content near the surface (Holt *et al.* 1987).

- The Short-eared Owl is crepuscular. Conduct surveys 0.5 hours prior to sunset until dark, and from the first light to 0.5 hours after sunrise.
- *kewww–owl* call given in response to human intruder in territory (Holt and Leasure 1993).

5.7.14 Boreal Owl B-BOOW *Aegolius funereus*

BoBC–386; BH–304; NGS–246; PWB–202

Species Description

Appearance: This is a small, earless owl with a large head and a pale yellow bill. The facial disks are framed with black. The forehead is dotted with white, and the white underparts are streaked with chocolate brown. Juveniles are dark brown with white eyebrows. Though rarely seen, Boreal Owls are usually discovered perched amid conifer branches, often standing motionless in an upright position near the trunk of the tree. Mobbing behaviour and alarm calls of passerine birds give some indication of a roosting owl.

Voice: Calls mainly in the breeding season, with a short rapid series of hollow *hoo* notes (staccato song). The sound is similar to that of water dripping, and is often confused with the winnowing call of a snipe.

Habitat

This owl is widespread through forested portions of the interior of the province, particularly in the north, and at higher elevations in the south. It is rarely recorded in coastal regions (Campbell *et al.* 1990). (ecoprovinces: CAM, SOI, SIM, CEI, SBI, BOP). Little is known about population densities in British Columbia; Boreal Owls population densities studied over two years in Alberta and Ontario were estimated at one bird/11 km^2 Bondrup-Nielsen

1978). Boreal Owls live and breed in boreal forest characterized by black and white spruce. In British Columbia they appear to prefer stands of mixed white spruce and trembling aspen in northern areas. In the central and southern interior, they have been found among Douglas-fir, lodgepole pine, and sub-alpine fir. Near Lillooet Lake they have used stands of Douglas-fir and western redcedar; near Kamloops, Engelmann spruce (Campbell *et al.* 1990). They roost near the boles of trees, at heights averaging about 6 m above ground. Roost sites are generally in dense conifer. This species is considered largely sedentary, though irruptions do occasionally occur. A shift in concentration of activity to lower elevations has also been recorded in winter. Movements seem to be more common in low prey years. Breeding period is not clearly defined in British Columbia with one record of nest eggs found in May and one record of young in June (Campbell *et al.* 1990). Egg laying has been recorded from late March to early June in the United States with a nestling period of 28-36 days (Hayward and Hayward 1993).

Diet

Boreal Owls feed by preference on small rodents, particularly voles. Smaller prey includes shrews and mice when available. Small birds, flying squirrels and insects also make up part of the diet.

Locating Nests

The Boreal Owl nests in tree cavities, typically old woodpecker nests, particularly those of the Northern Flicker and Pileated Woodpecker. Nests have been reported both in spruce and in trembling aspen. Nests or the location of the likely nest site can be found by walking in quietly to a calling bird. By using a spotlight, the singing male can often be seen calling from the nest hole. If the tree foliage is too dense, the tree can be flagged and a visual check can then be made of this and adjacent trees in daylight to locate possible nest sites. It should be noted that at this point you are surveying calling males, and a later check will be needed to see if the male successfully attracted a female to nest in that cavity. Presence of an owl in the cavity can often be confirmed by sharply rapping upon the trunk while watching the hole for a response; usually the protrusion of a disturbed female Boreal Owl. This technique, however, is not always useful, as females will not regularly flush during early stages of brooding. The presence of greyish down feathers around the rim of the hole and scattered whitewash at the base of surrounding trees is another more reliable clue.

The Boreal Owl casts pellets (one or two a day) from roost sites, and defecates from its perch a few times a day, often just before moving perches. Males only appear to display territorial behaviour in close proximity to the nest, and thus will not necessarily react to visitors within their home range.

These nest holes are known to fill with rotting prey remains, and the stench can be somewhat remarkable.

Survey Notes

The RIC recommended method for surveying the Boreal Owl is call playback during the breeding season.

Detectability for Boreal Owls is highly variable; they are almost impossible to locate during the day. When encountered at roost sites, the birds assume a long, thin posture against the tree trunk, narrowing the eyes to slits and erecting the facial disk into shallow 'horns'.

The best time for surveying is in the early spring, when males are singing the 'staccato song' near possible nest holes. This call resembles the winnowing noise of the common snipe, and is a trill of notes in a constant pitch. This call lasts one or two seconds, with about 12 pulsed notes per second, and is the only really loud vocalisation of this species. The unpaired male calls persistently for 20 minutes or more each night near possible nest holes, gradually increasing until his singing lasts most of the night. However, annual, seasonal, and nightly calling activity is highly variable. It is likely associated with changes in prey populations.

- Timing:
  - O'Connell (1987) found that the owls will respond to the 'staccato' song during most of the year, however, the best time for surveying may be in the early spring when males are singing.
  - Surveys should be done on moonlight nights, because the owls often approached without making a sound, therefore visual sightings are needed.
  - Conduct surveys between 0.5 hours after sundown and 0.5 hours before sunrise. Greatest calling intensity for the Boreal Owl is before midnight, but it can call anytime before dawn (Hayward and Hayward 1993).
- Stop Duration
  - The standard listening time of 5 minutes should be used after a call series is played.
  - Replies sometimes come after a delay of up to 15 minutes (O'Connell 1987).
  - In Ontario, Francis and Bradstreet (1997) found that many Boreal Owls responded spontaneously, however, call playback did increase response success. In the same study they also found that a prolonged final listening period was not efficient for this species as only a 30% increase in detections resulted from listening another 8 minutes after the initial 4 minutes of calls and listening period. They suggest keeping the stops short and doing more stations.
- Interstation Distance
  - Recommended distance between call playback stations for the Boreal owl is 0.7 and 0.8 km (Ryder et al. 1987, Palmer 1987).
  - Males can be heard calling from over 1.5-km distance on calm nights (Bondrup-Nielsen 1978).
- Surveyors must be trained to distinguish the owl's song from the winnowing of a snipe. Snipe will respond to playback of the Boreal Owl call.
- Conduct surveys over a minimum of three years because low vocal activity in two consecutive years is likely (Palmer 1987).

5.7.15 Northern Saw-whet Owl B-NSWO *Aegolius acadicus*

BoBC–388; BH–304; NGS–246; PWB–202

Species Description

Appearance: The Northern Saw-whet Owl is one of the smallest owls (robin-sized), without ear tufts. It is reddish brown above, and the underparts are white with blotchy rufous streaking. The facial disks are reddish and the bill is dark. Juveniles are dark reddish brown

with white eyebrows forming a V on the forehead. This owl is most often encountered as its hiding place and is revealed by an angry mob of scolding passerines.

Voice: A single, mellow, whistled note, repeated rapidly and monotonously. It also gives a raspy call.

Habitat

This owl is found in woodlands, dense forests, groves, and thickets of pure and mixed coniferous and deciduous trees. It also frequents tall shrubs often in association with lakeshores, wet bogs and marshes, hillsides and canyons, city parks, orchards, campgrounds and wooded residential areas. Northern Saw-whet Owls roost in dense tangles of branches as well as natural cavities and human-made structures like garages, barns, cabins, airport hangars, and stables. The breeding habitat in the western mountains overlaps that of the Flammulated Owl, and to some extent, that of Northern Pygmy-Owl. The Northern Saw-whet Owl frequently uses woodlands in second growth or transitional stages. Egg laying is from late February to early June and young are at the nest from early April to mid-August.

The Northern Saw-whet Owl is present year-round in its breeding range (ecoprovinces: CAM, GED, SOI, SIM, CEI, SBI, BOP). The Northern Saw-whet Owl is found on the Queen Charlotte Islands, southeastern Vancouver Island, and across the interior of British Columbia south of 51° latitude, and is very rarely found in northern British Columbia (numbers decrease rapidly north of Prince George). Considerable numbers move south as local spring and autumn migrants in southern British Columbia (Campbell *et al.* 1990).

Diet

The Northern Saw-whet Owl's main prey are small mammals, especially mice and voles. They forage along forest edges and openings, where suitable perches are located.

Locating Nests

This owl nests in natural and animal-created (usually Flicker or Pileated Woodpecker) cavities. Cavities in both deciduous and coniferous trees are used as well as nest boxes. Nests can be located by using the above (call playback surveys) to locate calling males. Try to pinpoint the location of these birds over several observation sessions and then search the immediate vicinity in daytime for possible nest site holes. These possible nests should be marked but not checked until later in the breeding season by which time a female may have been attracted to the nest and be in the latter stages of incubation or brooding chicks. Females may respond to a sharp rap on the tree by looking out of the nest hole, but others will sit tight on eggs and young and therefore the nests should be inspected visually for the presence of the birds. Field signs, such as the presence of down feathers around the edge of the nest hole and possibly the presence of small flies around the entrance hole, can also be used to indicate a nest site is active.

Risks

Female Northern Saw-whet Owls discovered on nests before, during, or shortly after egg laying have deserted their nests. It is best to wait a week before checking the contents of any newly found nest.

Survey Notes

The RIC recommended method for surveying the Northern Saw-whet Owl is call playback during the breeding season.

Male Northern Saw-whet Owls give advertising calls from February through April in southern British Columbia, with the peak period in late February and March. A minor resumption of singing in late summer and fall has been recorded. Road surveys for singing males gave a rough measure of relative population densities in several habitats in the Okanagan Valley (Cannings 1987). Cannings (1987) used nest boxes, but did find several nests in natural cavities by looking for singing males in March and April and surveying for nests in areas where they were heard. When listening for voluntarily calling Northern Saw-whet Owls, it is important to arrive before singing begins and to remain silent and motionless, as birds are easily disturbed.

Call playback surveys

- Tape playback of recorded song was used to effectively survey Northern Saw-whet Owls by Swengel and Swengel (1987).
- Northern Saw-whet Owls have been found to respond to Boreal Owl calls (Francis and Bradstreet 1997) and human imitations.
- In Ontario, Francis and Bradstreet (1997) found that many Northern Saw-whet Owls responded spontaneously, however, call playback did increase response success. Deal and Lamont (1996b unpubl.) found that the majority of Northern Saw-whet Owls detected started calling prior to broadcasting taped calls.
- Timing:
  - Greatest calling intensity for the Northern Saw-whet Owl is within a half-hour of sunset to just before sunrise, therefore surveys should be conducted between 0.5 hours after sundown and 0.5 hours before sunrise. Gill and Cannings (1997) conducted their surveys on the Queen Charlotte Islands starting at dark and continuing for five hours.
  - Singing activity is thought to peak in March or April at least in some parts of British Columbia (Cannings 1993). As a caution, playback surveys conducted in early spring may have to be scheduled to avoid times when snow melt noise is high. Running water greatly obscures owl hoots, and may affect the optimal time for surveying depending on the location.
  - Early in the breeding season the Northern Saw-whet Owl will respond even at midday with short song burst (Cannings 1993)
- Stop Duration
  - After broadcasting a series of calls, listen and wait the standard 5 minutes for any responses. In northern Ontario, Francis and Bradstreet (1997) found that in northern Ontario a prolonged final listening period was not efficient for this species as only a 30% increase in detections resulted from listening another 8 minutes after the initial 4 minutes of calls and listening period. They suggest keeping the stops short and doing more stations.
  - Gill and Cannings (1997) broadcasted up to 3 recordings of taped call series if no response was elicited after the first broadcast, with total station time lasting 8-10 minutes.

- Interstation Distance
  - Recommended distance between call playback stations for this species of inconspicuous owl is 0.7 (Palmer 1987).
  - Swengel and Swengel (1987) used a distance of 0.1 km. This may be appropriate if initial surveys indicate that there is a very high density of Northern Saw-whet Owls in the area. In 1997, they also used a distance of 0.1 km between call playback stations to calculate calls/station rather than owls/station.

5.8 Species Frequently Identified Incorrectly As Raptors

5.8.1 Crows and Ravens

American Crow	B-AMCR	*Corvus brachyrhynchos*
Northwestern Crow	B-NOCR	*Corvus caurinus*
Common Raven	B-CORA	*Corvus corax*

BoBC III–220, 228, 236; BH–416, 420; NGS–182; PWB–182

These species can be confused with raptors when they are seen flying high in the sky. These species also construct large stick nests similar in size and location to many raptors, and on occasions will build on old raptor nests.

Habitat

Crows are found in central, southern, and coastal British Columbia. They are most frequently seen in urban and agricultural settings. The Common Raven is found throughout the province from sea level to mountain peaks, and numerically over-take the American Crow in the central and northern parts of the province.

Diet

Corvids are true generalists, with diets ranging from vegetation and meat to scavenging kills to picking through garbage.

Locating Nests

Ravens build large (30–50 cm wide) nests that are located on cliffs, human-made structures, and near the top of mature deciduous and coniferous trees. Nests can be located by standwatches, aerial surveys, boat surveys and foot transects. Begging young often reveal the presence of a nest during foot searches in early summer. The nest is often surrounded by whitewash from the young and perching adults. Nests are reused, but a pair may have several other nest sites within the area that may have been used in other years. If a nest is not in use, raptor species such as Red-tailed Hawks could use the same nest.

Crows build smaller nests (20–30 cm wide), and are located in a variety of locations from human-made structures to cliffs. However, these nests will usually be placed in a tree. Nests in trees are often lower down in the crown than a Raven's nest, and there may be a loose colony of nests with pairs in several nearby trees (Ehrlich *et al.* 1988). As with ravens, crow nests are important platforms for the nests of some owl species, and therefore their presence may influence the distribution of these raptors. Nests are most readily located before leaf out as the birds are actively displaying and building nests (Dunk *et al.* 1997).

Survey Notes

These species are not part of the RIC *Inventory Methods for Raptors*, but nests and sightings of these species will frequently be encountered and it is important to be able to distinguish between these and raptor species.

In flight, ravens are the species most easily confused with raptor species such as hawks and eagles. It can be readily distinguished from similar sized raptor species by the characteristic wedge shaped tail.

Ravens breed early in the spring and are very defensive against large raptor species around their nest sites, often preventing hawks from breeding within several hundred meters of their nests. Location of raven nests is therefore a useful tool when determining the distribution of raptors that breed later in the breeding season. Nests of crows and ravens provide ideal nest sites for those species of owls that use stick nests of other species. Therefore, corvid nest distribution may affect the distribution and abundance of certain owl species.

As for all raptors where aerial surveys are used, helicopter flights should be flown a minimum of 50 m above the nest and should be terminated if birds are becoming agitated. Confirmation of nest occupancy can be determined on a later flight during the nestling stage when young are visible from a greater distance.

5.8.1 Common Nighthawk

An American Kestrel sized bird that like the smaller falcons has long pointed wings. This grey/brown bird is commonly seen at dusk and early morning as it circles and swoops for insects over open areas. It is best distinguished from the small falcons by the single white wing splashes across the primaries, the sweptback wings and slightly forked tail. Further, it has a distinctive call a nasal *peent* that is frequently heard while in flight.

5.8.1 Other Species

Fleeting glimpses of many species, notably waders (snipe), pigeons and grouse can and will be confused with raptor species, especially when seen in poor light and areas of poor visibility (forests). Mourning doves, blue grouse and common snipe can all sound like owls.

Glossary

ABSOLUTE ABUNDANCE: The total number of organisms in an area. Usually reported as absolute density: the number of organisms per unit area or volume.

ACCURACY: A measure of how close a measurement is to the true value.

AERIE (also eyrie): a cliff ledge or mountain top nest site of a raptorial bird species.

BIODIVERSITY: Jargon for biological diversity: "the variety of life forms, the ecological roles they perform, and the genetic diversity they contain" (Wilcox, B.A. 1984 cited in Murphy, D.D. 1988. Challenges to biological diversity in urban areas. Pages 71 - 76 in Wilson, E.O. and F.M. Peter, Eds. 1988. Biodiversity. National Academy Press, Washington, DC 519 pp.).

BIOGEOCLIMATIC SUBZONE: a geographic area with a uniform regional climate which is characterized by the same distinct climax vegetation on midslope (zonal) sites and relatively uniform mean temperature and precipitation.

BIOGEOCLIMATIC ZONE: a habitat mapping classification system which divides the province of British Columbia into 14 broad, climatically distinct areas usually named after the dominant climax tree species. Zones are differentiated by distinct patterns of vegetation and soil and can be more finely divided into subzones, variants and phases.

BLUE LIST: Taxa listed as BLUE are sensitive or vulnerable; indigenous (native) species that are not immediately threatened but are particularly at risk for reasons including low or declining numbers, a restricted distribution, or occurrence at the fringe of their global range. Population viability is a concern as shown by significant current or predicted downward trends in abundance or habitat suitability.

BROAD ECOSYSTEM UNIT: is a permanent area of the landscape that supports a distinct type of dominant vegetative cover, or distinct non-vegetated cover (such as lakes or rock outcrops). It is defined as including potential (climax) vegetation and any associated successional stages (for forests and grasslands). Broad Ecosystem Units are meant to be used for small scale mapping of large areas, mainly at the 1:250,000 scale.

CALL STATION: a unique location from which raptor calls are broadcasted. These are usually spaced at equidistances along a line transect.

CBCB (Components of British Columbia's Biodiversity) Manuals: Wildlife species inventory manuals that have been/are under development for approximately 36 different taxonomic groups in British Columbia, in addition, six supporting manuals.

CREPUSCULAR: Active in twilight, at dawn or dusk.

DESIGN COMPONENTS: Georeferenced units which are used as the basis for sampling, and may include geometric units, such as transects, quadrats or points, as well as ecological units, such as caves or colonies.

DIHEDRAL: Shape formed by birds when wings are held above the body in flight. It is the most aerodynamic/energy efficient position.

DISPERSAL: the movement of young birds from the site where they hatch to the site where they breed.

DIURNAL: Active during the daytime

ECOPROVINCE: is an area with consistent climate or oceanography, relief and plate tectonics, there are nine terrestrial and one maritime ecoprovinces in British Columbia

ECOREGION: is an area with major physiographic and minor macroclimatic oceanographic variation, there are 43 ecoregions in British Columbia, of which 39 are terrestrial

ECOSECTION: are areas with minor physiographic and macroclimatic or oceanographic variation, there are 110 ecosections in British Columbia, of which 100 are terrestrial.

EWG (Elements Working Group): A group of individuals that are part of the Terrestrial Ecosystems Task Force (one of 7 under the auspices of RIC) which is specifically concerned with inventory of the province's wildlife species. The EWG is mandated to provide standard inventory methods to deliver reliable, comparable data on the living "elements" of British Columbia's ecosystems. To meet this objective, the EWG is developing the CBCB series, a suite of manuals containing standard methods for wildlife inventory that will lead to the collection of comparable, defensible, and useful inventory and monitoring data for the species populations.

FLUSHING: to cause a raptor to temporarily leave its present location.

FLYWAY: geographical corridors such as mountain ridges or valleys along which raptors concentrate during migration.

INVENTORY: The process of gathering field data on wildlife distribution, numbers and/or composition. This includes traditional wildlife range determination and habitat association inventories. It also encompasses population monitoring, which is the process of detecting demographic changes (e.g. growth rate, recruitment and mortality rates) or distribution changes in a population. This is done by using information from repeated inventories and relating these changes to either natural processes (e.g. winter severity, predation) or human-related activities (e.g. animal harvesting, mining, forestry, hydro-development, urban development, etc.). Population monitoring may include the development and use of population models that integrate existing demographic information (including harvest) on a species. Within the species manuals, inventory also includes, species statusing which is the process of compiling general (overview) information on the historical and current abundance and distribution of a species, its habitat requirements, rate of population change, and limiting factors. Species statusing enables prioritization of animal inventories and population monitoring. All of these activities are included under the term inventory.

IRRUPTION: mass dispersal of populations caused by environmental factors such as food scarcity.

MIGRATION: a massive shift of birds twice each year between regular breeding and wintering ranges.

MONITOR: To follow a population (usually numbers of individuals) through time

NOCTURNAL: Active at night.

NOMADISM: movement from one place to another usually seeking food supplies.

OBSERVATION: The detection of a species or sign of a species during an inventory survey. Observations are collected on visits to a design component on a specific date at a specific time. Each observation must be georeferenced, either in itself or simply by association with a specific, georeferenced design component. Each observation will also include numerous types of information, such as species, sex, age class, activity, and morphometric information.

PELLETS: undigested food items (hair, feather fragments, bones) that are regurgitated by raptors.

POPULATION: A group of organisms of the same species occupying a particular space at a particular time.

PRECISION: A measurement of how close repeated measures are to one another.

PRESENCE/NOT DETECTED (POSSIBLE): A survey intensity that verifies that a species is present in an area or states that it was not detected (thus not likely to be in the area, but still a possibility).

PREY REMAINS: feathers, bones, carcasses from prey items eaten by raptors.

PROJECT AREA: An area, usually politically or economically determined, for which an inventory project is initiated. A project boundary may be shared by multiple types of resource or species inventory. Sampling for species generally takes place within smaller, representative study areas so that results can be extrapolated to the entire project area.

PROJECT: A species inventory project is the inventory of one or more species over one or more years. It has a georeferenced boundary location, to which other data, such as a project team, funding source, and start/end date are linked. Each project may also be composed of a number of surveys.

QUADRAT: areas equal in size and shape and are usually generated by laying a grid over a map of the project area.

RANDOM SAMPLE: A sample that has been selected by a random process, generally by reference to a table of random numbers.

RED LIST: Taxa listed as RED are candidates for designation as Endangered or Threatened. Endangered species are any indigenous (native) species threatened with imminent extinction or extirpation throughout all or a significant portion of their range in British Columbia. Threatened species are any indigenous taxa that are likely to become endangered in British Columbia, if factors affecting their vulnerability are not reversed.

RELATIVE ABUNDANCE: The number of organisms at one location or time relative to the number of organisms at another location or time. Generally reported as an index of abundance.

RIC (Resources Inventory Committee): RIC was established in 1991, with the primary task of establishing data collection standards for effective land management. This process involves evaluating data collection methods at different levels of detail and making recommendations for standardized protocols based on cost-effectiveness, co-operative data collection, broad application of results and long term relevance. RIC is comprised of seven task forces: Terrestrial, Aquatic, Coastal/Marine, Land Use, Atmospheric, Earth Sciences, and Cultural. Each task force consists of representatives from various ministries and agencies of the Federal and BC governments and First Nations. The objective of RIC is to develop a common set of standards and procedures for the provincial resources inventories. [See http://www.for.gov.bc.ca/ric/]

SPI: Abbreviation for 'Species Inventory'. Generally used in reference to the Species Inventory Datasystem and its components.

STANDWATCH: passive observation of suitable habitat looking for raptors flying above the canopy and/or listening for raptor vocalizations within suitable habitat.

STRATIFICATION: The separation of a sample population into non-overlapping groups based on a habitat or population characteristic that can be divided into multiple levels. Groups are homogeneous within, but distinct from, other strata.

STUDY AREA: A discrete area within a project boundary in which sampling actually takes place. Study areas should be delineated to logically group samples together, generally based on habitat or population stratification and/or logistical concerns.

SURVEY: The application of one RIC method to one taxonomic group for one season.

SYSTEMATIC SAMPLE: A sample obtained by randomly selecting a point to start, and then repeating sampling at a set distance or time thereafter.

TERRESTRIAL ECOSYSTEMS TASK FORCE: One of the 7 tasks forces under the auspices of the Resources Inventory Committee (RIC). Their goal is to develop a set of standards for inventory for the entire range of terrestrial species and ecosystems in British Columbia.

TERRITORY: an area defended by a pair of nesting raptors; boundaries are flexible over the years.

TRANSECT: a sampling design whereby the subject of interest is sampled along a line that is traversed using some form of transportation.

YELLOW-LIST: Includes any native species that is not red- or blue-listed.

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Habitat

In New York, bog turtles occur in open-canopy wet meadows, sedge meadows, and calcareous fens. The known habitat in the Lake Plain region of the state includes large fens that may include various species of sedges, such as slender sedge (*Carex lasiocarpa*), bog buckbean (*Menyanthes trifoliata*), mosses (*Sphagnum* spp.), pitcher plants (*Sarracenia* sp.), scattered trees, and scattered shrubs. In the Hudson River Valley, bog turtle habitats may be isolated from other wetlands or they may exist as part of larger wetland complexes. These wetlands are often fed by groundwater and the vegetation always includes various species of sedges. Other vegetation that is frequently found in southern New York bog turtle sites includes shrubby cinquefoil (*Potentilla fruticosa*), grass-of-parnassus (*Parnassia glauca*), mosses (*Sphagnum* spp.), horsetail (*Equisetum* sp.), scattered trees such as red maple (*Acer rubrum*), red cedar (*Juniperus virginianus*), and tamarack (*Larix laricina*), and scattered shrubs such as willows (*Salix* spp.), dogwood (*Cornus* spp.), and alder (*Alnus* spp.).

Associated Ecological Communities

Marl Fen
A wetland that occurs on a bed of marl. Marl is a whitish substance that is deposited from water that has a lot of calcium dissolved in it. The whitish substance is calcium carbonate, people used to harvest marl to lime agricultural fields. The marl substrate is always saturated, may be flooded, and has a very high pH, generally greater than 7.5. The main source of water is always groundwater. The plants are often sparse and stunted. Marl fens may occur as small patches within a rich graminoid fen.

Medium Fen
A wetland fed by water from springs and seeps. These waters are slightly acidic (pH values generally range from 4.5 to 6.5) and contain some dissolved minerals. Plant remains in these fens do not decompose rapidly and thus the plants in these fens usually grow on older, undecomposed plant parts of woody material, grasses, and mosses.

Red Maple-hardwood Swamp
A hardwood swamp that occurs in poorly drained depressions, usually on inorganic soils. Red maple is usually the most abundant canopy tree, but it can also be codominant with white, green, or black ash; white or slippery elm; yellow birch; and swamp white oak.

Red Maple-tamarack Peat Swamp
A swamp that occurs on organic soils (peat or muck) in poorly drained depressions. These swamps are often spring fed or enriched by seepage of mineral-rich groundwater resulting in a stable water table and continually saturated soil. The dominant trees are red maple and tamarack. These species usually form an open canopy (50 to 70% cover) with numerous small openings dominated by shrubs or sedges.

Rich Graminoid Fen
A wetland of mostly grasses usually fed by water from highly calcareous springs or seepage. These waters have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. Plant remains do not decompose rapidly and these grasses usually grow on older, undecomposed plant parts.

Rich Shrub Fen
A wetland with many shrubs that is usually fed by water from springs and seeps. These

waters have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. Plant remains in these fens do not decompose rapidly and thus the plants in these fens usually grow on older, undecomposed woody plant parts.

Rich Sloping Fen
A small, gently sloping wetland that occurs in a shallow depression on a slope composed of calcareous glacial deposits. Sloping fens are fed by small springs or groundwater seepage. Like other rich fens, their water sources have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. They often have water flowing at the surface in small channels or rivulets.

Sedge Meadow
A wet meadow community that has organic soils (muck or fibrous peat). Soils are permanently saturated and seasonally flooded. The dominant herbs must be members of the sedge family, typically of the genus Carex.

Other Probable Associated Communities

Black spruce-tamarack bog
Dwarf shrub bog

Associated Species

Spotted Turtle (*Clemmys guttata*)
Wood Turtle (*Clemmys insculpta*)