



December 15, 2014

VIA ELECTRONIC MAIL

Ref: 28409.00

Ms. Andrea Chaloux
Information Services
New York Natural Heritage Program
New York State Department of
Environmental Conservation
625 Broadway, 5th Floor
Albany, New York 12233-4757

Re: Request for Additional Information
Proposed Subdivision of EPCAL Property at Calverton
Calverton, Town of Riverhead
Suffolk County, New York
Suffolk County Tax Map Nos.: District 0600 - Section 135.00 – Block 01.00 –
Lots 007.001,007.002,007.029,007.033 and 007.004

Dear Ms. Chaloux:

VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) is serving as a consultant to the Town of Riverhead Town Board (as lead agency), for the proposed subdivision and redevelopment of portions of the 2,323.9± acre Enterprise Park at Calverton (EPCAL) property, located in the hamlet of Calverton, Town of Riverhead, Suffolk County (the "subject property"). Pursuant to VHB's January 24, 2014 request, the New York Natural Heritage Program (NYNHP) provided a list of records for rare and New York State-listed plants, wildlife and significant natural communities at and in the vicinity of the subject property, dated February 7, 2014 (copies of VHB and NYNHP correspondence enclosed). The records list was utilized as part of the rare/protected species assessment included as part of the Comprehensive Habitat Protection Plan (CHPP) and Draft Supplemental Generic Environmental Impact Statement (DSGEIS) for the proposed action. Currently, VHB is in the process of preparing a Final Supplemental Generic Environmental Impact Statement (FSGEIS) for the proposed action.

As part of the FSGEIS process, VHB must respond to comments issued by the New York State Department of Environmental Conservation (NYSDEC) Region 1 Office, in correspondence dated October 10, 2014. Specifically, the NYSDEC Region 1 Office has requested that VHB contact the NYNHP in order that we may provide more detailed information regarding the NYNHP rare/protected species and habitat records identified for the subject property and vicinity. In particular, the NYSDEC is requesting that VHB provide

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Ref: 28409.00
Ms. Andrea Chaloux
December 15, 2014
Page 2



a detailed discussion of the eight on-site and two off-site tiger salamander breeding ponds in the DEIS, and that the location of the breeding ponds and their associated buffer areas be incorporated into the property mapping. Accordingly, VHB respectfully requests that any and all available information for the individual species records included in the NYNHP's February 7, 2014 correspondence be provided, including the locations of the eight on-site and two off-site tiger salamander breeding ponds.

Thank you in advance for your assistance. If additional information is required, or if you have any questions, please do not hesitate to contact me.

Sincerely,

VHB Engineering, Surveying and Landscape Architecture, P.C.

A handwritten signature in blue ink, appearing to read "David Kennedy", written in a cursive style.

David Kennedy
Project Scientist

DK/ba

enc.

cc: Mr. Robert Marsh, Regional Natural Resources Supervisor, NYSDEC

Kennedy, David

From: Gibbons, Michelle L (DEC) <michelle.gibbons@dec.ny.gov>
Sent: Thursday, January 29, 2015 4:19 PM
To: Kennedy, David
Cc: Marsh, Rob (DEC); Hammarth, George (DEC)
Subject: RE: FW: Follow-up on letter from DEC re: EPCAL property
Attachments: OFFSITE_TIGER_PONDS.dbf; OFFSITE_TIGER_PONDS.prj;
OFFSITE_TIGER_PONDS.sbn; OFFSITE_TIGER_PONDS.sbx;
OFFSITE_TIGER_PONDS.shp; OFFSITE_TIGER_PONDS.shp.xml;
OFFSITE_TIGER_PONDS.shx

Follow Up Flag: Follow up
Flag Status: Flagged

David,

Attached are the shapefiles for the 2 off-site tiger salamander breeding ponds. All eight ponds on the project mapping are tiger salamander breeding ponds.

Additionally, you have requested that the NYSDEC provide any available information regarding specific on-site locations for the species records provided by natural heritage, assuming that any such information exists. For information on the banded sunfish you should contact Chart Guthrie, Fisheries Manager at 631.444.0280. The shapefiles attached provide the missing information on the on and off-site tiger salamander ponds. As for locational information on the short-eared owl, the natural heritage data is not specific, it includes all of the grasslands on-site. Missing from the Natural Heritage reports is the upland sandpiper and northern harrier. There is no specific location information available for the northern harrier of the upland sandpiper. The remaining species listed in the Natural Heritage letter have some information on location – do you need additional information or clarification on any one of those locations?

From: Kennedy, David [mailto:DKennedy@VHB.com]
Sent: Friday, January 23, 2015 3:28 PM
To: Gibbons, Michelle L (DEC)
Cc: Scully, Peter A (DEC); Marsh, Rob (DEC); Hammarth, George (DEC); lewis@townofriverheadny.gov; Pesner, Gail
Subject: RE: FW: Follow-up on letter from DEC re: EPCAL property

Hello Michelle:

Thank you for agreeing to provide the requested information for the EPCAL site and vicinity. Our original intention was to submit an information request for the records in question directly to the NYSDEC. However, based upon the November 26, 2014 EPCAL meeting at NYSDEC Region 1 headquarters attended by VHB personnel and NYSDEC staff, it was my understanding that VHB was to submit the request to the NYNHP instead.

As mentioned in your message to George Hammarth below, please forward the shape files for the two eastern tiger salamander breeding ponds located at off-site locations, in order that we may incorporate them into the project mapping. Based on the NYSDEC comment in the Final Supplemental Generic Environmental Statement (FSGEIS), we are aware that the two ponds are located on Suffolk County Tax Map parcels 0600-135-01-7.56 and 0600-136-01-1, however the location of the breeding pond on the former parcel is not readily apparent from aerial imagery. Also, based on the your comment in the aforementioned message, it is now my understanding that the eight ponds that are currently shown on the project mapping are all eastern tiger salamander breeding ponds. Please confirm if this is the case so that we may update the project mapping with the buffer zones for all of the breeding ponds.

Additionally, as detailed in the in the Draft Supplemental Generic Environmental Impact Statement (DSGEIS) and the Comprehensive Habitat Protection Plan (CHPP) for the EPCAL site, in addition to eastern tiger salamander and coastal barrens buck moth, the NYNHP has provided records for additional rare/protected plant and wildlife species located at or in the vicinity of the EPCAL site (a copy of the NYNHP correspondence is attached). In order to fully address the NYSDEC comments included in FSGEIS, we are requesting that the NYSDEC provide any available information regarding specific on-site locations for these species records, assuming that any exist such information exists.

Please do not hesitate to contact me if you have any questions.

Thank you,

David Kennedy, MS
Project Scientist

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From: Hammarth, George (DEC) [<mailto:george.hammarth@dec.ny.gov>]
Sent: Thursday, January 22, 2015 12:20 PM
To: Kennedy, David; lewis@townofriverheadny.gov
Cc: Gibbons, Michelle L (DEC); Scully, Peter A (DEC); Marsh, Rob (DEC)
Subject: [Pending]FW: Follow-up on letter from DEC re: EPCAL property

Hi Jill & David,

This responds to Jill's inquiry from yesterday about the status of the DEC and the Natural Heritage Program (NHP) response to David Kennedy's December 15, 2014 letter to the NHP seeking additional information about listed species at the EPCAL property to allow VHB to progress with FEIS and associated comprehensive habitat protection plan. David's letter produced some discussion between the NHP program folks and the Stony Brook DEC office to clarify our respective roles in this situation. Basically, the operating agreement between the NHP and DEC does not allow NHP to provide specific location information for listed species. If the inquiring entity requires more detailed information than NHP provides in response to the initial inquiry, they need to request it from the DEC regional office.

I've had the message below from Regional Wildlife Manager Michelle Gibbons since January 16th, my apologies. David, please read through Michelle's below and the attachments. If you have additional questions or need to discuss details, you can contact Michelle directly via email.

Thank you.

George Hammarth
NYSDEC Region 1.

From: Gibbons, Michelle L (DEC)
Sent: Friday, January 16, 2015 4:37 PM

To: Hammarth, George (DEC)

Subject: FW: Follow-up on letter from DEC re: EPCAL property

George – do you want me to contact Nick Conrad?

Attached is the tiger salamander guidance that we should provide to VHB, if they don't already have it. The latest subdivision map that they provided has 6 Tiger salamander occurrences (8 ponds) already mapped – but not all show the buffers. I can provide locations for the remaining 2 ponds directly. You provided the tax map parcels in your comments letter – they should have been able to figure it out from that? Either way – I can provide a shapefile for them.

The coastal barrens buck moth is what shows up on the Nat Heritage layer. Attached is the NYNHP Conservation Guide for the coastal barrens buck moth. We asked them to explore the possibility that the frosted elfin could also utilize the property. Natural Heritage would not have any information on the elfin as there is no record. Attached is the NYNHP Conservation Guide for the frosted elfin. It provides information on habitat requirements. Basically if the food plant is not there neither is the elfin. Long Island Elfin feed on wild indigo. The most typical habitats are utility right-of-ways and, at least in neighboring states, airport approach zones.

Is this at all helpful or do you want me to call VHB directly?

From: Conrad, Nick (DEC)

Sent: Tuesday, January 13, 2015 4:22 PM

To: Evans, Roger (DEC); Gibbons, Michelle L (DEC)

Cc: Chaloux, Andrea M (DEC)

Subject: Follow-up on letter from DEC re: EPCAL property

Hello, Roger and Michelle,

The New York Natural Heritage Program received the attached letter from VHB regarding the subdivision and redevelopment of the Enterprise Park at Calverton (EPCAL) property. We had already supplied some information to VHB on rare and listed species on and in the vicinity of the property.

In this most recent letter, Mr. Kennedy of VHB writes:

“VHB must respond to comments issued by the New York State Department of Environmental Conservation (NYSDEC) Region 1 Office, in correspondence dated October 10, 2014. Specifically, the NYSDEC Region 1 Office has requested VHB contact the NYNHP in order that we may provide more detailed information regarding the NYNHP rare/protected species and habitat records identified for the subject property and vicinity. In particular, the NYSDEC is requesting that VHB provide a detailed discussion of the eight on-site and two off-site tiger salamander breeding ponds in the DEIS, and that the location of the breeding ponds and their associated buffer areas be incorporated into the property mapping. Accordingly, VHB respectfully requests that any and all available information for the individual species records included in the NYNHP's February 7, 2014 correspondence be provided, including the locations of the eight on-site and two off-site tiger salamander breeding ponds.”

Mr. Kennedy did not enclose a copy of the October 10 letter from Region 1, so I'm not sure who exactly sent it, but I would presume it most likely came from Region 1 Permits. Mr. Kennedy's letter raises some questions for us:

-- Is Mr. Kennedy characterizing the letter and NYSDEC's requests accurately?

-- If yes to above, what NYSDEC and VHB are asking is not in line with our usual procedures. New York Natural Heritage has been directed by DFWMR that, in regards to state-listed animals, all consultation and information after the initial notification from Natural Heritage is to be provided from the Regional Office, including, and particularly, the specific

locations of state-listed animals. Is this a situation where an exception is being made? If so, we would need to hear that from agency staff and not the consultant. (I also want to make sure that this indeed would be an exception, and not setting a precedent.)

-- Natural Heritage would not be able to provide information on "associated buffer areas" without further guidance from the Region.

Please let me know what you know of VHB's request. Feel free to either call or e-mail.

Thanks,
Nick

Nicholas Conrad
Information Resources Coordinator
New York Natural Heritage Program
SUNY College of Environmental Science and Forestry
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Frosted Elfin



Frosted Elfin



Photo credits: Steve Walter

Scientific Name *Callophrys irus*
(Godart, [1824])

Family Name Lycaenidae
Blues, Coppers, Hairstreaks,
Elfins

Did you know?

The frosted elfin is extirpated from Canada and some U.S. states. In states such as New York, where the species remains, populations are not secure and are highly management dependent.

Summary

Protection Threatened in New York State, not listed federally.

This level of state protection means: A native species likely to become an endangered species within the foreseeable future in New York (includes any species listed as federally Threatened by the United States). It is illegal to take, import, transport, possess, or sell an animal listed as Th

Rarity G3, S1

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 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.

Conservation Status in New York

The Frosted Elfin has become globally rare and is extirpated in Canada. In the United States, there are no states where it is secure and it has become extirpated in some states. Much of the habitat has been lost in New York and small isolated colonies are unlikely to persist. Threats exist in many places and include high deer numbers and inappropriate habitat management. There are a few well known, protected, and adequately managed populations of the lupine feeding race. However, there may be fewer than five viable metapopulations in New York. This rare species has become highly management dependent.

Short-term Trends

The short-term trends indicate a decline of 10% to 30%.

Long-term Trends

Long-term trends indicate a large decline in the population of 75% to 90%, which is similar to or lower than nearby states.

Conservation and Management

Threats

Besides the destruction of habitats by development, threats that can quickly wipe out colonies. Threats include deer eating the foodplants (and eggs and larvae) and lack of appropriate habitat management, including applying herbicides to or disking utility right-of-ways. Mowing the foodplants before late June could eradicate or reduce an occurrence. Gypsy Moth (*Lymantria dispar*) spraying is also a potential threat, but the risk cannot be evaluated in the case of Bt (*Bacillus thuringiensis* - a bacterial biological control used on Gypsy Moth caterpillars). Depending on the application date, most larvae could be exposed, but their sensitivity is unknown. Habitat fragmentation may be the greatest threat in locations where potentially viable metapopulations still occur. Small isolated colonies are more likely to become extirpated because these populations sometimes fail to produce any adults in some years, due to deer browse or other variables, and subsequently are not recolonized. However, when populations are clustered, females can move between each of them and extirpations are often temporary.

Conservation Strategies and Management Practices

All habitats require disturbance, such as fire or mowing, to impede succession. Where fire is used, unburned habitat patches, or refugia, are needed since Indigo (*Baptisia* spp.) feeders will usually have very high mortality in these areas. Although Lupine (*Lupinus perennis*) feeders, which pupate in the sand, may not have the same high mortality rates, they may leave the burned areas. Winter mowing is a proven management option, but the footprint of the machinery should be minimized in order to avoid crushing the pupae. Populations can be maintained for decades with mowing. Generally, management that works for the Karner Blue (*Plebejus melissa samuelis*) should work for the co-occurring Frosted Elfin, although the elfins might be more vulnerable to deer since the larvae feed on the lupine flowers. Shelter from wind and the proximity of trees may be important for Wild Indigo feeders, although the adjacent habitat may be brushy with few trees. Maintaining connectivity of colonies where they are clustered is important and is likely to be critical for long term persistence of populations. See Albanese et al. (2006) regarding habitat needs.

Research Needs

Research into the effects of prescribed burning on populations, especially lupine (*Lupinus perennis*) feeders is needed. Lupine feeders, which pupate in the sand, probably do not incur much mortality, but they apparently avoid recently burned areas. Research is also needed to determine how long the post-fire effects persist and if they can be mitigated. Additional information on the situations that encourage females to move between foodplant patches is also needed.

Habitat

The key habitat feature is an abundance of the foodplant or, perhaps, many moderate-sized patches of the foodplant within a few hundred acres or more, and associated with remnant pine barrens, oak savannas, or dry oak forest. The grassland/herbaceous checkoff refers only to right-of-ways and airports not natural grasslands. There are two varieties of Frosted Elfin, one that feeds mostly on the flowers or seed pods of Wild Blue Lupine (*Lupinus perennis*), and another that feeds on leaves and stems of Wild Indigo (*Baptisia* spp.), primarily the native *Baptisia tinctoria* in New York. Populations will feed on only one of these plants or the other, even when both types of plants are present. Lupine feeders occur in the Albany area, western New York, and on Long Island, while Wild Indigo feeders occur on Long Island. Frosted elfins are not likely to be found in stands of foodplants that have been isolated for a long period of time. This species nearly always occurs in clusters of populations that function as metapopulations and small habitat patches may be unoccupied in some years. Females disperse within the habitat and larvae can turn up in appropriate habitat where adults are not usually seen. The most typical habitats are utility right-of-ways and, at least in neighboring states, airport approach zones. A few populations of the lupine feeders occur partially in more natural settings in the Albany Pine Bush and the Rome Sand Plains. No populations of the Wild Indigo (*Baptisia* spp.) feeders are known to occur in natural settings in New York. Typical habitat features include a shrubby or partially open aspect and a high density of the foodplant, although the observations of Albanese et al. (2006) may not apply fully to the lupine feeders which seem more capable of using open grassland with no tall shrubs or trees. Nectar might also be an important habitat feature.

Associated Ecological Communities

Coastal Oak-heath Forest

A low diversity, large patch to matrix, hardwood forest that typically occurs on dry, well-drained, sandy soils of glacial outwash plains or moraines of the Atlantic Coastal Plain. The forest is usually codominated by two or more species of scarlet oak, white oak, and black oak.

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.

Pitch Pine-heath Barrens

A shrub-savanna community that occurs on well-drained, sandy or rocky soils. The most abundant tree is pitch pine and the shrublayer is dominated by heath shrubs.

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-oak-heath Woodland

A pine barrens community that occurs on well-drained, infertile, sandy soils. The structure of this community is intermediate between a shrub-savanna and a woodland. Pitch pine and white oak are the most abundant trees.

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.

Identification Comments

Identifying Characteristics

This species is identifiable with any recent butterfly book. It is a rather large, very gray elfin, closely associated with lupine or wild indigo.

Characteristics Most Useful for Identification

In the field, association with the foodplant is the first clue to the identity of this species. The combination of extensive gray beneath, tailed hindwing, and the relatively large size for an elfin are generally diagnostic for adults.

Best Life Stage for Identifying This Species

The best life stage for identification is the adult stage, although the larvae are identifiable by experts.

Behavior

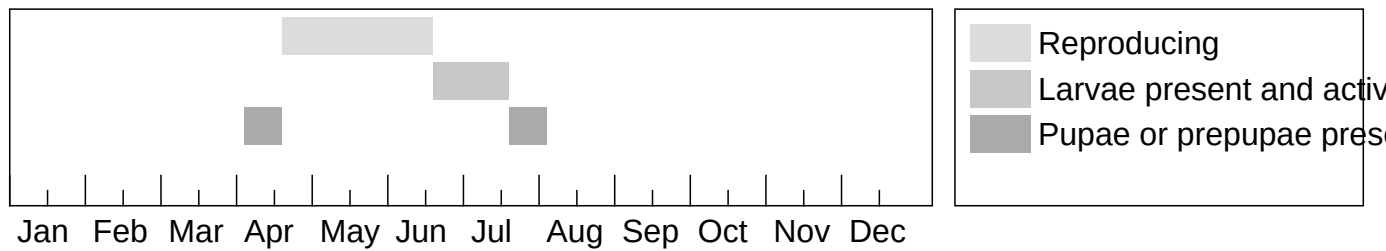
This species is almost always found within 50 feet of one of the foodplants.

Diet

The larval foodplant is Wild Indigo (*Baptisia* spp.) in some southeastern New York colonies and Wild Lupine (*Lupinus perennis*) elsewhere in the state. Both plants are used on Long Island, but no colony has been found to use both plants anywhere in the range of the species.

The Best Time to See

There is one annual generation with adults starting about late April to mid-May and often persisting into June. Wild Indigo (*Baptisia* spp.) feeders probably occur a bit later than lupine feeders in similar climates. At least with the *Baptisia* feeder, adult emergence is staggered and some fresh individuals can be seen for approximately one month. The egg stage is brief and the larval stage lasts for about a month, depending on the weather. Most larvae pupate by the end of June and most of the year is spent in that stage.



The time of year you would expect to find Frosted Elfin in New York.

Similar Species

Hoary Elfin(*Callophrys polios*): Hoary elfin lacks tails and is unlikely to be found in Frosted Elfin habitats.

Henry's Elfin(*Callophrys henrici*): Henry's Elfin is slightly smaller, much browner beneath and usually perches high.

Taxonomy

Kingdom Animalia

└ **Phylum** Mandibulates (Mandibulata)

└ **Class** Insects (Insecta)

└ **Order** Butterflies, Skippers, and Moths (Lepidoptera)

└ **Family** Lycaenidae (Blues, Coppers, Hairstreaks, Elfins)

Additional Resources

Links

NatureServe Explorer

<http://natureserve.org/explorer/servlet/NatureServe?searchName=CALLOPHRYS+IRUS>

Google Images

<http://images.google.com/images?q=CALLOPHRYS+IRUS>

References

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New York Natural Heritage Program

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- New York State Department of Environmental Conservation Hudson River Estuary Program
- Division of Lands & Forests, Department of Environmental Conservation
- New York State Office of Parks, Recreation and Historic Preservation

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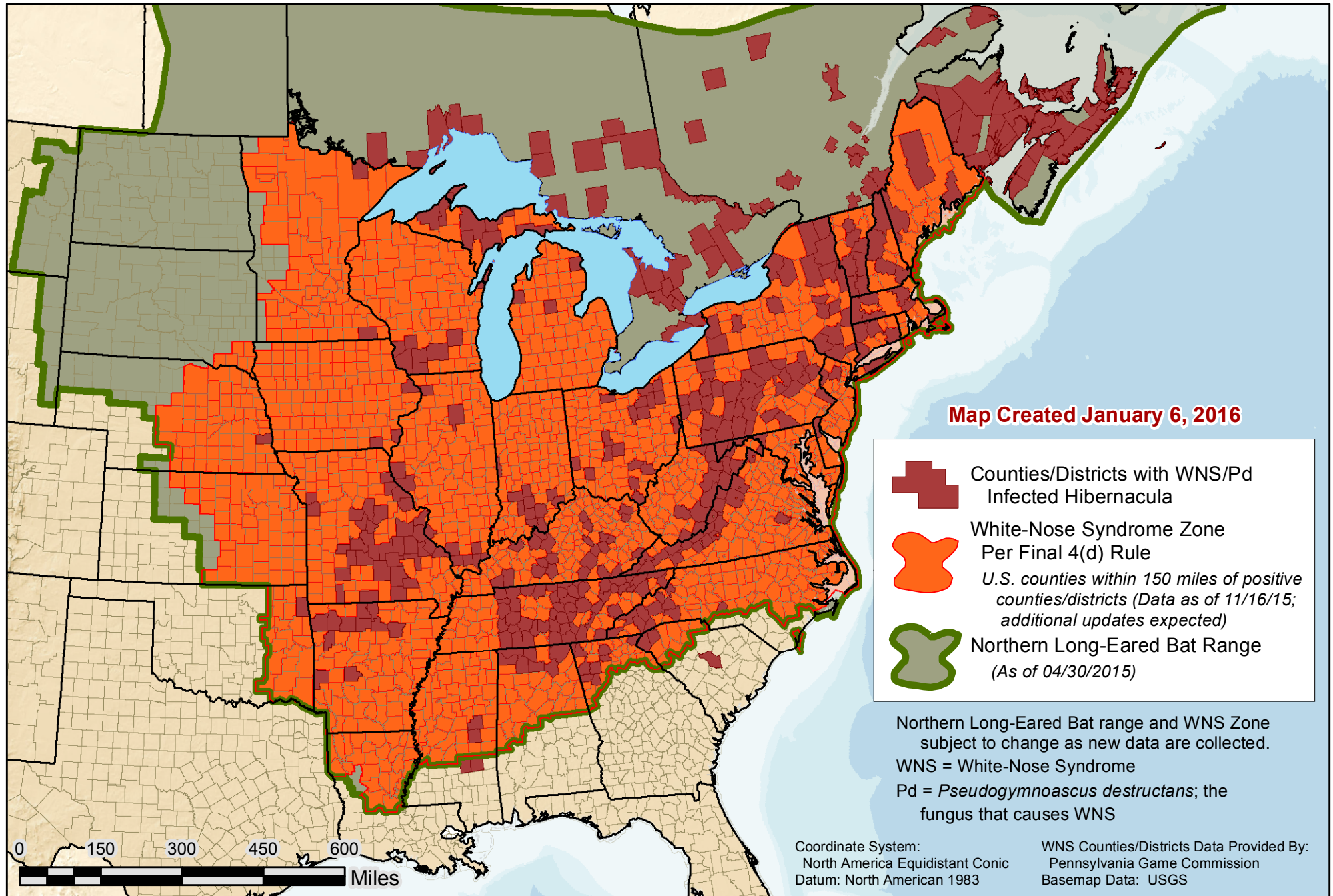
This guide was authored by



U.S. Fish & Wildlife Service

Northern Long-Eared Bat Final 4(d) Rule

White-Nose Syndrome Zone Around WNS/Pd Positive Counties/Districts



Proposed Redevelopment of EPCAL Property at Calverton

Hamlet of Calverton
Town of Riverhead
Suffolk County, New York

Prepared for: Town Board of the Town of Riverhead
Riverhead, New York

Prepared by:



VHB Engineering, Surveying and Landscape Architecture, P.C.
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JULY 2014
REVISED FEBRUARY 2016



Table of Contents

1.0 Introduction	1
2.0 Existing Ecological Conditions.....	3
2.1 Summary of Prior Ecological Surveys and Records	3
2.2 Existing Habitats.....	9
2.3 Rare/Protected Species.....	16
3.0 Habitat Protection Plan.....	20
4.0 Conclusions.....	31

List of Tables

Table 1 – Summary of EPCAL Mammal Data	4
Table 2 – Summary of EPCAL Herpetofauna Data.....	6
Table 3 – Summary of EPCAL Bird Survey Results.....	7
Table 4 – Summary of NYNHP Records.....	7
Table 5 – Summary of NYS Endangered, Threatened,	17
Table 6 – Audubon New York Grassland Bird Habitat Characteristics*	25

List of Attachments

Attachment A	-	Figures
		Figure 1 - Site Location Map
		Figure 2 - Existing Ecological Communities
		Figure 3 - NWI Wetlands
		Figure 4 - NYSDEC Wetlands
Attachment B	-	<i>Subdivision Map for Enterprise Park at Calverton</i>
Attachment C	-	New York Natural Heritage Program correspondence
Attachment D	-	<i>Habitat Protection Plan for Enterprise Park at Calverton</i>
Attachment E	-	<i>A Plan for Conserving Grassland Birds in New York</i> (Audubon New York)
Attachment F	-	<i>Best Management Practices for Grassland Birds</i> (NYSDEC)
Attachment G	-	USDA Natural Resource Conservation Service Technical Guide NY-36: <i>Plant Materials – Seeding Mixes for Wildlife</i>

1.0

Introduction

This Comprehensive Habitat Protection Plan (CHPP) has been prepared on behalf of the Town of Riverhead as part of the Supplemental Generic Environmental Impact Statement (SGEIS) for the 2,323.9-acre Enterprise Park at Calverton (EPCAL) property (hereinafter, the “subject property” or the “site”) and as part of the Town’s application for the Incidental Take Permit, pursuant to 6 NYCRR Part 182. The subject property is located in the hamlet of Calverton, Town of Riverhead, Suffolk County, and is bounded on the north by New York State Route 25 (Middle Country Road), industrial, agricultural and undeveloped/wooded parcels to the east, Grumman Boulevard to the south and Wading River Manor Road and residential and undeveloped/wooded properties to the west (Attachment A, Figure 1). The subject property surrounds the off-site Calverton Camelot Industrial Subdivision (Calverton Camelot) (formerly included in the Calverton Naval Weapons Industrial Reserve Plant [NWIRP] property) to the west, north and east. The subject property is designated on the Suffolk County Tax Map as: District 600-Section 135-Block 1 – Lots 7.1, 7.2, 7.33 and 7.4.

The subject property consists of portions of the NWIRP, which was formerly owned by the United States Department of the Navy (U.S. Navy). During the U.S. Navy’s ownership of the NWIRP property (from 1954 to 1994) approximately 2,900 acres were leased to Northrop Grumman Corporation (Grumman) for airfield operations, including final airplane assembly and testing. In 1994, subsequent to Grumman’s announcement of its intention to vacate the property, the United States Congress authorized the Secretary of the U.S. Navy to convey approximately 2,900 acres of the NWIRP, inclusive of the 2,323.9-acre subject property, to the Town of Riverhead Community Development Agency (CDA) for the purpose of economic development. The U.S. Navy subsequently prepared a Draft Environmental Impact Statement (DEIS) and a Final Environmental Impact Statement (FEIS) in 1997¹ evaluating the disposition and potential future use of the EPCAL property. As a supplement to the



¹THE DEIS and FEIS were prepared pursuant to the National Environmental Policy Act (and as a Generic Environmental Impact Statement [GEIS] for the purposes of the State Environmental Quality Review Act [SEQRA]).



1997 FEIS, a Draft Supplemental Generic Environmental Impact Statement (DSGEIS) was prepared to evaluate the potential adverse impacts associated with creation of a Planned Development District and the subdivision of the EPCAL property into 50 lots, of which 40 lots² would be for ultimate redevelopment with a mix of uses including, but not limited to, industrial, office, energy-related, recreation, utilities and supportive residential and retail uses (the “proposed action,” *Subdivision Map for Enterprise Park at Calverton* included as Attachment B).

This CHPP has been prepared in accordance with 6 NYCRR §182.2 (Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern; Incidental Take Permits), the Final Scope for the DSGEIS issued by the Town Board of the Town of Riverhead and the Final Supplemental Generic Environmental Impact Statement (FSGEIS) for the proposed action, in order to summarize the existing ecological resources at the site (e.g., existing ecological communities and rare species) and to detail the expected impacts to these resources as a result of the proposed action. The CHPP further details the habitat protection measures developed to mitigate these impacts, based upon consultations with the New York State Department of Environmental Conservation (NYSDEC).



² An additional three lots contain existing development (Lot 21-Grumman Memorial Park, Lot 46-Community Center and Lot 49-Town Park) and one lot (Lot 42) is proposed for effluent recharge associated with the Calverton sewage treatment plant.

2.0

Existing Ecological Conditions

2.1 Summary of Prior Ecological Surveys and Records

Numerous investigations of the ecological communities, vegetation and wildlife of the subject property have been conducted and are summarized in the 1997 FEIS, 2001 Supplemental FEIS and 2005 Supplemental FEIS. In addition, several wildlife surveys have been conducted at the site in recent years, including the Coalition for Open Space EPCAL Herpetofauna and Avifauna Inventory Summary (the “COS Study” [2008]), the Amy S. Greene Environmental Consultants, Inc. study (the “ASG Study” [2008]), the Nature Conservancy EPCAL Grassland Birds Summary (the “TNC Study” [2009]), and a mammal and reptile survey conducted by Dru Associates (the “Dru Study”). Moreover, the New York Natural Heritage Program (NYNHP) maintains rare/protected species and community records for the subject property and vicinity. A summary of the aforementioned investigations, surveys and records follows.

The 1997 FEIS includes a characterization of existing terrestrial, wetland, and aquatic habitats at the subject property and also provides inventories of observed and expected plant and wildlife species, based upon NYSDEC records and field surveys conducted in 1985 and 1989, which identified 13 mammal species at the site (see Table 1). Although a site-specific herpetofauna survey was not conducted, 1997 FEIS further identifies 21 amphibian and reptile species as potentially using the subject property (see Table 2). With respect to protected species, the 1997 FEIS includes five species (two animals and three plants) with current NYS Legal Status of “Endangered,” “Threatened,” “Special Concern” or “Rare” classifications within the NWIRP Calverton Property, based upon annual NYNHP field surveys beginning in 1986 and 1987 and two other studies dated 1996 and 1997. The five NYS-listed species identified in the 1997 FEIS are:

- eastern tiger salamander (*Ambystoma tigrinum*) (NYS Legal Status: Endangered)

- barrens buckmoth (*Hemileuca maia*) (NYS Legal Status: Special Concern)
- rose coreopsis (*Coreopsis rosea*) (NYS Legal Status: Rare)
- Nuttall's lobelia (*Lobelia nuttallii*) (NYS Legal Status: Rare)
- slender pinweed (*Lechea tenuifolia*) (NYS Legal Status: Threatened).

Table 1 – Summary of EPCAL Mammal Data

Common Name	Scientific Name	1997 FEIS	Dru Study (2008-2009)
eastern chipmunk	<i>Tamias striatus</i>	x	x
eastern cottontail	<i>Sylvilagus floridanus</i>	x	x
eastern gray squirrel	<i>Sciurus carolinensis</i>	x	x
eastern mole	<i>Scalopus aquaticus</i>	x	
masked shrew	<i>Sorex merriami</i>		x
meadow vole	<i>Microtus pennsylvanicus</i>		x
Mink	<i>Mustella vison</i>	x	
Mole	<i>Scalopus sp.</i>		x
Muskrat	<i>Ondatra zibethica</i>	x	x
raccoon	<i>Procyon lotor</i>	x	x
red fox	<i>Vulpes</i>	x	
short tail shrew	<i>Blarina brevicolata</i>		x
striped skunk	<i>Mephitis</i>	x	x
Virginia opossum	<i>Didelphis marsupialis</i>	x	x
Weasel	<i>Mustella sp.</i>	x	
white-footed mouse	<i>Peromyscus nuttalli</i>		x
whitetail deer	<i>Odocoileus virginianus</i>	x	x
Woodchuck	<i>Marmota monax</i>	x	

Both the 2001 *Supplemental FEIS* and 2005 *Supplemental FEIS* provide brief summaries of existing conditions at the NWIRP Calverton Property, based upon information in the 1997 *FEIS*, as summarized above.

Based upon two site-specific surveys, the COS Study identifies ten amphibian and reptile species on the subject property, including three with NYS-Legal Status (see Table 2). With respect to birds, the COS Study summarizes avifaunal records from three major sources (local breeding bird records, National Audubon Society survey data and NYS Breeding Bird Atlas results) to identify 120 bird species as having been observed on or near the subject property. Twenty-seven of these species are considered to be grassland-dependent birds, with 14 confirmed breeders and 11 probable or possible breeders on or in the vicinity of the subject property. Moreover, the COS Study documents six NYS-Endangered, Threatened or Special Concern grassland bird species as breeding and/or having been observed on the subject property:

- short-eared owl (*Asio flammeus*) (NYS Legal Status: Endangered)
- northern harrier (*Circus cyaneus*) (NYS Legal Status: Threatened)



- upland sandpiper (*Bartramia longicauda*) (NYS Legal Status: Threatened)
- horned lark (*Eremophila alpestris*) (NYS Legal Status: Special Concern)
- vesper sparrow (*Pooecetes gramineus*) (NYS Legal Status: Special Concern)
- grasshopper sparrow (*Ammodramus savannarum*) (NYS Legal Status: Special Concern).

The data summarized in the COS Study, which dates from as early as 1980, indicate that the breeding range of several grassland species has declined or disappeared from the areas surrounding the subject property, in some cases resulting in the subject property remaining as the only known breeding habitat in the area. The COS Study recognizes the subject property grasslands as an ecologically important and vital habitat for a diverse range of grassland-dependent bird species.

Table 2 – Summary of EPCAL Herpetofauna Data

Common Name	Scientific Name	1997 FEIS Anticipated Species*	NYSARAP Data (1990-1999)**	COS Study	Dru Study (2008-2009)	NYS Legal Status
common snapping turtle	<i>Chelydra serpentina</i>	X	X		X	
common musk turtle	<i>Sternotherus oderatus</i>	X				
eastern box turtle	<i>Terrapene carolina</i>	X	X		X	SC
eastern painted turtle	<i>Chrysemys picta</i>	X	X	X	X	
red-eared slider	<i>Trachemys scripta elegans</i>		X			
spotted turtle	<i>Clemmys guttata</i>		X		X	SC
eastern garter snake	<i>Thamnophis sirtalis</i>	X	X		X	
eastern hognose snake	<i>Heterodon platirhinos</i>	X	X	X		SC
eastern ribbon snake	<i>Thamnophis sauritus</i>	X	X		X	
northern black racer	<i>Coluber constrictor</i>	X	X			
northern ringneck snake	<i>Diadophis punctatus</i>		X			
northern water snake	<i>Nerodia sipedon</i>	X	X			
eastern spadefoot toad	<i>Scaphiopus holbrookii</i>	X	X		X	SC
Fowler's toad	<i>Bufo fowleri</i>	X	X	X	X	
American bull frog	<i>Rana catesbeiana</i>	X	X	X	X	
gray tree frog	<i>Hyla versicolor</i>	X	X	X	X	
green frog	<i>Rana clamitans</i>	X	X	X	X	
northern spring peeper	<i>Pseudacris crucifer</i>	X	X	X	X	
pickerel frog	<i>Rana palustris</i>		X		X	
wood frog	<i>Rana sylvatica</i>	X	X			
eastern tiger salamander	<i>Ambystoma tigrinum</i>	X	X	X	X	E
marbled salamander	<i>Ambystoma opacum</i>	X	X	X	X	SC
red-spotted newt	<i>Notophthalmus viridescens</i>	X	X		X	
northern redback salamander	<i>Plethodon cinereus</i>	X	X		X	
spotted salamander	<i>Ambystoma maculatum</i>	X	X	X	X	

*A site-specific herpetofauna survey was not conducted as part of the 1997 FEIS.

**New York State Amphibian and Reptile Atlas Project (1990-1999) data is for the entire USGS Wading River, NY Quadrangle within which the subject property is located and therefore is not necessarily site-specific.

E= Endangered; SC=Special Concern

The ASG Study included a survey for 13 targeted grassland bird species, based upon Amy S. Greene Environmental Consultants, Inc.'s consultations with the NYSDEC. The results of the ASG study included observations of northern harrier, short-eared owl, American kestrel, horned lark, savannah sparrow, and eastern meadowlark during a winter survey of the subject property. In addition, American kestrel, upland sandpiper, horned lark, vesper sparrow, savannah sparrow, and eastern meadowlark were confirmed as nesting on the subject property. In total, six avian species with NYS-Legal Status were identified at the subject property by the ASG Study (see Table 3).

The TNC Study summarizes the known occurrence of grassland-dependent bird species at the subject property, based upon National Audubon Society survey data and NYS Breeding Bird Atlas results. The TNC Study also provides species accounts and "minimum field size" information for fourteen grassland species, include the six species with NYS Legal Status identified in the COS Study, plus two additional NYS

Special Concern species identified as probable breeders on the subject property: common nighthawk (*Chordeiles minor*) and whip-poor-will (*Caprimulgus vociferus*), which is a bird of forested habitats (see Table 3).

Table 3 – Summary of EPCAL Bird Survey Results

Common Name	Scientific Name	NYS Legal Status
short-eared owl	<i>Asio flammeus</i>	E
northern harrier	<i>Circus cyaneus</i>	T
upland sandpiper	<i>Bartramia longicauda</i>	T
common nighthawk	<i>Chordeiles minor</i>	SC
grasshopper sparrow	<i>Ammodramus savannarum</i>	SC
horned lark	<i>Eremophila alpestris</i>	SC
vesper sparrow	<i>Pooecetes gramineus</i>	SC
whip-poor-will	<i>Caprimulgus vociferus</i>	SC
American kestrel	<i>Falco sparverius</i>	NL
eastern meadowlark	<i>Sturnella magna</i>	NL
savannah sparrow	<i>Passerculus sandwichensis</i>	NL

E= Endangered; T=Threatened; SC=Special Concern; NL=Not Listed

The 2008-2009 Dru Study identified 13 mammal species on the subject property during 2008-2009 (see Table 1). The Dru Study also included site-specific herpetofauna survey which identified 18 herpetofauna species, including five species with NYS Legal Status (see Table 2).

According to the NYNHP, records exist for various NYS-listed wildlife, plants and ecological communities at or in the vicinity of the subject property, as summarized below in Table 4 (NYNHP correspondence included as Attachment C).

Table 4 – Summary of NYNHP Records

Common Name	Scientific Name	NYS Legal Status	Record Date	Record Location
short-eared owl	<i>Asio flammeus</i>	Endangered	not provided	on-site
eastern tiger salamander	<i>Ambystoma tigrinum</i>	Endangered	not provided	on-site
eastern worm snake	<i>Carphophis amoenus</i>	Special Concern	2007	south side of River Road (off-site)
banded sunfish	<i>Enneacanthus obesus</i>	Threatened	not provided	Swan Lake (off-site), Brown's Bog (off-site)*
coastal barrens buckmoth	<i>Hemileuca maia ssp.</i>	Special Concern	1987 and 2002	Firebreak Pond East (on-site), Middle Country Road woods (location unknown)
comb-leaved mermaid-weed	<i>Proserpinaca pectinata</i>	Threatened	2000 and 2005	Third Pond (location unknown), Forest Pond (off-site),

Common Name	Scientific Name	NYS Legal Status	Record Date	Record Location
				Calverton woods (location unknown)
rose coreopsis	<i>Coreopsis rosea</i>	Rare	1987 and 2005	North Pond (on-site), Forest Pond (off-site), Third Pond (location unknown), Calverton woods (location unknown)
small floating bladderwort	<i>Utricularia radiata</i>	Threatened	1984, 1985 and 1991	Preston's pond (off-site), Forest Pond (off-site), Third Pond (location unknown)
short-beaked beakrush	<i>Rhynchospora nitens</i>	Threatened	2005	Forest Pond (off-site), Third Pond (location unknown)
coppery St. John's-wort	<i>Hypericum denticulatum</i>	Endangered	1996	Third Pond (location unknown)
pine barren bellwort	<i>Uvularia puberula</i>	Endangered	1987	Swan Pond (off-site)
slender pinweed	<i>Lechea tenuifolia</i>	Threatened	1986	North Pond Firebreak Road (on-site)
American ipecac	<i>Euphorbia ipecacuanhae</i>	Endangered	2000	Swan Pond (off-site)
slender crabgrass	<i>Digitaria filiformis</i>	Endangered	1987	Linus Pond (off-site)
tooth-cup	<i>Rotala ramosior</i>	Threatened	1984	Conoe Pond (off-site)
Wright's panic grass	<i>Dichanthelium wrightianum</i>	Endangered	2005	Third Pond (location unknown)
coastal plain pond shore		high quality occurrence of rare community type	Not provided	Third Pond (location unknown)
pitch pine-oak forest		high quality occurrence		Sandy Pond East (off-site)

*Location information provided by NYSDEC Region 1 staff.

As indicated on Table 4, several of the NYNHP records are from confirmed off-site locations, including those for eastern wormsnake, banded sunfish, pine barren bellwort, American ipecac, slender crabgrass and tooth-cup. Several other species records list "Third Pond" for the record location, including comb-leaved mermaid-weed, coppery St. John's-wort, rose coreopsis, small-floating bladderwort, short-beaked beakrush and Wright's panic grass. The location of Third Pond is unknown. Accordingly, for the purposes of this CHPP, it is assumed that the pond and associated plants occur on or in the vicinity of the subject property.

Based upon NYSDEC comments in the FSGEIS for the proposed action, a habitat assessment was conducted to determine if the subject property represents habitat for the NYS-Threatened butterfly frosted elfin (*Callophrys irus*). According to the NYNHP Frosted Elfin Conservation Guide,³ the frosted elfin is associated with the Pitch Pine Oak Forest and Pitch Pine-Oak-Heath Woodland ecological communities, both of which occur at the subject property. Accordingly, though no site-specific records for frosted elfin were reviewed as part of this assessment, the subject property supports potential habitat for this butterfly species.

2.2 Existing Habitats

Based upon field surveys of the subject property conducted by VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) from 2011 to 2015, a summary of existing habitat conditions at the subject property follows.

Upland Habitats

In order to describe and categorize existing upland habitats at the subject property, VHB consulted the New York Natural Heritage Program (NYNHP)⁴ publication *Ecological Communities of New York State* (ECNYS)⁵, which provides detailed descriptions and rarity rankings for various ecological communities found throughout NYS, including those observed during field surveys of the subject property. Although the 1997 FEIS did not employ the ECNYS classification system, the descriptions of the various upland ecological communities contained in that document generally correspond to the following six ECNYS-defined communities observed during field surveys:

- Pitch Pine-Oak Forest
- Pitch Pine-Oak-Heath Woodland
- Pine/Spruce/Conifer Plantation
- Successional Old Field
- Successional Shrubland
- Paved Road/Path.

The following provides a summary of each of the six ecological communities, based upon the 2011-2015 field surveys and descriptions from the 1997 FEIS. The ecological community map (Attachment A, Figure 2) illustrates the general location(s) of each community.



³ New York Natural Heritage Program. Frosted Elfin Conservation Guide. 2014. Available online at: <http://www.acris.nynhp.org/report.php?id=7860>. Accessed February 23, 2016.

⁴ The NY Natural Heritage Program is a partnership between the New York State Department of Environmental Conservation and the State University of New York College of Environmental Science and Forestry.

⁵ Edinger, G.J., et al. (editors). 2014. *Ecological Communities of New York State*. Second Edition. New York Natural Heritage Program, NYSDEC.

Pitch Pine-Oak Forest

This ecological community is primary forested habitat that occurs within the area to the north of the western runway, as well as in some areas to the north of the eastern runway. ECNYS describes the Pitch Pine-Oak Forest ecological community as follows:

"...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 ridge tops.

The dominant trees are pitch pine (Pinus rigida) mixed with one or more of the following oaks: scarlet oak (Quercus coccinea), white oak (Q. alba), red oak (Q. rubra), or black oak (Q. velutina). The relative proportions of pines and oaks are quite variable within this community type. At one extreme are stands in which the pines are widely spaced amidst the oaks, in which case the pines are often emergent above the canopy of oak trees. At the other extreme are stands in which the pines form a nearly pure stand with only a few widely spaced oak trees.

The shrub layer is well-developed with scattered clumps of scrub oak (Quercus ilicifolia) and a nearly continuous cover of low heath shrubs such as blueberries (Vaccinium pallidum, V. angustifolium) and black huckleberry (Gaylussacia baccata).

The herbaceous layer is relatively sparse; characteristic species are bracken fern (Pteridium aquilinum), wintergreen (Gaultheria procumbens), and Pennsylvania sedge (Carex pensylvanica)..."

Similar to the above description, a wide variation in the relative proportions of pines versus oaks exists within the Pitch Pine-Oak Forest observed across the subject property, presumably as a result of fire frequency and severity. Generally speaking, increased burn frequency and/or severity results in dominance of pitch pine over tree oak species, while oaks dominate in areas with low burn frequency/severity, and particularly in areas where fire has been historically suppressed. Other factors, including soil moisture, soil fertility and human disturbance are also relevant to community composition. Sandy, xeric (dry), low nutrient soils favor pitch pine, while mesic (moist), more nutrient-rich soils are needed to support most oaks and other hardwoods. The variants of the Pitch Pine-Oak Forest community type observed on the site include the following:

- Forests dominated by widely-spaced pitch pines, with only a few scattered oaks, a sparse, patchy shrub stratum consisting of heaths, bayberry (*Morella pensylvanica*) and/or bearberry (*Arctostaphylos uva-ursi*) and a nearly continuous groundcover stratum dominated by sedges (e.g., Pennsylvania sedge) and grasses.

- Mixed oaks (i.e., white, scarlet and black oak) with scattered large (and often senescent) pitch pines and a low but relatively continuous heath stratum.
- Nearly pure stands of white oak, with few pitch pines and a dense, nearly continuous heath understory stratum.
- Intermediate variations of the three communities described above.

The ECNYS Pitch Pine-Oak Forest community variants described above are consistent with the “Pitch Pine-Oak Woodlands” and “Oak-Pine Woodlands” community descriptions of the 1997 FEIS.

Large, contiguous blocks of the Pitch Pine-Oak Forest ecological community occupy the western portion of the subject property, the area to the north and south of the western runway and the northeastern portion of the site. This community is less prevalent in the vicinity of the eastern runway, where it occurs in smaller and often non-contiguous habitat blocks interspersed with ECNYS Pitch Pine-Oak-Heath Woodland, Tree Plantation and Successional Shrubland communities, as described below. Additionally, a “*high quality occurrence*” of Pitch Pine-Oak Forest has been documented by the NYNHP to the south of the subject property, in the vicinity of Sandy Pond East.

The Pitch Pine-Oak Forest ecological community is ranked by the NYNHP as G4, S4. According to the NYNHP, G4 indicates a community that is considered “*apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.*” The S4 ranking denotes a community that is considered “*apparently secure in New York State.*”

Pitch Pine-Oak-Heath Woodland

The ECNYS Pitch Pine-Oak-Heath Woodland community discussed here was described as “Pitch Pine-Shrub Oak Woodlands” in the 1997 FEIS. During the field surveys, it was observed that this community occurs in scattered pockets at the southeastern portion of the site, in the area to the north of the eastern runway. ECNYS describes Pitch Pine-Oak-Heath Woodland as follows:

“...a pine barrens community that occurs on well-drained, infertile, sandy soils in eastern Long Island (and possibly on sandy or rocky soils in upstate New York). The structure of this community is intermediate between a shrub-savanna and a woodland.”

Pitch pine and white oak are the most abundant trees, and these form an open canopy with 30 to 60% cover. Scarlet oak and black oak may also occur in the canopy.

The shrub layer is dominated by scrub oaks, and includes a few heath shrubs such as

huckleberry and blueberry. The density of the shrub layer is inversely related to the tree canopy cover; where the trees are sparse, the shrubs form a dense thicket, and where the trees form a more closed canopy, the shrub layer may be relatively sparse. Stunted, multiple-stemmed white oaks may be present in the shrub layer if the site has burned regularly.

*Characteristic species of the groundcover include bearberry (*Arctostaphylos uva-ursi*), Pennsylvania sedge (*Carex pensylvanica*), golden heather (*Hudsonia ericoides*), beach heather (*Hudsonia tomentosa*), and pinweed (*Lechea villosa*).*

*Like other closely related pine barrens communities, the woodland provides habitat for buckmoth (*Hemileuca maia*) and prairie warbler (*Dendroica discolor*)...*

This community is adapted to periodic fires; the fire frequency has not been documented, but it probably burns less frequently than pitch pine-scrub oak barrens (i.e., more than 15 years between fires)..."

The 1997 FEIS described this community as occurring infrequently and in small scattered pockets, particularly at the southeast portion of the site. During the field surveys, scattered examples of Pitch Pine-Oak-Heath Woodland were observed in this area. Similar to the above description, these communities are characterized by an open canopy of pitch pine and white oak, with a dense understory shrub stratum dominated by scrub oak (*Quercus ilicifolia*) and scattered heath species. The main distinctions between Pitch Pine-Oak-Heath Woodland and the Pitch Pine-Oak Forest community described above are the open canopy, scrub-oak dominated shrub layer and the greater fire frequency needed to maintain the former community. As indicated in the ECNYS community description, Pitch Pine-Oak-Heath Woodland is adapted to periodic fires and requires a greater burn frequency than that which occurs within the various Pitch Pine-Oak Forest communities that comprise the forest cover over most of the subject property. According to the 1997 FEIS, "*wildfires have been suppressed in the fenced area to protect buildings and agriculture,*" with records existing for just two wildfires that occurred on the southwestern and eastern site areas "*in the early 1980s.*" Thus, the limited extent of Pitch Pine-Oak-Heath Woodland at the subject property and the historic paucity of this community from the site as a whole are most likely due to historic fire suppression.

Pitch Pine-Oak-Heath Woodland is ranked by the NYNHP as G3G4, S2S3. G3 indicates a community that is considered "*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.*" The S2 ranking designates "*Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State*", while S3 indicates "*Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.*"

Pine/Spruce/Conifer Plantation

Tree plantations were observed in several locations to the north of the eastern runway. Species observed within the plantations include various pines such as eastern white pine (*Pinus strobus*), red pine (*P. resinosa*) and other pines, spruces (*Picea* spp.) and larch (*Larix* spp.). Similarly, the 1997 FEIS indicates that “several tracts in the fenced area, north and east of Runway 32-14 (the eastern runway) support plantations of white pine and spruce, established in the 1960s.” Based upon site observations, the tree plantations have not been actively managed for some time, and successional vegetation (i.e., herbaceous plants, shrubs and pioneering tree species) from surrounding wooded and grassland habitats is present-to-dominant amongst the planted trees. Tree plantations were not observed within the western portion of the site.

For the purposes of this summary, the Pine Plantation, Spruce Plantation and Conifer Plantation ECNYS ecological communities have been combined into a single community. In general, the ECNYS describes these tree plantations as:

“...a stand of softwoods planted for the cultivation and harvest of timber products, or to provide wildlife habitat, soil erosion control, windbreaks, or landscaping...These plantations may be monocultures, or they may be mixed stands with two or more co-dominant species.”

The Pine, Spruce and Conifer Plantation ecological communities are distributed throughout New York State and identified as “unranked cultural” communities by the NYNHP.

Successional Old Field

The vast majority of the area immediately adjacent to the eastern and western runways currently supports grassland habitat. An additional grassland habitat block exists to the south of the eastern runway (Navy Parcel “B”), for a total of 646.2 acres of existing grasslands at the subject property. According to the TNC Study, this habitat is “by far the largest remaining grassland on Long Island.” As ECNYS does not include a grassland habitat description specific to the site or the Long Island region, the on-site grasslands are best defined by the ECNYS Successional Old Field community description:

“...a meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned...Shrubs may be present, but collectively they have less than 50% cover in the community.”

The Successional Old Field community represents the initial stage in the process of ecological succession, which is the process by which a cleared or otherwise disturbed habitat progresses by stages to a climax forest community over time. The disturbance that has maintained the subject property’s grasslands and prevented succession to

later ecological stages is maintenance of the runway adjacent areas in the form of mowing.

The 1997 FEIS classified the on-site grasslands as “Semi-Improved Vegetation”, indicating lands that are “...subject to annual, semiannual, or once in three – to four-year maintenance (mowing) operations...Examples of semi-improved vegetation include the clear zones required along the runways...”

The grasslands observed within the runway areas are dominated by a number of grass species, including broomsedge (*Andropogon virginicus*), fall witchgrass (*Digitaria cognatum*), fescue (*Festuca* spp.), foxtail (*Setaria* spp.), Indian grass (*Sorghastrum nutans*) little blue stem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*) and timothy (*Phleum pratense*). Many forbs also occur, including sweet everlasting (*Pseudognaphalium obtusifolium*), common mullein (*Verbascum thapsus*), common St. John’s wort (*Hypericum perforatum*), toadflax (*Linaria vulgaris*), horseweed (*Conyza canadensis*), golden heather (*Hudsonia ericoides*), sickle-leaf golden aster, (*Pityopsis falcata*), hawkweeds (*Hieracium* spp.), goldenrods (*Solidago* spp.), etc. Vegetative cover is generally dense, however, sparsely-vegetated and unvegetated areas of exposed sandy soil are scattered throughout the grasslands. Site observations indicate that vegetative cover and species composition are generally similar between the western and eastern runway areas.

The Successional Old Field ecological community is distributed throughout New York State and is ranked as G5, S5 by the NYNHP. G5 describes a community that is “Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery,” while S5 denotes a community that is considered “Demonstrably secure in New York State.” Nevertheless, it should be noted that the extensive grasslands that occur at the subject property have also been recognized by COS, ASG and TNC studies as a regionally significant habitat for a diverse range of rare grassland bird species, as well as the largest remaining grassland community on Long Island. As indicated previously, the disturbance that has maintained these grasslands and prevented succession to later ecological stages has been historic maintenance of the runway areas in the form of periodic mowing. In the absence of this disturbance, colonization by shrub and tree species from surrounding wooded habitat communities would result in succession to later ecological stages (i.e., shrublands and forests) and the incremental loss of this habitat type from the subject property, thus rendering the site unsuitable as habitat for grassland specialist birds.

Successional Shrubland

The Successional Shrubland community represents the next stage in the process of ecological succession following Successional Old Field. ECNYS defines Successional Shrubland as:



"...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."

Although this or a similarly-described ecological community was not noted in the 1997 FEIS, Successional Shrubland currently exists primarily within areas that were subject to historic disturbance, including portions of the former agricultural fields and tree plantations to the north of the eastern runway. According to the 1997 DEIS, some agricultural fields were still being actively farmed at that time, while other recently inactive agricultural fields appear to have been classified as "old field" and included under the "Semi-Improved Vegetation Category." Thus, at that time it is likely that these locations supported little to no evidence of the shrub cover that has colonized the inactive agricultural fields on the site in the intervening years. Other areas of successional shrubs exist in border areas and clearings within the Tree Plantation communities described above.

Much of the shrub cover observed within the Successional Shrubland is comprised of colonizing tree saplings (e.g., pitch pine, oaks) and shrubs (e.g., heaths, bearberry, and bayberry) from adjacent forest and woodland habitats. However, in some areas, typical Successional Shrubland species are also present, including eastern red cedar (*Juniperus virginiana*), brambles (*Rubus* spp.), black cherry (*Prunus serotina*) saplings and non-native/invasive multiflora rose (*Rosa multiflora*) shrubs.

The Successional Shrubland ecological community is distributed throughout New York State and is ranked as G5, S5 by the NYNHP.

Paved Road/Path

Runway and internal roadway areas are best described by the ECNYS Paved Road/Path community profile:

"...a road or pathway that is paved with asphalt, concrete, brick, stone, etc. There may be sparse vegetation rooted in cracks in the paved surface."

As indicated in the above description the runways, taxiways and associated paved areas observed at the subject property support sparse vegetation in cracked areas, including typical "weedy" species, as well as grasses and forbs from the neighboring grasslands.

The Paved Road/Path community is distributed throughout New York State and is characterized as an unranked cultural community by the NYNHP.

Wetland and Aquatic Habitats

On-site wetland and aquatic habitats were characterized utilizing the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Cowardian



Classification system. As depicted on Figure 3 of Attachment A, the following NWI wetland habitat types are supported on-site:

- PUBH (Palustrine, Unconsolidated Bottom, Permanently Flooded)
- PUBHh (Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded)
- PUBHx (Palustrine, Unconsolidated Bottom, Permanently Flooded, Excavated)
- PF1O1C (Palustrine, Forested, Broad—Leaved Deciduous, Seasonally Flooded)
- PFO1Eh (Palustrine, Forested, Broad—Leaved Deciduous, Seasonally Flooded/Saturated, Diked/Impounded)
- PFO1FH (Palustrine, Forested, Broad—Leaved Deciduous, Semi permanently Flooded, Diked/Impounded)
- PFO5E (Palustrine, Forested, Dead, Seasonally Flooded/Saturated)
- PEM1Cx, (Palustrine, Emergent, Persistent, Seasonally Flooded, Excavated)
- PEM1/SS1Ax (Palustrine, Emergent, Persistent/Palustrine Scrub-Shrub, Excavated)
- PSS1Eh (Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded/Saturated, Diked/impounded).

In addition, there are six NYSDEC-regulated wetlands located entirely or partially within the overall boundaries of the subject property, including NYSDEC Wetland Nos. W-16, W-24 through W-27 and R-5 (Attachment A, Figure 4).

According to the NYNHP, the subject property or vicinity also supports a “high quality occurrence” of the rare Coastal Plain Pond community, which is ranked as G3G4, S2 in ECNYS. Although the location of the community was not provided in the NYNHP records, a pond community located at the northeastern portion of the subject property and identified as a tiger salamander breeding pond by the NYSDEC is characteristic of a Coastal Plain Pond community.

2.3 Rare/Protected Species

Based upon a review of New York Natural Heritage Program (NYNHP) records, as well as the various ecological investigations and surveys summarized previously, 16 wildlife species and eight plant species listed by New York State as “Endangered,” “Threatened,” “Special Concern” or “Rare,” as defined in 6 NYCRR §182-2, have been documented as occurring at or in the vicinity of the subject property (Table 45).

With respect to plants, pursuant to 6 NYCRR §193.3, New York State Endangered plants are those species “*in danger of extirpation throughout all or a significant portion of their ranges within the state and requiring remedial action to prevent such extinction.*” Threatened plants are defined in 6 NYCRR 193.3 as species “*that are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges within the state.*” Finally, rare plants are described as those species with “*20 to 35 extant sites or 3,000 to 5,000 individuals statewide.*”

Table 5 – Summary of NYS Endangered, Threatened, Special Concern and Rare Species Records for the EPCAL Property and Vicinity

Record Type	Common Name	Scientific Name	NYS Status
Avian	short-eared owl	<i>Asio flammeus</i>	Endangered
Avian	northern harrier	<i>Circus cyaneus</i>	Threatened
Avian	upland sandpiper	<i>Bartramia longicauda</i>	Threatened
Avian	grasshopper sparrow	<i>Ammodramus savannarum</i>	Special Concern
Avian	horned lark	<i>Eremophila alpestris</i>	Special Concern
Avian	vesper sparrow	<i>Poocetes gramineus</i>	Special Concern
Avian	whip-poor-will	<i>Caprimulgus vociferus</i>	Special Concern
Amphibian	eastern tiger salamander	<i>Ambystoma tigrinum</i>	Endangered
Amphibian	marbled salamander	<i>Ambystoma opacum</i>	Special Concern
Amphibian	eastern spadefoot toad	<i>Scaphiopus holbrookii</i>	Special Concern
Reptile	spotted turtle	<i>Clemmys guttata</i>	Special Concern
Reptile	eastern box turtle	<i>Terrapene carolina</i>	Special Concern
Reptile	eastern hognose snake	<i>Heterodon platirhinos</i>	Special Concern
Reptile	eastern worm snake	<i>Carphophis amoenus</i>	Special Concern
Insect	coastal barrens buckmoth	<i>Hemileuca maia ssp.5</i>	Special Concern
Plant	coppery St. John's-wort	<i>Hypericum denticulatum</i>	Endangered
Plant	comb-leaved mermaid-weed	<i>Proserpinaca pectinata</i>	Threatened
Plant	small floating bladderwort	<i>Utricularia radiata</i>	Threatened
Plant	short-beaked beakrush	<i>Rhynchospora nitens</i>	Threatened
Plant	slender pinweed	<i>Lechea tenuifolia</i>	Threatened
Plant	rose coreopsis	<i>Coreopsis rosea</i>	Rare
Plant	Nuttall's lobelia	<i>Lobelia nuttallii</i>	Rare
Plant	Wright's Panic Grass	<i>Dichanthelium wrightianum</i>	Endangered

With the exception of whip-poor-will, the eight avian species listed in Table 1, including the NYS-Endangered short-eared owl (*Asio flammeus*) and NYS-Threatened northern harrier (*Circus cyaneus*), are grassland habitat specialists that have been



observed utilizing the site grasslands as breeding and/or non-breeding habitat. In addition, other non-listed grassland bird species, including American kestrel (*Falco sparverius*), savannah sparrow (*Passerculus sandwichensis*) and eastern meadowlark (*Sturnella magna*), have also been documented on-site during the aforementioned studies.

With respect to rare herpetofauna (amphibians and reptiles), according to the NYSDEC, the NYS-Endangered eastern tiger salamander (*Ambystoma tigrinum*) has been documented as breeding within four on-site ponds at the subject property, including three within the Pine Barrens Core Area at the western portion of the site and one located to the south of NYS Route 25 at the northeastern portion of the site (see subdivision map in Attachment B). In addition, six additional eastern tiger salamander breeding ponds occur at off-site properties located proximate to the subject property, including five at Calverton Camelot to the south of the site and one pond located beyond Peconic Avenue to the east of the site. Portions of the 535-foot and/or 1,000-foot eastern tiger salamander buffers associated with these six breeding ponds extend onto the subject property.

On-site non-breeding (terrestrial) habitat for eastern tiger salamander includes the Pitch Pine-Oak Forest communities located within 1,000 feet of the two breeding ponds. Similarly, the various wetland and aquatic communities detailed above and the surrounding uplands represent potential habitat for NYS-Special Concern marbled salamander (*Ambystoma opacum*), eastern spadefoot toad (*Scaphiopus holbrookii*) and spotted turtle (*Clemmys guttata*). On-site habitat for NYS-Special Concern eastern box turtle (*Clemmys guttata*) and eastern hognose snake (*Heterodon platirhinos*) includes wooded and successional habitats, particularly those that are proximate to wetlands. Additionally, the NYS-Special Concern snake species eastern worm snake (*Carphophis amoenus*) has been documented in the vicinity of the subject property and may also occur at the site, particularly within moist forested areas near water features.

Optimal on-site breeding, larval and adult habitat for the NYS-Special Concern coastal barrens buckmoth, which was documented at the site in 1987, is represented by the Pitch Pine-Oak-Heath woodland communities. Similarly, though no site-specific records for frosted elfin butterfly were reviewed as part of this assessment, the Pitch Pine Oak Forest and Pitch Pine-Oak-Heath Woodland ecological communities that occur at the subject property represent habitat for this species.

With respect to plants, habitat for the NYS-Endangered coppery St. John's-wort (*Hypericum denticulatum*) and Wright's panic grass (*Dichanthelium wrightianum*), NYS-Threatened comb-leaved mermaid-weed (*Proserpinaca pectinata*), small floating bladderwort (*Utricularia radiata*), short-beaked beakrush (*Rhynchospora nitens*) and rose coreopsis (*Coreopsis rosea*), as well as the NYS-Rare Nuttall's lobelia [*Lobelia nuttallii*] included includes on-site wetland/ aquatic communities and/or their margins with adjacent uplands. On-site habitat for the remaining rare plant species,

NYS-Threatened slender pinweed (*Lechea tenuifolia*) includes grassland habitats, as well as disturbed areas within the forested and successional communities.

The forested portions of the subject property represent potentially suitable summer foraging and/or roosting habitat for the NYS-Threatened northern long-eared bat (*Myotis septentrionalis*). The northern long eared bat is also listed as federally Threatened by the United States Fish and Wildlife Service (USFWS) under section 4(d) of the federal Endangered Species Act of 1973, due to significant population declines as a result of the white-nose syndrome fungal disease.⁶ According to the most recent USFWS white-nose syndrome zone map (Attachment C), Suffolk County is included among the counties containing hibernacula (winter hibernation sites) that are infected with white-nose syndrome. As such, the provisions of the USFWS final 4(d) rule for northern long-eared bat (effective February 16, 2016)⁷ are applicable to Suffolk County and the subject property. The final 4(d) rule includes certain prohibitions against incidental take, which is defined as killing, wounding, harassing or otherwise disturbing a species that would occur incidental to, and is not the purpose of, an otherwise lawful activity. Pursuant to the final 4(d) rule, incidental take of northern long-eared bat within white-nose syndrome zone counties (i.e., Suffolk County) is prohibited if it occurs within a hibernacula or if it results from tree removal activities that occur within 0.25 mile of a known, occupied hibernacula. Further, incidental take of northern long-eared bat is also prohibited if it results from cutting or destroying a known, occupied maternity roost tree or other trees within a 150 foot radius from a maternity roost tree during the pup season from (June 1 through July 31). Any proposed activity that would result in prohibited incidental take of northern long-eared bat as described above would require USFWS consultation and/or permitting. Activities that would not result in prohibited incidental take of northern long-eared bat as described above can proceed without USFWS consultation or permitting, provided that the activity does not require federal authorization, funding or approvals.

The final 4(d) rule further indicates that information for the locations of known, occupied hibernacula and maternity roost trees can be obtained from “*state Natural Heritage Inventory databases*.” With respect to the subject property, correspondence from the NYNHP indicates that no agency records currently exist for northern long-eared bat hibernacula or roost trees at or in the vicinity of the site (Attachment C). Furthermore, no other site-specific northern long-eared bat records were reviewed during preparation of the CHPP.



⁶ Federal Register Vol. 80, No. 63. Thursday, April 2, 2015.

⁷ Federal Register Vol. 81, No. 9. Thursday, January 14, 2016.

3.0

Habitat Protection Plan

As detailed in Section 1.0, the proposed action would result in the ultimate subdivision of the EPCAL property into 50 lots, of which 40 lots would be redeveloped into a mixture of business, industrial, energy-related and other uses. Based upon consultations with the NYSDEC, this CHPP has been designed to mitigate the impacts of the proposed action on the existing ecological habitats identified in Section 2.0, through the preservation, creation and management of key habitat areas for resident plant and wildlife species.

The CHPP activities described herein will be funded by the full faith and credit of the Town of Riverhead. The Town of Riverhead CDA will be responsible for the implementation of the CHPP. The legal mechanism by which the on-site grasslands will be maintained in perpetuity will be a covenant attached to the grassland areas under supervision of the CHPP. In the event that any of the preserved grassland areas described herein are transferred, a security bond will be required to ensure that the required maintenance and monitoring will be funded.

As shown on the *Subdivision Map* (Attachment B) and the *Habitat Protection Plan for Enterprise Park at Calverton* (Attachment D), prior to any potential development of individual subdivision lots that abut on-site grassland habitats, the Town of Riverhead will require the establishment of a five-foot non-disturbance buffer area during the site plan process. Covenants and restrictions will be required to preserve the buffer area in its natural state.

As also shown on the *Subdivision Map* and the *Habitat Protection Plan*, the Town of Riverhead will require that fencing be installed at the lots that infringe upon or abut 1,000-foot eastern tiger salamander breeding pond buffer zones (Lot 28/Drainage Reserve Area, and Lot 39). Covenants and restrictions for the fencing will be required during the site plan process.

Beyond the buffer zone fencing requirements described above, no other active management practices are proposed for the eastern tiger salamander buffer zone areas, woodland and wetland habitats that would be preserved under the CHPP.



Active management of existing and created grassland habitats at the subject property would occur the CHPP, as described below.

Details of the habitat protection areas for the subject property are illustrated on the *Habitat Protection Plan* (Attachment D). Specific details regarding habitat protection measures for each of the vegetated ecological communities identified in Section 2.0 are provided below.

Grasslands

As detailed in Section 2.0, the subject property's grasslands have been identified by the NYSDEC and the Nature Conservancy (TNC) as the largest remaining grassland habitat on Long Island and represent an important habitat for many declining grassland-dependent birds, including eight avian species that are listed as Endangered, Threatened or Special Concern species in New York State. The disturbance that has maintained these grasslands and prevented succession to later ecological stages has been historic maintenance of the runway areas in the form of periodic mowing. Currently, however, the grasslands are not actively managed, and there is no long-term management plan in place. In the absence of periodic management, colonization by shrub and tree species from surrounding wooded communities would result in succession to later ecological stages (i.e., shrubland and forest) and the incremental loss of grasslands from the subject property, thus rendering the site unsuitable as habitat for grassland specialist birds.

Implementation of the proposed action would result in the removal of 133.8 acres of the existing 646.2 acres of grassland habitat at the site, primarily in the area to the north of both runways and to the south of the western runway. Given that development within these lots would likely occur in incremental stages over the course of multiple years, grassland habitat loss would also occur incrementally as well. In order to mitigate this habitat loss, this CHPP provides for the preservation and maintenance (as described below) of the remaining 512.4 acres of grassland habitat, representing 79.3 percent of the existing grasslands at the site. Furthermore, the proposed action would also result in the creation of an additional 70.6 acres of on-site grassland habitat, through, among other things, the conversion of existing wooded habitat to grasslands within three areas located to the north of the eastern runway. This conversion would occur during the initial stages of the proposed action, thus ensuring that replacement habitat has been established before any clearing of grasslands occurs. In total, a net loss of 63.2 acres of grassland habitat would occur as a result of the proposed action. However, as a result of preservation of existing habitat and creation of new habitat, the CHPP provides for a total proposed grassland area of 583.0 acres. The preserved and created grassland habitats would be actively maintained, as opposed to developing into shrublands and ultimately woodlands through the process of ecological succession that would occur in the absence of a maintenance plan. The latter two habitat types are unsuitable for the resident grassland birds identified in Section 1.0. In contrast, implementation of

the proposed action is expected to result in the perpetuation of grassland habitat that would continue to attract resident grassland birds to the subject property.

As detailed previously, periodic mowing has prevented the succession of the existing grasslands into other ecological communities that occur on the site. Currently, no management plan for the maintenance of the on-site grassland habitat exists. As part of the proposed action, the total proposed grassland area of 583.0 acres would be actively maintained as habitat for grassland bird species in accordance with Best Management Practices (BMPs) developed by New York Audubon⁸ and the NYSDEC⁹ for grassland bird habitat (see Attachments E and F, respectively), as detailed below.

- In order to avoid disturbance during the grassland bird breeding season and the overwintering period for short-eared owl, northern harrier and other raptors, activities associated with the creation of 70.6 acres of grassland habitat (i.e., pavement removal, clearing of wooded habitat, tilling, seed planting, etc.) would occur between August 16 and October 31.
- In general, existing woody vegetation (i.e., trees, shrubs and vines) and invasive herbaceous plants would be removed from the existing and created grassland habitats to the maximum extent practicable through both mechanical means and manual methods (i.e., “by hand”). Removal efforts would occur between August 16 and October 31 during the first year of management. If necessary, subsequent removal efforts would occur during the same time period, in order to remove undesirable colonizing vegetation, including invasive plant species.
- Seeding of created grassland areas with warm- and/or cold-season grasses will be accomplished according to the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Plant Materials Technical Note NY-36: Plant Materials – Seeding Mixes for Wildlife¹⁰ or similar approved guidance (Attachment G).
- Management for perching species (e.g., upland sandpiper, vesper sparrow, eastern meadowlark), can be accomplished through maintenance of a limited amount of scattered woody vegetation or the installation of fence posts within portions of the grassland.



⁸ Morgan, M. and Burger, M. 2008. *A Plan for Conserving Grassland Birds in New York: Final Report to the New York State Department of Environmental Conservation under Contract No. C005137*. Audubon New York.

⁹ New York State Department of Environmental Conservation. 2014. *Best Management Practices for Grassland Birds*. Available online at: <http://www.dec.ny.gov/pubs/86582.html> Accessed February 23, 2016.

¹⁰ United States Department of Agriculture Natural Resource Conservation Service. 2007. Plant Materials Technical Note NY-36

- In general, mowing would occur every one-to-three years to attract and maintain habitat for different grassland species. Additionally, mowing frequency will vary across the site based upon other factors, including variations in soil types, moisture, dominant vegetative species and the presence of invasive plant species.
- Habitat preferences, including vegetation height and density, shrub tolerance, forb component, litter depth, and the need for perches vary widely within the on-site grassland bird species assemblage (see Table 6). However, given the large extent of grasslands at the subject property, the site can be managed to attract and provide habitat for a variety of grassland birds by varying mowing frequencies and other maintenance practices across the site, thereby creating a diversity of habitat zones.
- Haying (which removes cut vegetation or “thatch”) can be employed as opposed to mowing (which leaves thatch on the ground) within habitat patches that are intended to attract species with low tolerance for thatch (see Table 6)
- Mowing or other mechanized activities would not occur within the grassland habitat during the breeding season (April 23 to August 15, inclusive).
- In order to avoid avian breeding season and to establish dominance of grasses over forbs (non-grassy herbaceous vegetation), mowing would occur as early as possible during the time period from August 16 to October 1.
- Should spring season mowing be necessary (e.g., to control invasive plant species), the mowing activity would occur no earlier than March 2 and no later than April 22.
- Disturbances, including mechanized activity and excessive noise, would be avoided or minimized to the maximum extent practicable during the overwintering season (November 1 to March 1).



Table 6 provides a summary of recommended habitat sizes and habitat characteristics for the grassland birds that have been documented at the subject property. Maintenance practices based upon these factors will be employed in order to provide habitat for these targeted species. Ongoing monitoring will occur, in order to ensure that goals for habitat quantity/quality and occupation by the targeted species goals are met. The monitoring will include periodic field surveillance of grassland habitat with observation and measurement of vegetation health and other physical parameters. The monitoring will also incorporate surveys for invasive or otherwise undesirable plant species, for comparison with the approved plan specifications detailed above and in Table 6. As per NYSDEC requirements, monitoring activities would also include observations of grassland bird species present, in order to determine plan efficacy at providing quality habitat for target bird species and to determine whether modifications to plan parameters (e.g., mowing frequency, height, etc.) are desirable. Based upon the monitoring observations and data, maintenance practices will be amended, as necessary, in order to meet the goals for targeted species.

Table 6 – Audubon New York Grassland Bird Habitat Characteristics*

Species	Recommended Habitat Size (acres)	Shrub Tolerance (% Cover)	Forb Component (% Cover)	Thatch Depth (cm)	Vegetation Height (cm)	Vegetation Density	Perches Important?
short-eared owl (<i>Asio flammeus</i>)	Large	None indicated	Medium (20)	No preference indicated	Medium (40-60)	High	Possible
northern harrier (<i>Circus cyaneus</i>)	74+	Medium-to-high (1-5)	Low (10)	No preference indicated	Tall (60+)	High	
upland sandpiper (<i>Bartramia longicauda</i>)	74+	Low (1)	Low (10-15)	Low (1)	Mixed (<15 and 40+)	Low	Yes
grasshopper sparrow (<i>Ammodramus savannarum</i>)	124-247+	Medium (1-3)	Medium	Low (<1)	Medium (30)	Low	
horned lark (<i>Eremophila alpestris</i>)	2.5-25	None (0)	High	0	Very Short (0-10)	Minimal	
vesper sparrow (<i>Pooecetes gramineus</i>)	25	Low (<10)	High	Low (<1)	Short (<20)	Low	Yes
eastern meadowlark (<i>Sturnella magna</i>)	37	Medium (2-3)	High (20-30)	Medium (2-6)	Medium (20-40)	High	Yes
savannah sparrow (<i>Passerculus sandwichensis</i>)	12-25	Medium (2-3)	<40	4 (+)	Medium (30-40)	Medium	

*Morgan, M. and Burger, M. 2008. A Plan for Conserving Grassland Birds in New York: Final Report to the New York State Department of Environmental Conservation under Contract No. C005137. Audubon New York.



It is anticipated that management of the on-site grasslands under the New York Audubon and NYSDEC BMPs and the grassland species habitat preferences detailed above would improve the overall quality of the existing and created grasslands as a habitat for avian species, including the NYS-Endangered, -Threatened and Special Concern bird species that have been reported on the subject property.

Finally, in addition to preserving habitat for grassland birds and other wildlife, the total proposed grassland area of 583.0 acres would also contain expansive habitat area for the NYS-Threatened plant slender pinweed, which has been documented as occurring on the subject property in NYNHP records.

Pitch Pine-Oak Forest

The majority of existing habitat that would be zoned for ultimate development and subject to clearing as a result of the proposed action would occur in this community type. However, approximately 787 acres of existing on-site forested communities, including large contiguous blocks of Pitch Pine-Oak Forest, would be preserved at the subject property to the north of the eastern runway, to the south of both runways and particularly within the lands comprising the CPB Core Preservation Area at the western portion of the site. It is also anticipated that additional Pitch Pine-Oak Forest habitat will occupy the site over time, as preserved areas supporting Tree Plantation and Successional Shrubland communities located to the north of the eastern runway develop into forested communities through the process of ecological succession.

Furthermore, the proposed action has been designed such that vegetated open space areas within the proposed lots would be contiguous with each other and with vegetated areas on adjacent parcels. The proposed lot layout has specifically been configured such that areas of existing Pitch Pine-Oak Forest and other natural vegetation to remain are concentrated within the rear and side yards of the proposed lots, and contiguous to existing areas of Pitch Pine-Oak Forest on adjoining off-site properties.

The areas of Pitch Pine-Oak Forest to be preserved represent significant upland habitat area for herpetofauna, including the five NYS-Special Concern species that have been documented at the site. With respect to the NYS-Endangered eastern tiger salamander, as described below, Pitch Pine-Oak Forest communities occupy much of the upland area to be preserved within 1,000 feet of the four on-site and six off-site eastern tiger salamander breeding ponds identified by the NYSDEC. As indicated previously, the Town of Riverhead will require that fencing be installed along the eastern tiger salamander buffer zone on those lots that infringe upon or abut the buffer zone. Beyond these measures, no other active management practices are proposed for Pitch Pine-Oak Forest habitat to be preserved under the CHPP.

Preservation of forested habitat under the CHPP would also afford habitat protection for the NYS-Special Concern woodland bird species whip-poor-will, which was observed and noted as a probable on-site breeder in 2009.



Although no records for the NYS-Threatened butterfly species frosted elfin were reviewed as part of this assessment, the NYSDEC has identified this species as potentially occurring on-site. The large contiguous blocks of Pitch Pine-Oak Forest to be preserved under the CHPP represent significant potential habitat area for this species.

The NYS-Threatened plant slender pinweed was identified as occurring on-site in NYNHP records and is known to colonize disturbed areas within this community type. The large contiguous blocks of Pitch Pine-Oak Forest to be preserved under the CHPP represent significant potential habitat area for this plant species.

The Pitch Pine-Oak Forest community and other forested portions of the subject property represent potentially suitable summer foraging and/or roosting habitat for the NYS- and federally-Threatened northern long-eared bat. Correspondence from the NYNHP indicates that no agency records currently exist for northern long-eared bat hibernacula or roost trees at or in the vicinity of the site (Attachment C), and no other site-specific northern long-eared bat records were reviewed during preparation of the CHPP. Nevertheless, the approximately 787 acres of Pitch Pine-Oak Forest and other forested habitat at the subject property to be preserved under the CHPP represents potentially suitable summer foraging and/or roosting habitat for this species.

Moreover, any proposed clearing of forested habitat on the individual lots proposed for development would ultimately require updated NYNHP record requests in order to determine if records exist for northern long-eared bat hibernacula or roosts. Should such records exist, consultations and/or permitting with the USFWS regarding the proposed clearing would be necessary if prohibited incidental take of northern long-eared bat would occur. As defined in the USFWS final 4(d) rule, incidental take of northern long-eared bat includes tree removal activities that occur within 0.25 mile of a known, occupied hibernacula or cutting or destroying a known, occupied maternity roost tree or other trees within a 150 foot radius from a maternity roost tree during the pup season from (June 1 through July 31). Any proposed activity that would result in prohibited incidental take of northern long-eared bat, as described above, would require USFWS consultation and/or permitting.

Pitch Pine-Oak-Heath Woodland

As detailed previously, the NYNHP ranks this fire-dependent community as “very vulnerable,” with few remaining acres remaining in New York State. The Pitch Pine-Oak-Heath Woodland community occurs within scattered pockets at the southeastern portion of the site, in the area to the north of the eastern runway. As this area would be preserved as open space under the CHPP, no significant adverse impacts to the on-site Pitch Pine-Oak-Heath Woodland habitat are anticipated as a result of the proposed action. The preserved areas of this community represent potential upland habitat for the five NYS-Special Concern species that have been documented at the subject property. The preservation of this community would also



preserve the optimal on-site breeding, larval and adult habitat for the NYS-Special Concern coastal barrens buckmoth and the NYS-Threatened frosted elfin, as well as potential habitat for NYS-Threatened slender pinweed. Finally, the Pitch Pine-Oak-Heath Woodland to be preserved at the subject property under the CHPP represents potentially suitable summer foraging and/or roosting habitat for the NYS and federally-Threatened northern long-eared bat.

Pine/Spruce/Conifer Plantation

Portions of the tree plantation communities noted to the north of the eastern runway are located within Lots 40 through 43 and thus would be zoned for ultimate redevelopment and clearing as a result of the proposed action. However, other on-site examples of these communities would be preserved within the proposed open space areas to the north and south of these lots, including those within lands proposed for preservation. Similar to existing conditions, it is anticipated that colonization by successional vegetation from surrounding wooded and grassland habitats observed during the field inspections would continue within the preserved tree plantations following implementation of the proposed action, resulting in the eventual conversion of these anthropogenic habitats to forested communities dominated by tree species from neighboring habitats (i.e., Pitch Pine-Oak Forest). However, as tree plantation communities are noted by the NYNHP as being distributed throughout New York State and are common regionally, no significant adverse impacts to this community type are anticipated as a result of the proposed action.

The protection of portions of the former tree plantation areas would provide additional upland habitat protection for the rare herpetofauna noted on-site, as well as potential habitat for slender pinweed within disturbed openings. Finally, the tree plantation communities to be preserved at the subject property under the CHPP represents potentially suitable summer foraging and/or roosting habitat for the NYS and federally-Threatened northern long-eared bat.

Successional Shrubland

As indicated previously, the Successional Shrubland ecological community is represented in scattered locations at the subject property that have been subject to historic disturbance, including portions of the former agricultural fields and tree plantations to the north of the eastern runway. Some areas of this community occur within Lots 39 through 42, and therefore would be zoned for ultimate redevelopment and eventual clearing as a result of the proposed action. However, other on-site examples of Successional Shrubland would be preserved under the CHPP within the proposed open space areas to the north and south of these lots. Regardless of the proposed action, and in the absence of additional disturbance, it is anticipated that the process of ecological succession that is already underway will continue within the Successional Shrubland habitats, resulting in the eventual conversion to wooded communities. However, given that the Successional Shrubland community is by definition a dynamic, transitional habitat that is considered by the NYNHP to be



“demonstrably secure” in New York State, no significant adverse impacts to this community type are anticipated as a result of the proposed action.

The preservation of portions of the Successional Shrubland would afford upland habitat protection for the rare herpetofauna species noted on-site, as well as potential habitat for slender pinweed.

Paved Road/Path

The existing eastern runway is proposed to be retained for potential aviation use, but the usable area, although left intact, would be shortened from 10,000 feet to 7,000 feet. The western runway would be left intact for potential use for the installation of solar panels or similar renewable energy use. Therefore, no significant adverse impacts to the existing paved areas are anticipated. As these largely unvegetated habitats are of little overall ecological significance, no significant adverse impacts are anticipated. As part of the management and maintenance of grasslands located along the runways, the party responsible for implementing the CHPP will endeavor to reduce illegal activities at and provide security of the runways (e.g., providing barriers).

Wetland and Aquatic Habitats

As detailed previously, various wetland and aquatic resources are located within or partially within the subject property boundaries, including ten NWI-designated habitats and six NYSDEC-regulated wetland areas. The CHPP has been specifically developed to avoid the loss of wetland and aquatic habitats, and to minimize development-related disturbance to these resources. Accordingly, as detailed on the *Habitat Protection Plan* (see Attachment D), a key element of the CHPP is the preservation of all on-site wetland and aquatic habitats and avoidance of development within 1,000 feet of any such on- or off-site habitat, including the NYNHP-listed Coastal Plain Pond community.

The protection afforded to wetland and aquatic habitats and surrounding upland buffers by the CHPP would also preserve all known breeding and non-breeding habitat for the NYS-Endangered eastern tiger salamander at the subject property. Pursuant to the NYSDEC *Guidance for Land Cover Set Asides for Conservation of the Eastern Tiger Salamander and Suggested Methods to Avoid, Minimize and Mitigate Impacts*,¹¹ it is recommended that 100 percent of existing upland forest habitat within 535 feet of breeding ponds and a minimum of 50 percent of adjacent upland habitat within 1,000 feet of breeding ponds be preserved. In accordance with this guidance document, all future development would occur a minimum of 1,000 feet from the ten eastern tiger salamander breeding ponds identified by the NYSDEC at and adjacent to the subject property. As shown on the *Subdivision Map* (Attachment B), as part of the CHPP, the Town of Riverhead will require that fencing be installed at the lots



¹¹ New York State Department of Environmental Conservation. 2010. *Guidance for Land Cover Set Aside for Conservation of the Eastern Tiger Salamander*.



that infringe upon or abut 1,000-foot eastern tiger salamander breeding pond buffer zones (Lot 28/Drainage Reserve Area, and Lot 39. Covenants and restrictions for the fencing will be required during the site plan review process. Based upon the foregoing no loss of, or physical disturbance to, the ten aforementioned breeding ponds would occur under the CHPP, and surrounding upland habitat for eastern tiger salamander would be preserved as well.

As the CHPP provides for the preservation of all wetland and aquatic habitats and adjacent upland areas located at the site, protection of breeding and non-breeding habitat for the five NYS Special Concern amphibian or reptile species documented at the subject property (marbled salamander, eastern spadefoot toad eastern box turtle, spotted turtle and eastern hognose snake) would also be accomplished. Additionally, the NYS Special Concern snake species eastern worm snake has been documented in the vicinity of the subject property and may also occur on-site, particularly within moist forested areas near water features. If present at the site, potential on-site habitat protection for this species would also be afforded by the CHPP through the preservation of wetlands and adjacent habitats.

Finally, by preserving all on-site wetland/aquatic habitats, the CHPP would also preserve any potential habitat for the seven NYS-listed wetland-adapted plants for which on-site records exist (coppery St. John's-wort, comb-leaved mermaid-weed, small floating bladderwort, short-beaked beakrush, rose coreopsis, Nuttall's lobelia and Wright's panic grass).

4.0

Conclusions

The EPCAL site supports six distinct upland communities and ten National Wetland inventory (NWI) wetland/aquatic habitat categories. A total of 16 wildlife species and eight plant species listed by New York State as “Endangered,” “Threatened,” “Special Concern” or “Rare” have been documented as occurring at or in the vicinity of the subject property. Based upon consultations with the NYSDEC, this CHPP has been prepared by VHB in order to mitigate impacts to the six aforementioned habitats related to the subdivision of the subject property into 50 lots, of which 40 lots would be for ultimate redevelopment (see Footnote 1).

In order to mitigate for the proposed removal of 133.8 acres of grassland habitat (which is currently not maintained and is subject to loss through ecological succession), the CHPP provides for the preservation of the remaining 512.4 acres of grasslands and the creation of an additional 70.6 acres of on-site grassland habitat, all of which would be maintained as a grassland preserve. The grasslands would be managed under NY Audubon/NYSDEC BMPS as a habitat for grassland birds and other wildlife species, including the NYS-Endangered short-eared owl, the NYS-Threatened northern harrier and six other grassland specialist bird species that have been documented at the subject property. Potential habitat for NYS-Threatened plant slender pinweed also occurs within the grasslands to be preserved.

Combined with the grassland preserve, the preservation of large contiguous blocks of the Pitch Pine-Oak Forest, Pitch Pine-Oak-Heath Woodland, Pine/Spruce/Conifer Plantation and Successional Shrubland communities as described in the CHPP would also preserve habitat for six NYS-Special Concern herpetofauna species that have been noted at or in the vicinity of the site, as well as potential larval and adult habitat for the NYS-Special Concern coastal barrens buckmoth and the NYS-Threatened frosted elfin. Potential habitat for NYS-Threatened plant slender pinweed also occurs within these preserved habitat areas.

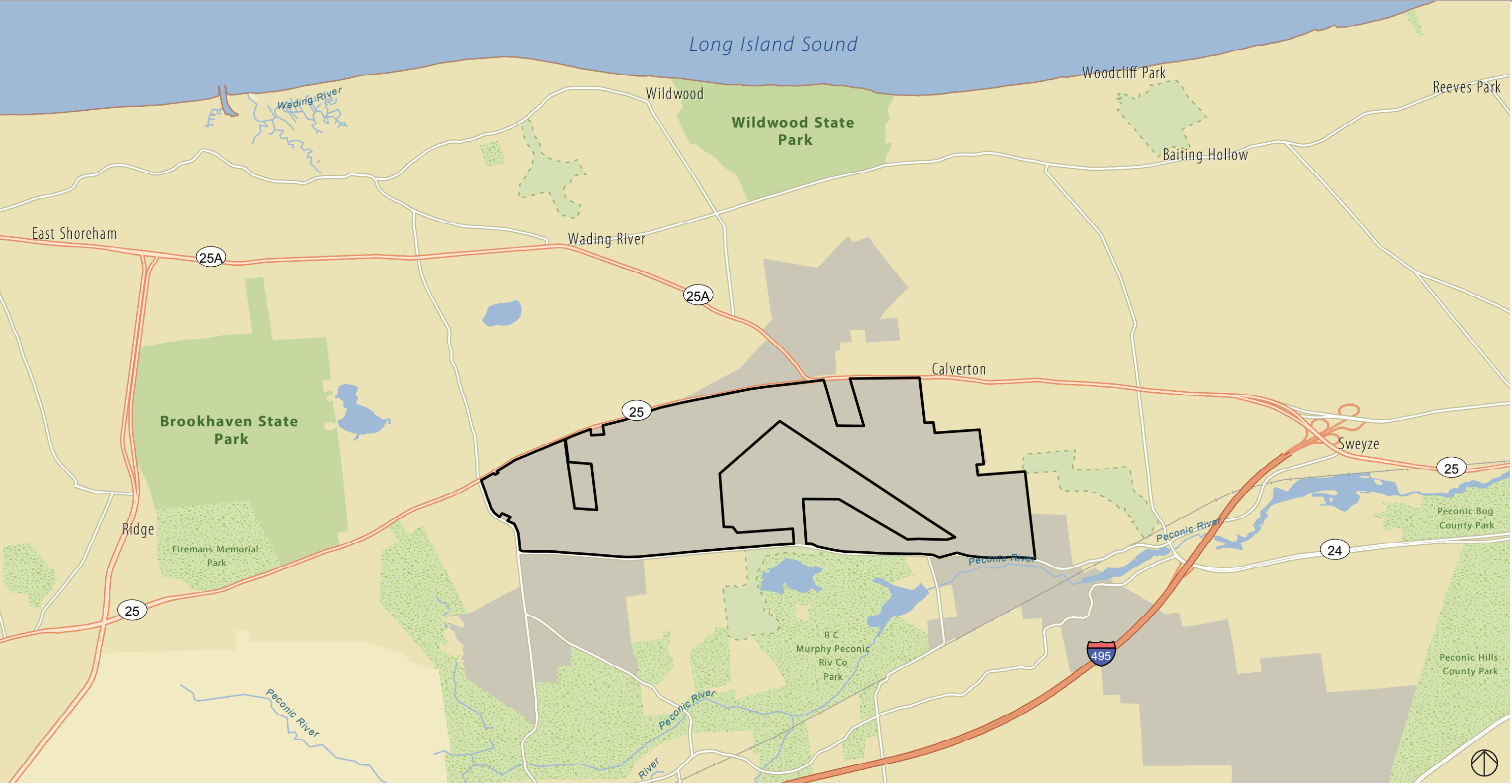
The protection afforded to on-site wetland and aquatic habitats by the CHPP would also preserve the four documented eastern tiger salamander breeding ponds located at the subject property, including the surrounding 1,000 buffer zones associated with



each pond. In addition, on-site upland habitat located within 1,000 feet of the six documented off-site breeding ponds would also be preserved. Habitat preservation for seven NYS-listed wetland plant species that have been documented at or in the vicinity of the subject property would also occur as a result.

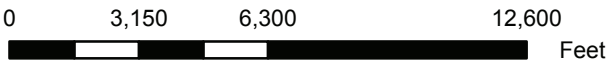
Based upon the foregoing, the CHPP provides for protection of significant habitat area for 24 NYS-listed wildlife and plant species through the preservation of large, contiguous blocks of all existing upland and wetland/aquatic habitats at the subject property. The CHPP further provides for the management and ongoing monitoring of much of the site as a habitat preserve for grassland bird species. Accordingly, it is anticipated that management of the on-site grasslands under the New York Audubon and NYSDEC BMPs detailed in this CHPP would improve the overall quality of the grasslands as a habitat for avian species, including the NYS-Endangered, -Threatened and Special Concern grassland bird species that have been documented on the subject property.

Attachment A



LEGEND

 EPCAL Property



Source: Town of Riverhead GIS

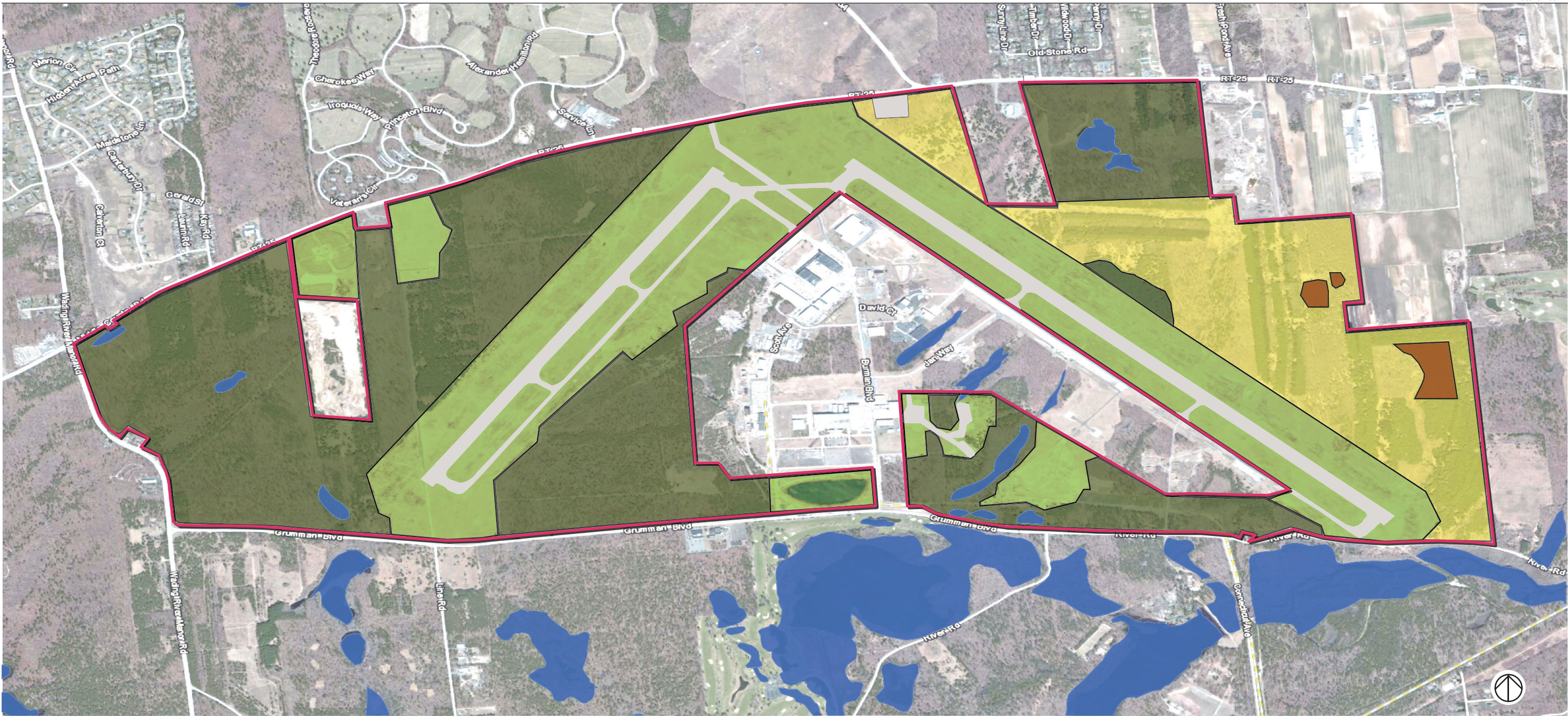


PROPOSED SUBDIVISION OF EPCAL PROPERTY
DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT
COMPREHENSIVE HABITAT PROTECTION PLAN
Calverton, New York

Site Location



Figure
1



LEGEND

-  EPCAL Property
-  Pitch Pine-Oak Forest
-  Pitch Pine-Oak-Heath Woodland
-  Tree Plantation/Successional Shrubland
-  Successional Old Field
-  Paved Road/Path
-  Surface Water/Wetland

0 1,250 2,500 5,000 Feet

Source: VHB



PROPOSED SUBDIVISION OF EPCAL PROPERTY
DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT
COMPREHENSIVE HABITAT PROTECTION PLAN
Calverton, New York

Ecological Communities



Figure
2



LEGEND

- EPCAL Property
- NWI Wetland

0 1,250 2,500 5,000 Feet

Source: Town of Riverhead GIS; U.S. Fish and Wildlife Service National Wetlands Inventory Wetland Mapper <http://www.fws.gov/wetlands/Data/mapper.html>. October 31, 2011

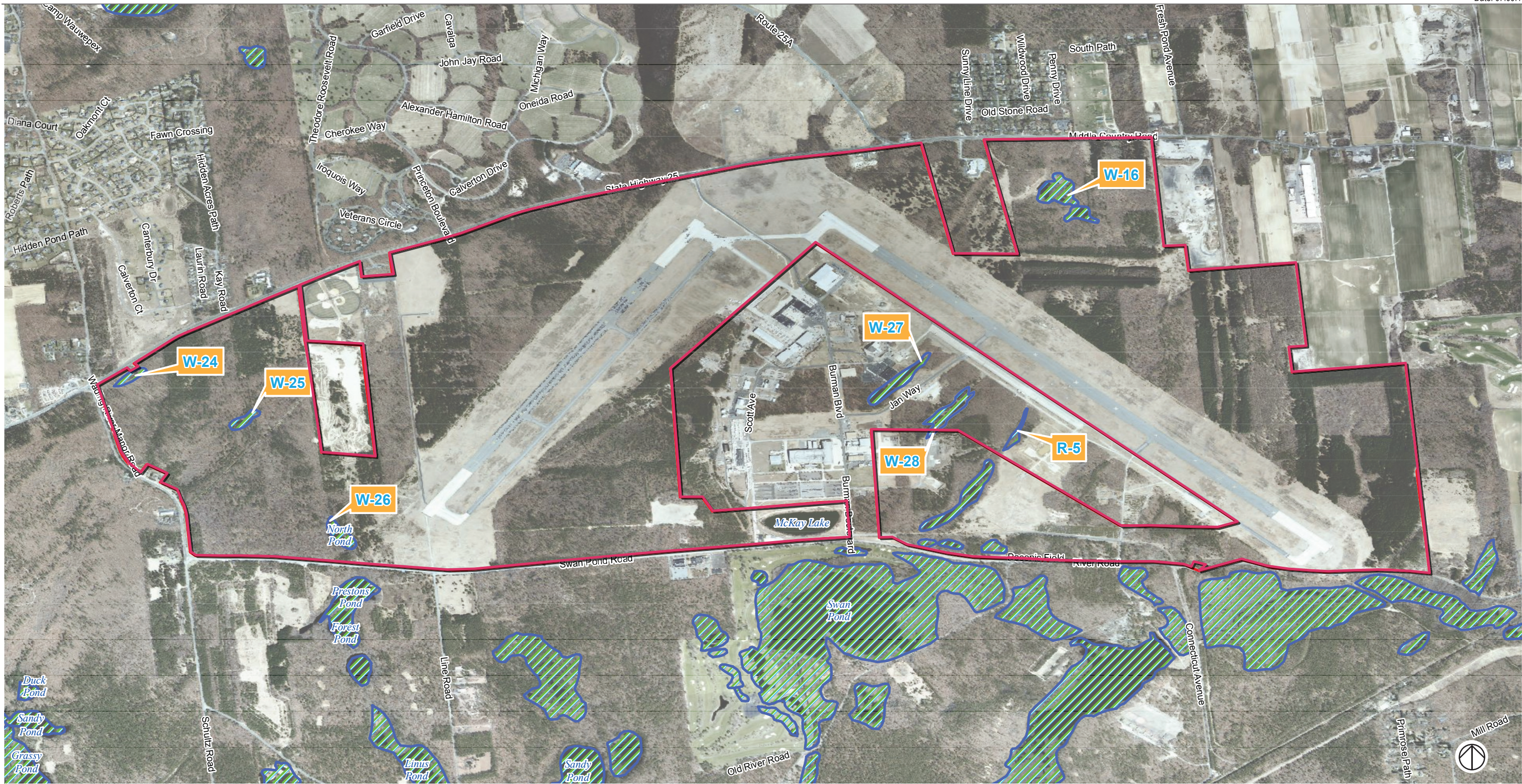


PROPOSED SUBDIVISION OF EPCAL PROPERTY
DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT
COMPREHENSIVE HABITAT PROTECTION PLAN
Calverton, New York



NWI Wetlands

Figure
3



LEGEND

- EPCAL Property
- NYSDEC Freshwater Wetlands
- NYSDEC Wetland ID

0 1,250 2,500 5,000 Feet

Source: NYS Regulatory Freshwater Wetlands for Suffolk County, NYSDEC, July 2013; 2013 NYS Digital Ortho-imagery, NYSITS, October 2013; Tax map parcel linework from Town of Riverhead GIS S.R.P.T.A. 2008



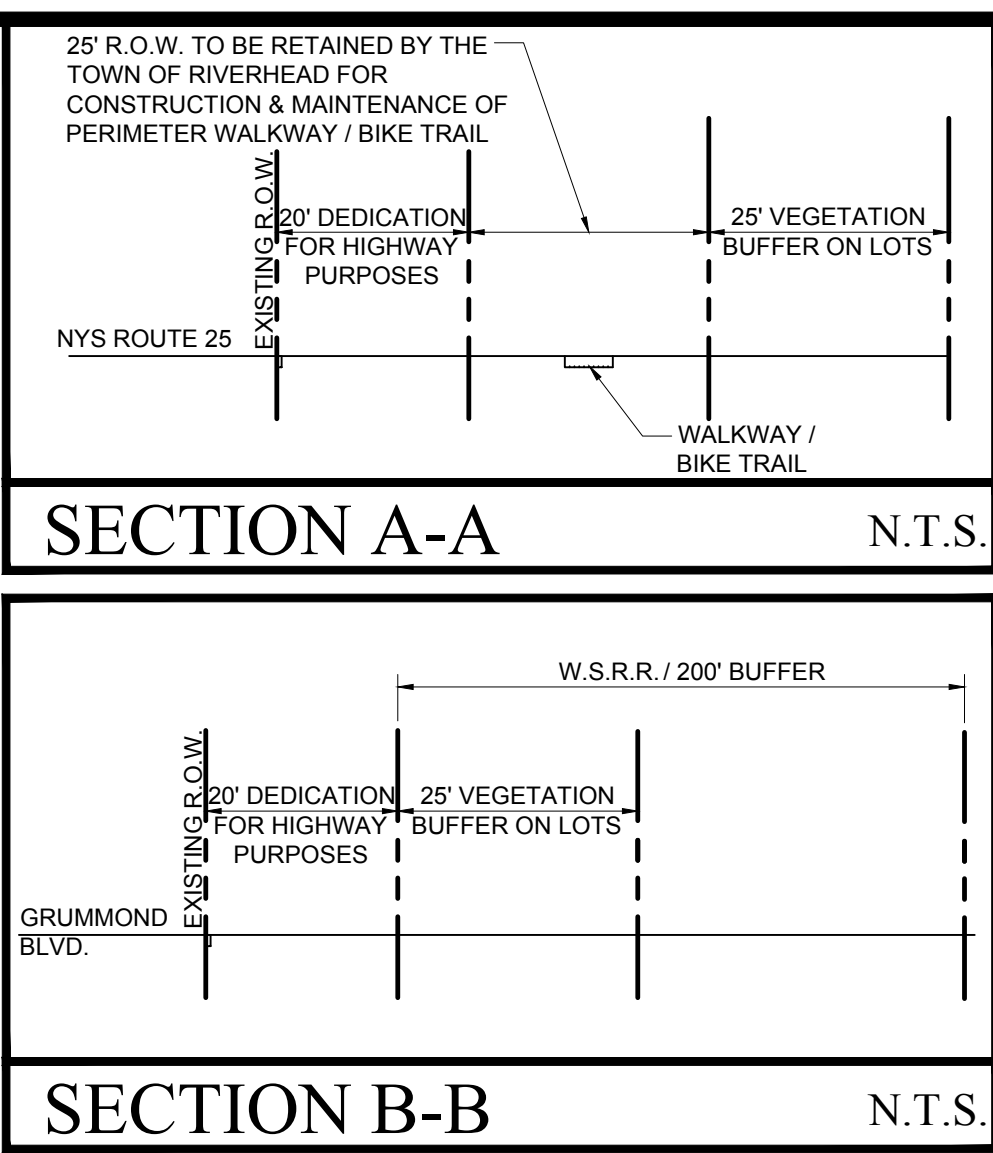
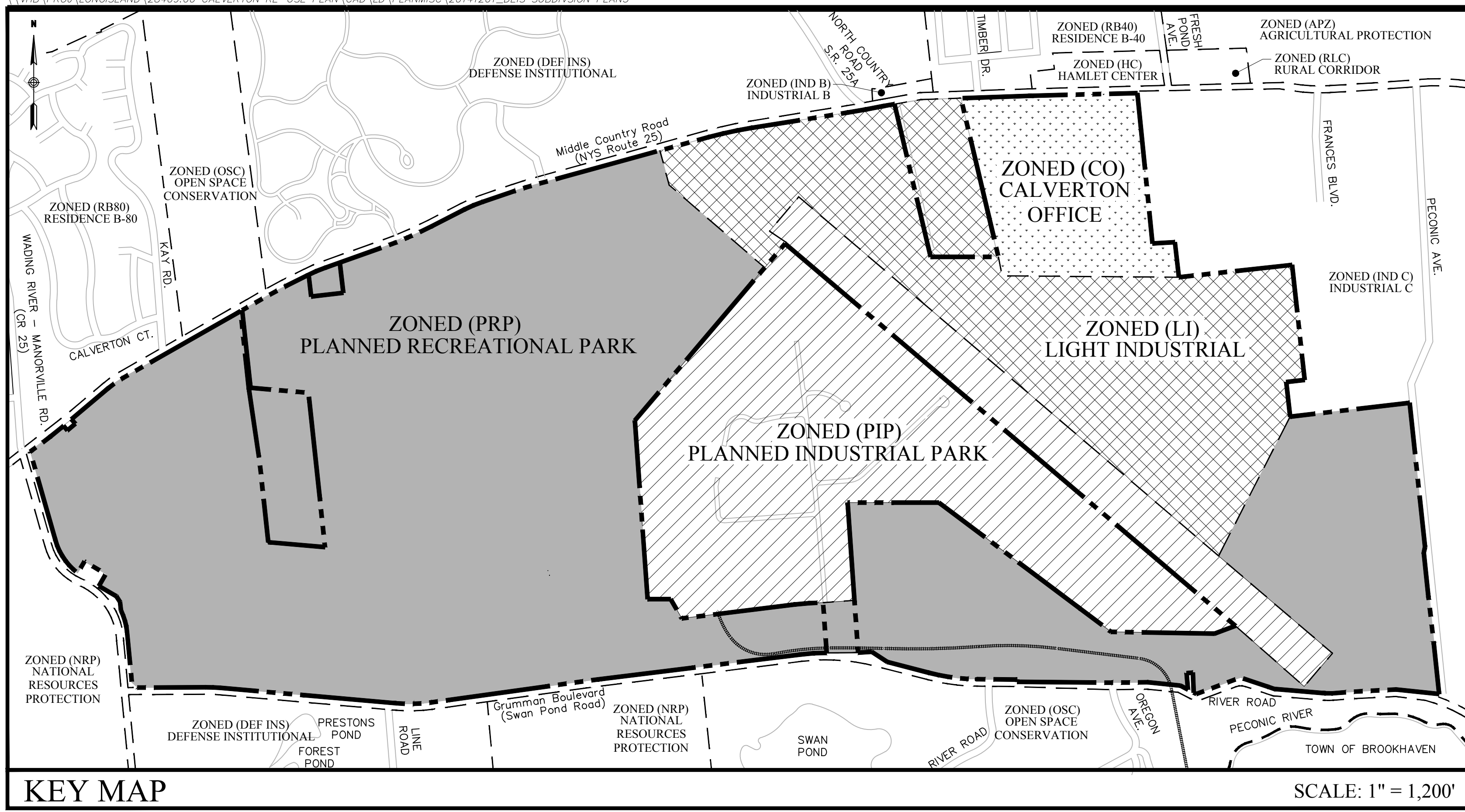
PROPOSED SUBDIVISION OF EPCAL PROPERTY
DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT
COMPREHENSIVE HABITAT PROTECTION PLAN
Calverton, New York

NYSDEC Freshwater



Figure
4

Attachment B

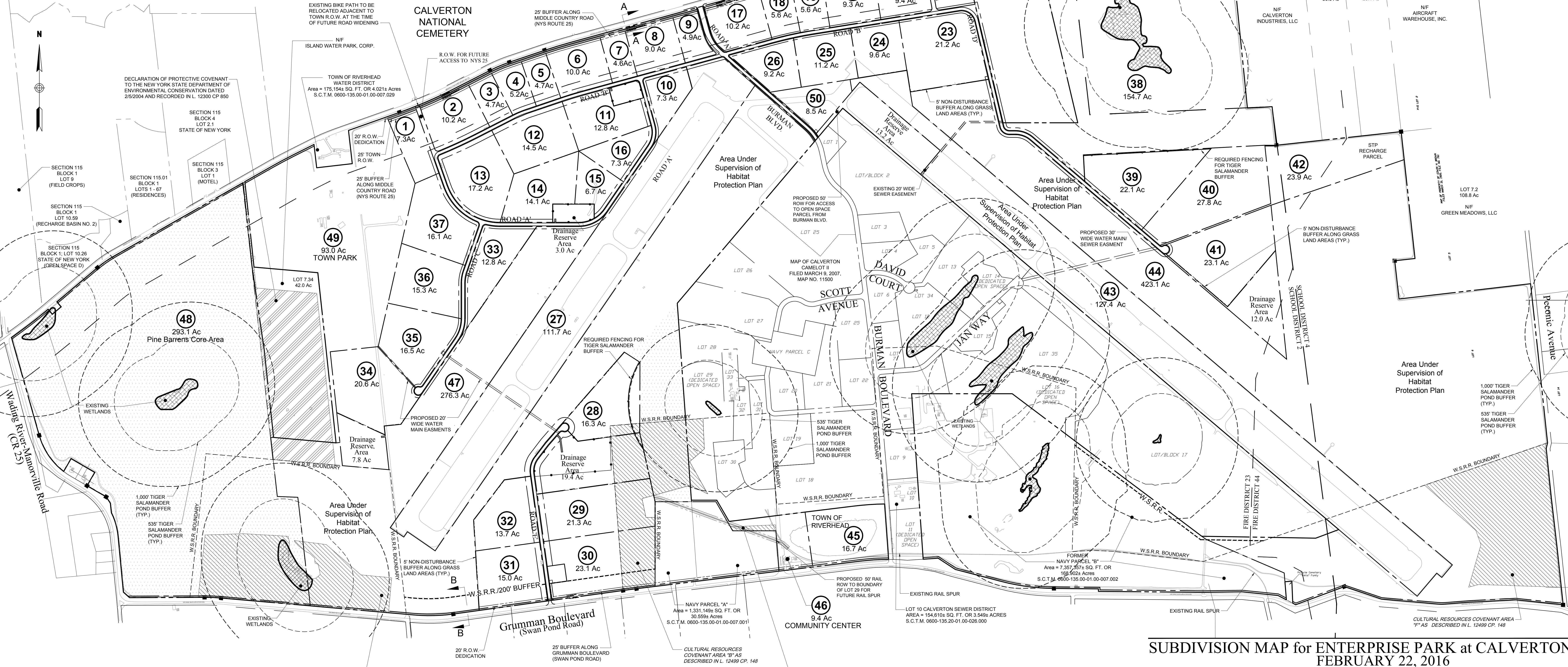


Legend	
	Overall Property Boundary
	Fire District Boundary
	School District Boundary
	Existing W.S.R.R. Boundary as Annotated from NYSDEC Sketch
	Proposed W.S.R.R. Boundary
	Interior Lot Lines
	Lot number
	Existing Monument Locations
	Proposed Monument Locations
	Existing Rail Spur
	Future Rail Spur in 50' ROW
	Wetland Area

Legend	
	Declaration of Protective Covenant to the New York State Department of Environmental Conservation Dated 2/5/2004 and Recorded in L. 12300 cp 850
	Cultural Resources Covenant Areas as Described in L. 12499 cp. 148
	Pine Barrens Core Preservation Area / Add'l wooded area to remain



**Engineering, Surveying
& Landscape Architecture, P.C.**
Transportation
Land Development
Environmental Services
100 Motor Parkway, Suite 135
Hauppauge, New York 11788
631.787.3400 • FAX 631.813.2545



SUBDIVISION MAP for ENTERPRISE PARK at CALVERTON FEBRUARY 22, 2016

Owner:	TOWN OF RIVERHEAD 200 Howell Avenue, Riverhead, NY 11901
Existing Zoning:	LI, PIP, PRP, CO, NRP
Proposed Zoning:	Planned Development District (PDD)
TOWN OF RIVERHEAD SUFFOLK COUNTY, NEW YORK	
District 0600; Section 135; Block 1; Lots 7.1, 7.2, 7.33 & 7.4	
Total Site Area = 2323.9 Acres	



Attachment C

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th Floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **Fax:** (518) 402-8925
Website: www.dec.ny.gov



Joe Martens
Commissioner

February 07, 2014

David Kennedy
VHB Engineering, Surveying and Landscape Architecture, P.C.
2150 Joshua's Path, Suite 300
Hauppauge, NY 11788

Re: Proposed subdivision and redevelopment of EPCAL property at Calverton
Town/City: Riverhead. County: Suffolk.

Dear David Kennedy :

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project

Enclosed is a report of rare or state-listed animals and plants, and significant natural communities, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site.

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 as to the presence or absence of all rare or state-listed species or significant natural communities. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

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.

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, as listed at www.dec.ny.gov/about/39381.html.

Sincerely,

Andrea Chaloux
Environmental Review Specialist
New York Natural Heritage Program



**The following state-listed animals have been documented
at your project site, or in its vicinity.**

The following list includes animals that are listed by NYS as Endangered, Threatened, or Special Concern; and/or that are federally listed or are candidates for federal listing. The list may also include significant natural communities that can serve as habitat for Endangered or Threatened animals, and/or other rare animals and rare plants found at these habitats.

For information about potential impacts of your project on these populations, how to avoid, minimize, or mitigate any impacts, and any permit considerations, contact the Wildlife Manager or the Fisheries Manager at the NYSDEC Regional Office for the region where the project is located. A listing of Regional Offices is at <http://www.dec.ny.gov/about/558.html>.

The following species and habitats have been documented at or near the project site, generally within 0.5 mile. Potential onsite and offsite impacts from the project may need to be addressed.

COMMON NAME		SCIENTIFIC NAME	NY STATE LISTING	FEDERAL LISTING
Birds				
Short-eared Owl	onsite	<i>Asio flammeus</i>	Endangered	13216
<i>Nonbreeding</i>				
Amphibians				
Tiger Salamander	onsite	<i>Ambystoma tigrinum</i>	Endangered	529
Fish				
Banded Sunfish		<i>Enneacanthus obesus</i>	Threatened	2872

This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the listed animals in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, and from NYSDEC at <http://www.dec.ny.gov/animals/7494.html>.

Information about many of the rare plants and animals, and natural community types, in New York are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, and from NatureServe Explorer at <http://www.natureserve.org/explorer>.



**The following rare plants, rare animals, and significant natural communities
have been documented at your project site, or in its vicinity.**

We recommend that potential onsite and offsite impacts of the proposed project on these species or communities be addressed as part of any environmental assessment or review conducted as part of the planning, permitting and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may still contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

The following animals, while not listed by New York State as Endangered or Threatened, are of conservation concern to the state, and are considered rare by the New York Natural Heritage Program.

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
Reptiles			
Eastern Wormsnake	<i>Carphophis amoenus</i>	Special Concern	Imperiled in NYS
River Road, 2007-09-13: The snake was found at the edge of an old clearing along the south side of River Road. This area has sandy soils, white oak, pin oak, pitch pine, grasses, and moss and appears similar to a pine barrens community.			12701
Moths			
Coastal Barrens Buckmoth	<i>Hemileuca maia</i> ssp. 5	Special Concern	Imperiled in NYS and Globally Uncommon
Middle Country Road Woods, 2002-06-18: Pitch pine oak heath woodland and pitch pine oak forest with scrub oak and other oaks. This area was burned in 1981.			867
Coastal Barrens Buckmoth	<i>Hemileuca maia</i> ssp. 5	Special Concern	Imperiled in NYS and Globally Uncommon
Firebreak Pond East, 1987-10-19: The moths were trapped on a military airport surrounded by fire-suppressed pine-oak woods. The areas around the runways are kept low by mowing and tree cutting. The northeast section burned in 1984.			8051

The following significant natural communities are considered significant from a statewide perspective by the NY Natural Heritage Program. They are either occurrences of a community type that is rare in the state, or a high quality example of a more common community type. By meeting specific, documented criteria, the NY Natural Heritage Program considers these community occurrences to have high ecological and conservation value.

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
Wetland/Aquatic Communities			
Coastal Plain Pond Shore			High Quality Occurrence of Rare Community Type
Third Pond Calverton: Excellent sandy margins. Little emergent vegetation. Little disturbance.			8257

Upland/Terrestrial Communities

Pitch Pine-Oak Forest

High Quality Occurrence

Sandy Pond East: The occurrence is good sized with good species composition. The area is part of the much larger central Long Island pine barrens.

10254

The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by the New York Natural Heritage Program, and so are a vulnerable natural resource of conservation concern.

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
Vascular Plants			
Comb-leaved Mermaid-weed	<i>Proserpinaca pectinata</i>	Threatened	Imperiled in NYS
Third Pond Calverton, 2000-08-03: This is a shallow, dark water pond with an extensive exposed margin on the east side of the pond and set in a <i>Pinus rigida</i> dominated pine barrens. The plants are in the sandy upper margin of a coastal plain pond.			819
Rose Coreopsis	<i>Coreopsis rosea</i>	Rare	Vulnerable in NYS and Globally Uncommon
Calverton Woods, 2005-07-26: This is a small, shallow pond set in a remote section of the pine barrens. No paths lead to the pond. The plants are on a dry margin of a small coastal plain pond.			921
Small Floating Bladderwort	<i>Utricularia radiata</i>	Threatened	Imperiled in NYS
Forest Pond, 1985-08-09: This is a small, shallow pond set in pine barrens. 1984: There are low water conditions.			996
Short-beaked Beakrush	<i>Rhynchospora nitens</i>	Threatened	Imperiled in NYS
Forest Pond, 2005-09-13: This is a shallow coastal plain pond set in oak-dominated pine barrens.			962
Small Floating Bladderwort	<i>Utricularia radiata</i>	Threatened	Imperiled in NYS
Prestons Pond, 1984-08-10: This is a shallow coastal plain pond set in pine barrens.			3046
Rose Coreopsis	<i>Coreopsis rosea</i>	Rare	Vulnerable in NYS and Globally Uncommon
Forest Pond, 2005-07-26: This is a shallow coastal plain pond set in oak-dominated pine barrens.			3061
Coppery St. John's-wort	<i>Hypericum denticulatum</i>	Endangered	Critically Imperiled in NYS
Third Pond Calverton, 1996-su: The plants are in a shallow, dark water pond with an extensive exposed margin on the east side set in a <i>Pinus rigida</i> dominated pine barrens. The upper pond margin is in a sand substrate.			2678
Pine Barren Bellwort	<i>Uvularia puberula</i>	Endangered	Critically Imperiled in NYS
Swan Pond, 1987-05-20: A wet pine barrens woodland with open light under the mixed pine-deciduous canopy.			4542

Slender Pinweed	<i>Lechea tenuifolia</i>	Threatened	Imperiled in NYS	
North Pond Firebreak Road, 1986-10-10: Bulldozed mounds along firebreak.				4099
Rose Coreopsis	<i>Coreopsis rosea</i>	Rare	Vulnerable in NYS and Globally Uncommon	
North Pond Riverhead, 1987-08-10: The plants are on a very grassy coastal plain pond with low diversity and set in a pine barrens near an airport runway apron.				4900
American Ipecac	<i>Euphorbia ipecacuanhae</i>	Endangered	Critically Imperiled in NYS	
Swan Pond, 2000-08-03: A sandy pebbly roadside in open sand with little competition.				5182
Slender Crabgrass	<i>Digitaria filiformis</i>	Endangered	Critically Imperiled in NYS	
Linus Pond, 1987-10-03: The plants are on a sandy wet road through wet pine barrens. The site is dominated by red maple, pitch-pine, Nyssa, and Clethra.				4786
Short-beaked Beakrush	<i>Rhynchospora nitens</i>	Threatened	Imperiled in NYS	
Third Pond Calverton, 2005-09-13: The plants are in a shallow, dark water pond with an extensive exposed margin on the east side set in Pinus rigida dominated pine barrens. There are dense stands in the sandy exposed margin.				6252
Slender Pinweed	<i>Lechea tenuifolia</i>	Threatened	Imperiled in NYS	
Middle Country Road Margin, 1985-08-06: A periodically mowed roadside in a developed area.				7061
Small Floating Bladderwort	<i>Utricularia radiata</i>	Threatened	Imperiled in NYS	
Third Pond Calverton, 1991-09-10: This is a small, circular, pine barrens, dark water pond with a low diversity emergent vegetation zone.				6736
Tooth-cup	<i>Rotala ramosior</i>	Threatened	Imperiled in NYS	
Conoe Pond, 1984-09: Elongate pond set in woods surrounded by farm fields with sand pits along east side. Pond shore.				9029
Comb-leaved Mermaid-weed	<i>Proserpinaca pectinata</i>	Threatened	Imperiled in NYS	
Forest Pond, 2005-09-13: This is a shallow coastal plain pond set in oak-dominated pine barrens. The plants are on the sandy margin of a dry coastal plain pond.				9545
Rose Coreopsis	<i>Coreopsis rosea</i>	Rare	Vulnerable in NYS and Globally Uncommon	
Third Pond Calverton, 2005-09-13: The plants are in a shallow, dark water pond with an extensive exposed margin on the east side set in a Pinus rigida dominated pine barrens. The upper pond margin is in a sand substrate.				8208
Comb-leaved Mermaid-weed	<i>Proserpinaca pectinata</i>	Threatened	Imperiled in NYS	
Calverton Woods, 2005-07-26: This is a shallow pond set in oak-pine woods and Vaccinium corymbosum thickets in a larger pine barrens landscape.				5211

Third Pond Calverton, 2005-09-13: The plants are in a small circular pine barrens pond with low diversity emergent vegetation zone. The plants are on the exposed margin of the coastal plain pond shore.

10592

This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, from NatureServe Explorer at <http://www.natureserve.org/explorer>, and from USDA's Plants Database at <http://plants.usda.gov/index.html> (for plants).

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.guides.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.



**The following rare plants and rare animals have
historical records
at your project site, or in its vicinity.**

The following rare 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, and/or there is uncertainty regarding their continued presence. 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.

If suitable habitat for these plants or animals is present in the vicinity of the project site, it is possible that they may still occur there. We recommend that any field surveys to the site include a search for these species, particularly at sites that are currently undeveloped and may still contain suitable habitat.

COMMON NAME	SCIENTIFIC NAME	NYS LISTING	HERITAGE CONSERVATION STATUS
Amphibians			
Northern Cricket Frog	<i>Acris crepitans</i>	Endangered	Critically Imperiled in NYS
1928-05-16:			7586
Tiger Salamander	<i>Ambystoma tigrinum</i>	Endangered	Critically Imperiled in NYS
2002-03-10: The salamanders were found in a small pond/pool. Soon after, the pond was converted into a rip-rapped drainage ditch. The ditch has an oak leaf litter and grass substrate. The -- See HOTLINK for full text.			12618
Beetles			
New Jersey Pine Barrens Tiger Beetle	<i>Cicindela patruela consentanea</i>	Unlisted	Historical Records Only in NYS and Globally Rare
1946-05-07: Calverton.			1539
Vascular Plants			
Marsh Straw Sedge	<i>Carex hormathodes</i>	Threatened	Imperiled in NYS
1927-07-02: Calverton. Moist woods.			164
Primrose-leaf Violet	<i>Viola primulifolia</i>	Threatened	Imperiled in NYS
1927-05-29: Calverton. Moist, open ground.			3039
Atlantic White Cedar	<i>Chamaecyparis thyoides</i>	Threatened	Imperiled in NYS
1923-11-17: Calverton.			4540

COMMON NAME	SCIENTIFIC NAME	NYS LISTING	HERITAGE CONSERVATION STATUS
Silvery Aster 1873-09-11: Calverton.	<i>Symphyotrichum concolor</i> <i>var. concolor</i>	Endangered	Critically Imperiled in NYS 4450
Stargrass 1927-08-12: Calverton. Specimen label: Low, wet gravelly soil.	<i>Aletris farinosa</i>	Threatened	Imperiled in NYS 6474
Great Plains Flatsedge 1955-09-09: Calverton. Dry sandy soil.	<i>Cyperus lupulinus</i> ssp. <i>lupulinus</i>	Threatened	Imperiled in NYS 5807
Carolina Redroot 1941-09-06: Forest Pond.	<i>Lachnanthes caroliniana</i>	Endangered	Critically Imperiled in NYS 6088
Catfoot 1929-09-15: Manorville.	<i>Pseudognaphalium helleri</i> <i>ssp. micradenium</i>	Endangered	Historical Records Only in NYS and Globally Uncommon 6810
Flax-leaf Whitetop 1927-08-14: Calverton.	<i>Sericocarpus linifolius</i>	Threatened	Imperiled in NYS 5471
Rose Coreopsis 1979-08-09: Sandpit Pond River Road.	<i>Coreopsis rosea</i>	Rare	Vulnerable in NYS and Globally Uncommon 9394
Coppery St. John's-wort 1923-07-22: Manorville. Wet meadows, pine barren. Border of ponds.	<i>Hypericum denticulatum</i>	Endangered	Critically Imperiled in NYS 9085
Autumnal Water-starwort 1927-08-12: Calverton. In water, river.	<i>Callitriche hermaphroditica</i>	Endangered	Critically Imperiled in NYS 9337

This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

COMMON NAME

SCIENTIFIC NAME

NYS LISTING

HERITAGE CONSERVATION STATUS

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, from NatureServe Explorer at <http://www.natureserve.org/explorer>, and from USDA's Plants Database at <http://plants.usda.gov/index.html> (for plants).

Attachment D



Engineering, Surveying
& Landscape Architecture, P.C.

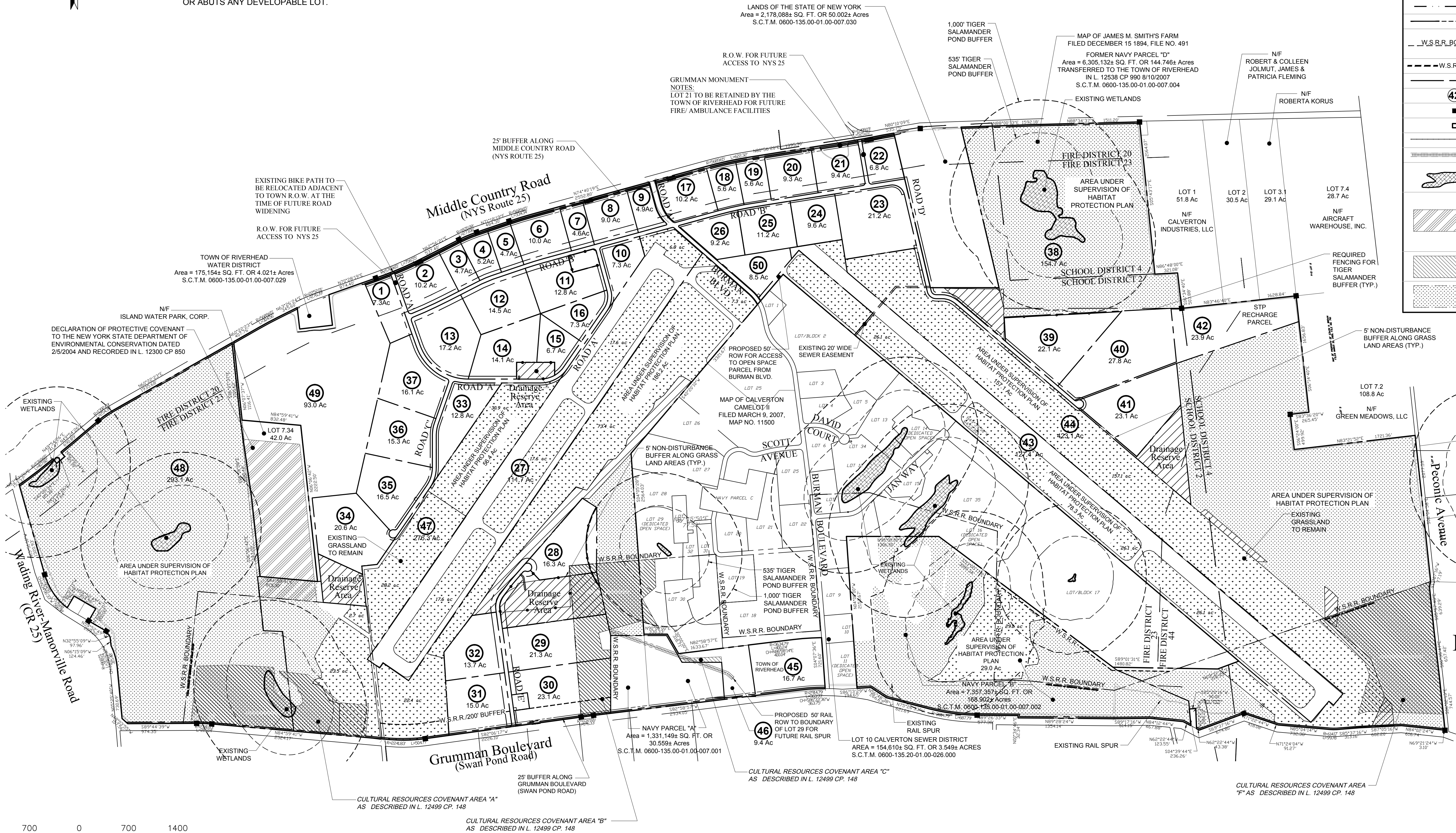
Transportation
Land Development
Environmental Services

100 Motor Parkway, Suite 135
Hauppauge, New York 11788
631.787.3400 • FAX 631.813.2545

TOWN BOARD NOTES:

1. A 5-FOOT NON-DISTURBANCE BUFFER IS TO REMAIN NATURAL ALONG ALL DEVELOPABLE LOTS ADJACENT TO EXISTING OR PROPOSED GRASSLAND.
2. A FENCE IS REQUIRED ALONG THE 1,000 FOOT TIGER SALAMANDER BUFFER THAT INFRINGES UPON OR ABUTS ANY DEVELOPABLE LOT.

Legend	
	Overall Property Boundary
	Fire District Boundary
	School District Boundary
	Existing W.S.R.R. Boundary as Annotated from NYSDEC Sketch
	Proposed W.S.R.R. Boundary
	Interior Lot Lines
	Lot number
	Existing Monument Locations
	Proposed Monument Locations
	Existing Rail Spur
	Future Rail Spur in 50' ROW
	Wetland Area
	Declaration of Protective Covenant to the New York State Department of Environmental Conservation Dated 2/5/2004 and Recorded in L. 12300 cp 850
	Cultural Resources Covenant Areas as Described in L. 12499 cp. 148
	Pine Barrens Core Preservation Area and Additional Wooded Area to Remain



TOTAL EXISTING
GRASSLAND 646.2 AC

	EXISTING GRASSLAND TO REMAIN	512.4 AC
	GRASSLAND TO BE CREATED/MAINTAINED	70.6 AC

TOTAL
POST-DEVELOPMENT
GRASSLAND 583.0 AC

HABITAT PROTECTION PLAN for ENTERPRISE PARK at CALVERTON

TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK
February 22, 2016
District 0600; Section 135; Block 1;
Lots 7.1, 7.2, 7.33 & 7.4

Attachment E

**A Plan for Conserving Grassland Birds in New York:
Final Report to the New York State Department of Environmental
Conservation under contract #C005137**

Michael Morgan and Michael Burger
Audubon New York

8 May 2008

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Ithaca, NY 14850

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Support

The funding for the planning process and the creation of this document, which describes the foundation for grassland bird conservation in New York and provides direction for future efforts, has been provided by a contract from the Department of Environmental Conservation (C005137). Funds for the contract originated as a Tier 1 grant from the USFWS State Wildlife Grants Program.

Many partnering agencies are contributing to the coordinated grassland bird conservation effort in New York, and are listed as partners in this plan. The following individuals have either contributed to the development of various components of the plan, or supported its development through review of draft materials or participation in discussions, and this support is greatly appreciated. Thanks to Jeff Bolsinger, Chris Dobony, Peter Gibbs, Mitch Hartley, Paul Hess, Sheila Hess, Tom Jasikoff, Heidi Kennedy, Chris Lajewski, Mike Murphy, Paul Novak, Dave Odell, Ray Perry, Tim Post, Marcelo del Puerto, Chris Reidy, Ron Rohrbaugh, Ken Rosenberg, Paul Salon, Carl Schwartz, Shanna Shaw, Gerry Smith, Bryan Swift, Mike Townsend, and Maiken Winter, among others. Our apologies to anyone that we've failed to mention.

Executive Summary

- Grassland birds have been declining faster than any other habitat-species suite in the northeastern United States. The primary cause of these declines is abandonment of agricultural lands, causing habitat loss due to reversion to later successional stages or due to sprawl development. Remaining potential habitat is also being lost or severely degraded by intensification of agricultural practices, e.g., conversion to row crops or early and frequent mowing of hayfields.
- Audubon New York is coordinating efforts of several conservation partners to achieve maximum results with the limited resources available. This version of a conservation plan describes these efforts, and provides the information needed to further align efforts. This plan also identifies upcoming planning and research priorities that are needed to fully implement a conservation plan. As these planning and information needs are met, the relevant information will need to be incorporated into future versions of this plan.
- The key strategy for coordinating conservation efforts is the delineation and employment of “focus areas,” which are regions of the state that support key, residual populations of grassland birds. Because grassland birds are sensitive to landscape-level factors (such as availability of suitable habitat within the surrounding landscape) and funding for conservation activities is limited, the best opportunity for achieving success is to concentrate efforts within focus areas. Current lack of suitable landcover classification datasets prevents the incorporation of habitat availability into the delineation process, but efforts are underway to address this need.
- Habitat managers often struggle with balancing the conservation priorities highlighted by various initiatives. Although grassland bird conservation is widely accepted as a top priority, managers occasionally fail to fully assess their capacity to provide the needed habitat characteristics of the targeted species before executing plantings or management projects. This plan provides the “recipe” for creating management plans for projects located within the focus areas, based upon a review of the grassland bird species most likely to be able to respond to the project, along with the ability to provide the various characteristics which define a suitable habitat patch for those species.
- Although proper management of grassland habitat currently on public lands or targeted for acquisition within the focus areas is one important component of this effort, the vast

majority of remaining habitat is privately owned. Therefore, private lands incentive and educational programs will be a major component of the conservation effort. Protection of existing habitat for threatened and endangered species through enforcement of regulations pertaining to the taking of habitat is a critical component of the conservation effort for these species.

- To complement existing, but under-funded incentive programs, the New York State Department of Environmental Conservation is collaborating with Audubon New York to deliver funding from a US Fish and Wildlife Service Landowner Incentive Program grant to willing landowners throughout the focus areas. This new program is important in that selection and scoring factors have been identified that will ensure funding is delivered to protect high quality habitats that are most likely to provide significant habitat to grassland birds. Furthermore, this program requires careful monitoring of grassland bird use of the properties enrolled.
- Land trusts are a key partner in conservation activities, either by facilitating the transfer of lands into public ownership, or by permanent acquisition and protection of critical habitats. However, their activities have traditionally focused on forested lands, wetlands, or open space in general, while avoiding grasslands with a few exceptions. The invaluable role that land trusts could play in grasslands conservation efforts warrants further exploration, including an assessment of existing properties that contain grasslands, as well as developing relationships with and providing technical assistance to active land trusts operating within the grassland focus areas.
- The monitoring scheme being developed for the Landowner Incentive Program will be the basis for regional monitoring throughout the Northeast, and will facilitate meaningful assessment of grassland bird responses at several levels, including site-level response to management, along with regional response to conservation programs.
- Further research is needed on:
 1. Methods and data for modeling distributions and abundance of grassland landcover across the landscape.
 2. Impacts of management on productivity of grassland birds, to amplify existing information on grassland bird abundances associated with management.

3. Potential benefits of native grass species as grassland habitat in contrast with demonstrated benefit of non-native cool season grasses.

Table of Contents

1 - Introduction	10
1.1 - New York's Grassland Birds.....	14
1.2 - Overview of Plan Objective, Strategies, and Implementation.....	15
2 - Grassland Focus Areas.....	16
2.1 - A Review of Available Landcover Data.....	17
2.2 - Use of Bird Distribution Data to Identify Focus Areas	18
2.3 - 2005 Grassland Breeding Bird Focus Area Survey.....	22
2.4 - 2006 State Wildlife Grant Targeted Surveys for Uncommon Grassland Birds	27
2.5 - Principal Species within each Focus Area.....	29
2.6 - Predicting Grassland Bird Habitat using Landcover Data.....	31
3 - Habitat Management and Considerations	33
3.1 - Tailoring Management to the Targeted Breeding Species	34
<i>Step 1. Assess local grassland bird community and identify reasonable targets.</i>	<i>35</i>
<i>Step 2. Determine if project site meets the minimum habitat size requirements for the</i> <i>targeted species.....</i>	<i>36</i>
<i>Step 3. Identify habitat characteristics preferred by the targeted species.....</i>	<i>37</i>
<i>Step 4. Determine capacity to implement management and conduct monitoring.....</i>	<i>44</i>
3.2 - Management Options.....	44
3.2.1 - Mowing	49
3.2.2 - Grazing	50
3.2.3 - Burning	51
3.2.4 - Comparison of management techniques.....	52
3.2.5 - Planting or "Restoring" Grassland Vegetation.....	54
3.2.5.1 - Warm-season versus cool-season grasses.....	54
3.2.5.2 - Seed mixes.....	55
3.3 - Management for Targeted Wintering Species	56
4 - Implementation of Plan.....	58
4.1 - Conservation Objective and Targets (Habitat and Population)	58
4.2 – Strategies.....	58
4.2.1 – Incentives and Easements (Private Lands)	60

4.2.2 – Purchases (Public Lands)	67
4.2.3 - Land Trusts	69
4.2.4 - Education	70
4.2.5 - Public Policy.....	70
4.3 - Assessment / Monitoring	71
4.3.1 – Assessment of data collection techniques.	72
4.3.2 Tiers or “strata” of interest for evaluation/monitoring efforts.	74
5 - Preliminary Research Needs.....	75
6 - Next Steps	75
7 - Additional Information and Related Planning Efforts	75
Citations	76
Appendices.....	85
Appendix A - Grassland Bird Species targeted by the NY Grassland Bird Conservation Plan.	85
Appendix B - Maps of Breeding Bird Atlas blocks with grassland birds documented as possible, probable, or confirmed breeders (data collected from 2000-2005).	86
Appendix C – Maps of the Corrected Relative Abundances observed for each species during the 2005 Grassland Breeding Bird Focus Area Survey.	99
Appendix D - Potential important areas for wintering Short-eared Owls.	109
Appendix E – Estimated and ranked relative abundances of each grassland bird species interpolated across each focus area using kriging.....	111
Appendix F – Maps and keys of publicly-owned lands within the Grassland Focus Areas...	121
Appendix G – Land trusts operating locally, statewide, and nationally in New York (list maintained by the Land Trust Alliance at www.lta.org).	138

List of Tables

Table 1. Grassland bird population trends at three scales from 1966 to 2005 (from Sauer et al. 2005).	11
Table 2. Members of the New York grassland bird conservation partnership (in alphabetical order).....	13

Table 3. Grassland Focus Area capture rates of Breeding Bird Atlas Blocks that recorded possible breeding attempts by grassland birds from 2000-2005, where “Total # Blocks” is the total number of blocks in which a species was found across the state and “Targeted # Blocks” is the number of these blocks contained within the focus areas.	21
Table 4. Detection rates for each observer for each species during the 2005 focus area surveys.	24
Table 5. Number of points sampled and the corrected relative abundances for each species after adjusting for observer detection ability in each focus area.....	24
Table 6. Principal species within each focus area (from 2005 survey data, Lazazzero and Norment 2006, and Schneider 2006).	31
Table 7. Area in each NLCD 2001 Land Cover Class that includes potential grassland bird habitat in New York and in the Grassland Focus Areas.	33
Table 8. Breeding habitat characteristics preferred by the grassland bird species.	41
Table 9. Approximate timing of stages in the breeding cycle of grassland breeding birds in New York.	47
Table 10. Effects of management techniques on selected grassland bird habitat characteristics.	53
Table 11. Private lands incentive and cost-sharing conservation programs.	66
Table 12. Proportion of focus areas in public ownership (from NYS Accident Location Information System-Public Land Boundaries 2006).	68
Table 13. Differences in average relative abundances estimated using roadside (RS) versus in-field (INF) point counts during the 2005 grassland breeding bird focus area survey conducted by Audubon New York (significant differences in bold).....	73
Tables 14-20. Keys for maps of public lands within each focus area.....	123-137

List of Figures

Figure 1. Trends in land use and ownership for agricultural land in New York (from Stanton and Bills 1996).....	12
Figure 2. Grassland focus areas identified using data from the 2000 Breeding Bird Atlas.....	20
Figure 3. Locations surveyed during the 2005 grassland breeding bird focus area survey.	23
Figure 4. Surfaces displaying the combined scores of the reclassification of the kriging interpolation of 2005 point count survey data. Darker shading indicates more important	

areas, i.e. areas that generally support higher relative abundances, higher richness, and rarer species than areas with lighter shading.	26
Figure 5. Highest priority regions within the Focus Areas that scored in the highest of four geometric intervals of the combined diversity and abundance index.	27
Figure 6. Locations surveyed during the NYSDEC 2006 Uncommon Grassland Bird Survey, along with symbols indicating the species identified at certain locations.	29
Figure 7. Example process for deciding between grassland and shrubland/early successional habitat projects.	34
Figures 8a-f. Illustration of various percent cover categories.	38
Figure 9. Approximate timing of stages in the breeding cycle for grassland breeding birds in New York (adapted from the information provided in Table 9). Dashed line indicates the suggested window for avoiding management activities.	48
Figure 10. Over 100 acres of grassland habitat complex protected and managed through complementary conservation programs.	60
Figure 11. Locations of applicants to the Landowner Incentive Program for Grassland Protection and Management in 2006-2007.	62
Figure 12. Project site locations for the NY Partners for Fish and Wildlife Program.	65
Figure 13. Chart comparing proportions of each Focus Area that are publicly owned (from NYS Accident Location Information System-Public Land Boundaries 2006).	69
Figures 14-26. Maps indicating the Breeding Bird Atlas blocks in which each grassland bird species were recorded as possible, probable, or confirmed breeders (2000-2005).	87-97
Figures 27-35. Corrected relative abundances of each grassland bird species detected during the 2005 Grassland Breeding Bird Focus Area Surveys.	100-107
Figure 36. Approximate locations of probable Short-eared Owl wintering areas based on observations from 1995 -2006 (Schneider 2004, 2006).	110
Figures 37-45. Ranked and scored estimates of relative abundances for each grassland bird species interpolated across the Focus Areas using kriging.	112-120
Figures 46-52. Public lands within each focus area (from NYS Accident Location Information System-Public Land Boundaries 2006).	122-139

1 - Introduction

Stabilizing the declines of populations of grassland birds has been identified as a conservation priority by virtually all of the bird conservation initiatives, groups, and agencies in the northeastern US, as well as across the continent (Vickery and Herkert 2001, Brennan and Kuvlesky 2005), due to concern over how precipitous their population declines have been across portions of their ranges (for the list of species of concern and their population trends, see Table 1). In New York, grassland bird population declines are linked strongly to the loss of agricultural grasslands, primarily hayfields and pastures (see Figure 1, below). Norment (2002) describes in some detail the reasons for, and summarizes some of the arguments against, grassland bird conservation in the Northeast.

Table 1. Grassland bird population trends at three scales from 1966 to 2005 (from Sauer et al. 2005).

Species	New York		USFWS Region 5		Survey-wide	
	trend (%/year)	population remaining (%)	trend (%/year)	population remaining (%)	trend (%/year)	population remaining (%)
Northern Harrier ¹	-3.4	25.9	1.1	153.2	-1.7	51.2
Upland Sandpiper ¹	-6.9	6.2	-0.7	76.0	0.5	121.5
Short-eared Owl ¹	--	--	--	--	-4.6	15.9
Sedge Wren ¹	-11.5	0.9	0.5	121.5	1.8	200.5
Henslow's Sparrow	-13.8	0.3	-12.6	0.5	-7.9	4.0
Grasshopper Sparrow ¹	-9.4	2.1	-5.2	12.5	-3.8	22.1
Bobolink ¹	-0.5	82.2	-0.3	88.9	-1.8	49.2
Loggerhead Shrike ¹	--	--	-11.4	0.9	-3.7	23.0
Horned Lark ²	-4.7	15.3	-2.1	43.7	-2.1	43.7
Vesper Sparrow ²	-7.9	4.0	-5.4	11.5	-1.0	67.6
Eastern Meadowlark ²	-4.9	14.1	-4.3	18.0	-2.9	31.7
Savannah Sparrow ²	-2.6	35.8	-2.3	40.4	-0.9	70.3

¹Highest priority or ²High priority for conservation

Note: Background colors correspond with "regional credibility measures" for the data as provided by the authors. **Blue** indicates no deficiencies, **Yellow** (yellow) indicates a deficiency, and **Red** indicates an important deficiency.

Bold indicates significant trends (P<0.05).

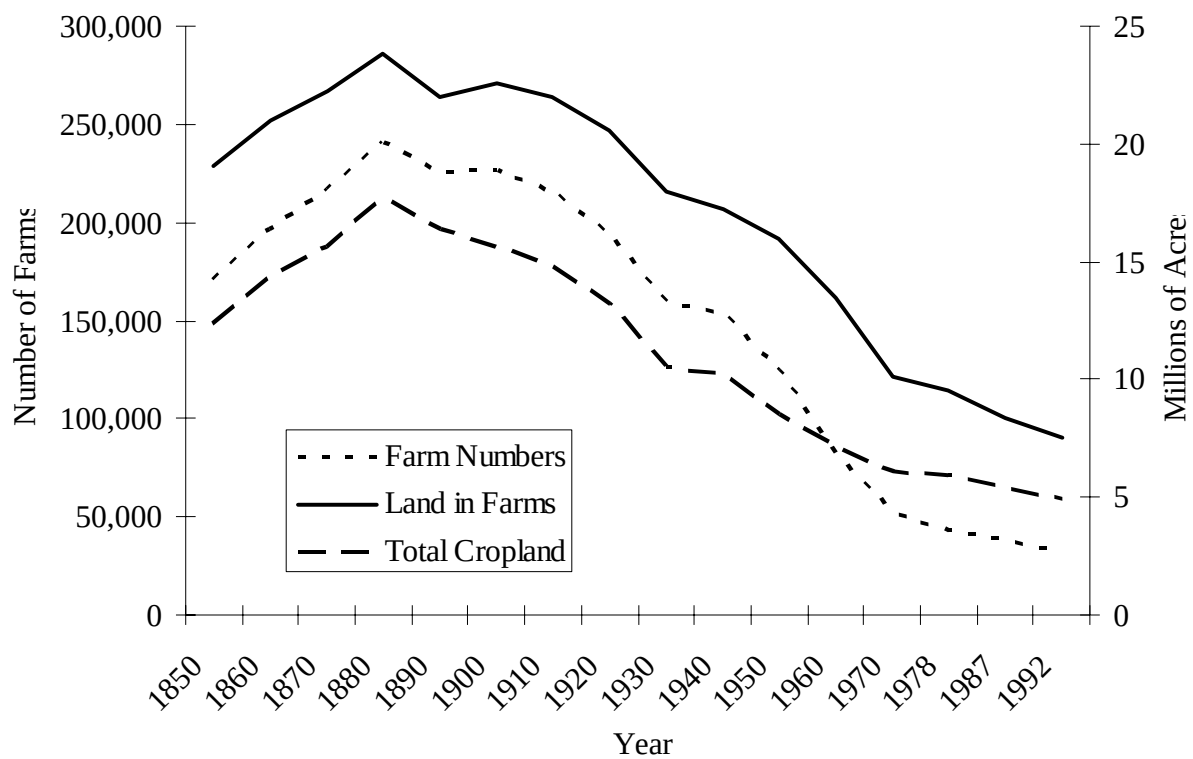


Figure 1. Trends in land use and ownership for agricultural land in New York (from Stanton and Bills 1996).

Audubon New York, with support from the New York State Department of Environmental Conservation (NYSDEC), is coordinating a comprehensive grassland bird conservation effort in New York State. A significant portion of this initial effort will culminate with the drafting and implementation of this grassland bird conservation plan. A New York grassland bird partnership group has been formed to help determine the approach and strategies for this effort (Table 2).

Table 2. Members of the New York grassland bird conservation partnership (in alphabetical order).

Audubon New York (ANY)
Colorado State University at Ft. Drum (CSU)
Cornell Lab of Ornithology (CLO)
Ducks Unlimited (DU)
Finger Lakes Land Trust (FLLT)
Fort Drum-US Department of Defense (Ft. Drum)
Gerry Smith-Independent consultant
New York Natural Heritage Program (NYNHP)
New York State Parks, Recreation and Historical Preservation (NYSOPRHP)
New York State Department of Environmental Conservation (NYSDEC)*
State University of New York at Brockport (SUNY Brockport)
The Nature Conservancy (TNC)
Thousand Islands Land Trust (TILT)
US Department of Agriculture-Natural Resource Conservation Service (USDA-NRCS)
US Fish and Wildlife Service (USFWS)

*The NYSDEC provided financial and intellectual support for the development of this plan.

The primary objective for this effort is to stabilize or reverse the declining trends of New York's grassland birds—Northern Harrier (*Circus cyaneus*), Upland Sandpiper (*Bartramia longicauda*), Short-eared Owl (*Asio flammeus*), Sedge Wren (*Cistothorus platensis*), Henslow's Sparrow (*Ammodramus henslowii*), Grasshopper Sparrow (*Ammodramus savannarum*), Bobolink (*Dolichonyx oryzivorus*), Loggerhead Shrike (*Lanius ludovicianus*), Horned Lark (*Eremophila alpestris*), Vesper Sparrow (*Pooecetes gramineus*), Eastern Meadowlark (*Sturnella magna*), and Savannah Sparrow (*Passerculus sandwichensis*), (for population trends for these species, see Table 1).

Because the vast majority of grasslands in New York are privately owned hayfields and pastures, it would be impossibly expensive to protect all of them through conservation programs that focus on acquisition and management of public lands. Furthermore, the NY grassland group

determined that spreading existing grassland conservation resources over too broad an area was unlikely to result in landscapes sufficient to support viable grassland bird populations. Therefore, regions of the state where grassland birds are most likely to persist, i.e. focus areas, have been identified and will be targeted for surveys and monitoring and serve to focus conservation resources—particularly incentive programs that encourage proper management of private lands, although proper management of publicly-owned lands in these areas is also important to this effort.

This plan describes the identification of these focus areas, techniques for habitat management, steps for creating site-specific habitat management plans, and summaries of the habitat requirements for the targeted species. In addition, this plan will identify strategies (and methods for evaluating their success) for implementing this plan.

1.1 - New York's Grassland Birds

While a variety of wildlife and plants depend on grassland habitats, the targeted species in this effort (listed in Table 1) are the most specific in their habitat preferences and needs, and are the species most commonly designated as “grassland birds” in New York. While the natural habitats most commonly considered to be grasslands are the tall and short-grass prairies of the Midwest, some of the common landcover types in New York that provide habitat for these grassland birds include hayfields, pastures, fallow fields, and other agricultural lands, as well as recently abandoned agricultural lands, landfills, airports, and a variety of other land uses that maintain the land cover in very early successional stages.

New York's grassland birds are not all the same priority for conservation. Some have experienced steeper declines than others, or have a smaller population size and/or distribution across the state or region. For the purpose of this plan, species included in the highest priority tier are those of greatest conservation need (as indicated by the priority rankings given to these species by a variety of conservation initiatives and regulatory rankings; see Appendix A). The highest priority tier includes (“alpha codes” in parentheses for abbreviation in certain tables and figures): Northern Harrier (NOHA), Upland Sandpiper (UPSA), Short-eared Owl (SEOW), Sedge Wren (SEWR), Henslow's Sparrow (HESP), Grasshopper Sparrow (GRSP), Bobolink (BOBO), and Loggerhead Shrike (LOSH). Species included in the high priority tier are those that have been given relatively lower priority by the conservation initiatives, but whose

populations are also declining and are in need of conservation. The high priority tier includes: Horned Lark (HOLA), Vesper Sparrow (VESP), Eastern Meadowlark (EAME), and Savannah Sparrow (SAVS).

While these birds rely on grasslands in New York as breeding habitat (in general), two of these species (Northern Harrier and Short-eared Owl) and several other raptor species also rely on New York's grasslands for wintering habitat. For this reason, a third target group of birds are those species that rely on grassland habitats while they over-winter (or are year-round residents) in New York. For a list of the target species with their categorization by a variety of prioritization schemes and regulatory lists (that supported the ranking of these species into tiers), see [Appendix A](#).

1.2 - Overview of Plan Objective, Strategies, and Implementation

The primary objectives of the efforts outlined in this plan are to halt or even reverse the declining trends for populations of grassland birds in New York, and to sustain viable populations of them into the future. To accomplish those objectives, this plan outlines several strategies and provides information that will be helpful as the NY grassland bird conservation partners move forward on implementation. Those strategies/steps that are central to this plan for grassland bird conservation include: 1) identification of grassland bird focus areas where land use and habitat availability are such that continued support of grassland birds is more likely than in other parts of the state; 2) identification of target species of grassland birds within each focus area that habitat management in the areas will seek to support; 3) coordination and concentration of grassland bird conservation efforts on both public and private lands within the focus areas to achieve landscape characteristics that support grassland birds; 4) implementation of various management and restoration projects for target species within the focus areas; 5) monitoring to evaluate response of grassland birds on project sites and changes of grassland bird relative abundance within focus areas; and 6) revision of this plan upon consideration of monitoring results and evaluation of resources and scale of implementation required to achieve the objectives.

The strategies and supporting information are covered in more detail in the remainder of this plan. Some of the components are in their final forms, while others are more dynamic and are expected to be modified after results of initial implementation and monitoring are completed.

2 - Grassland Focus Areas

New York contains diverse habitats (and associated species assemblages) including the three general categories of grasslands, wetlands, and forests. There are many regions of New York where few or no grasslands exist. In these areas grassland conservation would be imprudent, and may be detrimental to other populations of significant conservation concern by fragmenting critical habitat. However, there are many other regions of New York where grassland conservation would be much more practical, and where important populations of grassland birds currently breed. In several of these areas, grassland habitats cannot only coexist with other habitat types, but are ideal neighbors in a balanced landscape. For example, wetland associated grasslands are ideal nesting habitat for several waterfowl species. In addition, creating landscapes that contain relatively large amounts of grassland habitat would support conservation efforts by increasing grassland bird species richness throughout these regions (Hamer et al. 2006).

To focus this conservation effort on regions of the state that have the highest likelihood for sustaining grassland bird populations on a long-term basis, we identified regions where we assumed conservation efforts would be most effective and that would help identify priorities for the comprehensive conservation planning that is occurring statewide. While certain regions of New York are easily eliminated as potential grassland bird conservation areas, such as the forests of the Adirondack Mountains and the Tug Hill Plateau, the remaining area still contains vast regions that either currently do not support large populations of grassland birds, or are otherwise lacking as potential grassland conservation areas. There are many additional conservation priorities beyond grassland birds and their habitat, and many regions of New York contain important landscapes dominated by early successional/shrubland and forest habitats. The development of these grassland focus areas facilitates land-use planning and simplifies decision making for managers and landowners that are considering which conservation priorities to address through their habitat management.

Although one objective for creating these focus areas is to establish large expanses of suitable grassland habitat at a landscape level, this plan does not advocate capricious clearing of forests within the focus areas. In general, the landcover within the focus areas is less forested than other regions of the state, but even within the focus areas, conservation should be directed at

sites most suitable as grassland bird habitat, e.g., those containing large, open expanses of grasslands, agricultural lands, or other open space. At the site level, consideration given to any particular land unit and its associated management objectives should include the values that any forest land cover within the focus areas may provide to other conservation priorities.

2.1 - A Review of Available Landcover Data

The 1992 National Land Cover Dataset and the New York Gap Analysis (1998) provide landcover classifications based upon satellite imagery collected in 1992 by the Landsat Thematic Mapper satellite. Both of these classifications categorized grassland-type land covers with relatively poor accuracy. The 1992 NLCD provides the user with a 42% accuracy rate for land cover class 81-Pasture/Hay (Stehman et al. 2003), and the NY GAP provides an accuracy rate of 48 % (Laba et al. 2003). Furthermore, because of the dynamic nature of grassland habitats, many changes may have taken place since 1992 due to crop rotation, natural succession, and development. As a result, neither of these datasets was found to be of much use in attempting to identify grassland focus areas.

Audubon New York attempted to combine the two classification datasets in an effort to improve their accuracies by evaluating discrepancies in their classifications. By limiting the predicted grassland habitat to only those areas that were classified as grasslands by both datasets, a marginal improvement in accuracy was realized (as evaluated by additional ground-truthing conducted by Audubon New York in 2004). However, the error rates (>50% for many categories associated with grassland and agricultural cover types) were still too great to rely on this hybrid classification scheme for identifying grassland focus areas.

Note (added in Feb. 2008): In 1999, a second generation of the Multi-Resolution Land Characteristics Consortium was formed to analyze Landsat 7 imagery to create an updated landcover dataset. This NLCD 2001 is nearly complete; however, data for New York was only recently made available. A preliminary assessment of Landsat 7 accuracy in the St. Lawrence Valley indicated some usefulness when predicting existing and potential grassland landcover, and further assessment across New York would be beneficial. To see this dataset using Ducks Unlimited's online mapping application, visit:

<http://glaro.ducks.org/website/HEN/Template/viewer.htm?StLawrence>

A general assessment of all possible cover classes from the NLCD 2001 that may include habitat suitable for grassland birds was conducted with regard to the Focus Areas identified below, and the results are presented in section 2.6.

2.2 - Use of Bird Distribution Data to Identify Focus Areas

To define the focus areas for this effort, Audubon New York examined available data to identify areas containing core populations of grassland birds. The New York portion of the North American Breeding Bird Survey (BBS; Sauer et al. 2005) includes more than one hundred roadside transects through all possible habitat types, but provides only a limited amount of information regarding grassland bird distributions. While the BBS is capable of determining population trends and general distributions at broad, regional levels for most species, it lacks the resolution needed to identify important grassland bird populations at a smaller scale. In addition, certain grassland bird species experience very low detection rates for this type of roadside survey, and the BBS lacks sufficient power to determine significant population trends in New York for these species.

New York recently completed its second Breeding Bird Atlas (BBA; NYSDEC 2006), which attempted to document all bird species that breed in the state. This project involved hundreds of volunteer observers who classify breeding efforts for all possible species in 5 km by 5 km “blocks” across the entire state. While the BBA was useful for identifying grassland bird focus areas, there are two concerns to be aware of when using the data. First, since data were collected on a volunteer basis, effort level and observer ability likely varied considerably from block to block, so the absence of records for a species from a block should not be considered as definitive that the species was not present. Second, the BBA does not provide estimates of population sizes, breeding densities, or even relative abundances.

Despite these drawbacks, the effort is sufficiently complete and adequate for identification of large regions within the state that support grassland birds. Therefore, focus areas were delineated using BBA data from 2000-2004. The general approach was to include in a focus area all blocks with high richness of breeding grassland birds, as well as contiguous blocks also supporting grassland species. These focus area boundaries were smoothed in an inclusive manner, such that some areas of low grassland bird richness were included in the focus areas.

This process has resulted in the identification of 8 focus areas that support New York's grassland breeding birds (see Figure 2).

Following the completion of the atlasing effort in 2005, and review of the Focus Area maps and final BBA data by the New York grassland bird conservation partnership, three areas were identified that would have been included in the Focus Area boundaries during the previous delineation process (following the criteria of contiguity of adjacent blocks with high species richness). These areas include a portion of the lake plain west of Rochester (an extension of the northeastern border of Focus Area 1), a smaller extension of the southeastern border of Focus Area 4, and islands in eastern Lake Ontario and the St. Lawrence River overlooked when the initial shapefiles were created. These areas are highlighted in blue in Figure 2.

Finally, the BBA blocks with which the Focus Areas were delineated are arranged so that every portion of New York is included in a standardized block. As a result, the blocks overlapping the borders of the state extend past the geographic boundary by varying distances (by several kilometers in many cases). Therefore, a simple modification to the Focus Area boundaries was to clip areas extending past the official boundaries of New York.

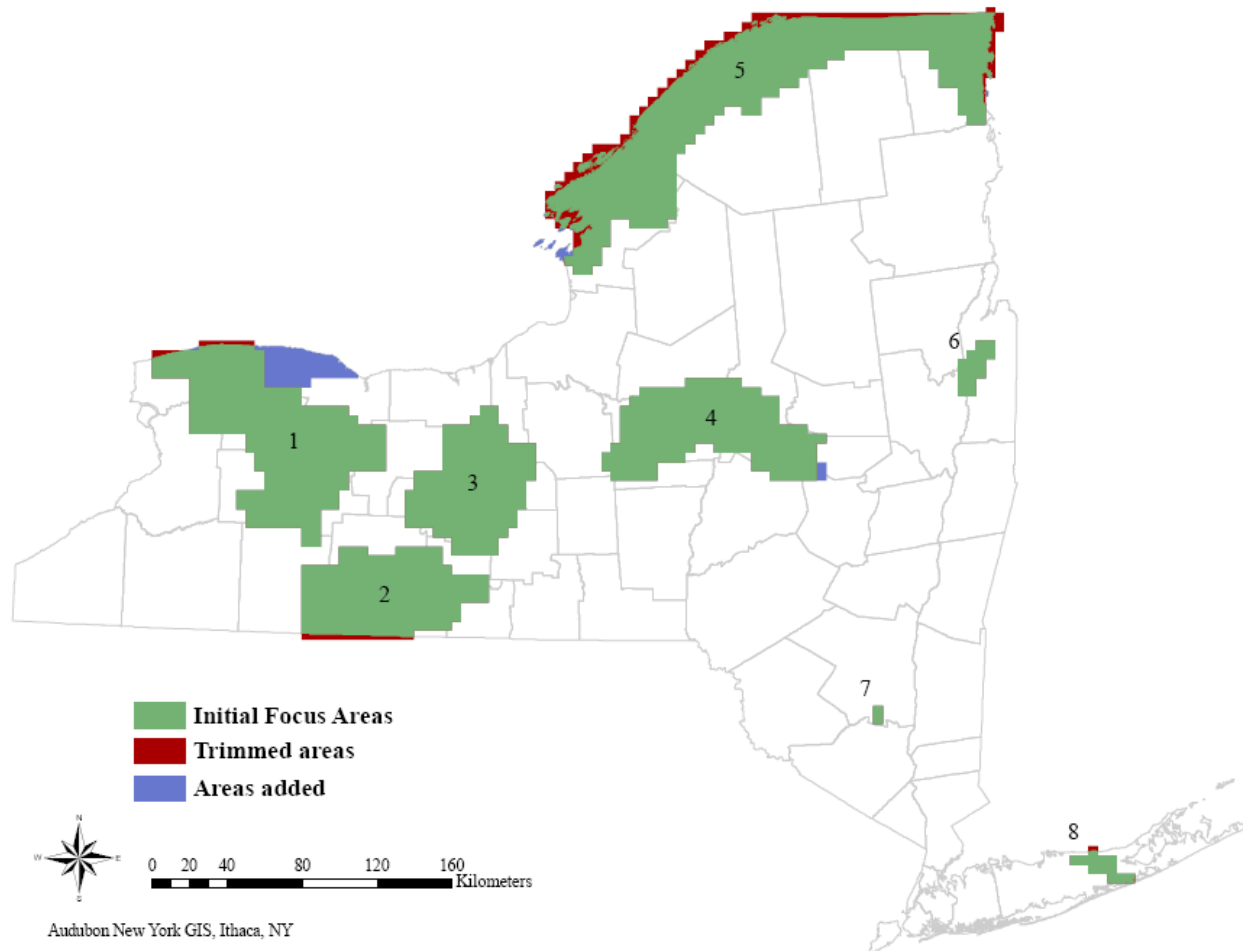


Figure 2. Grassland focus areas identified using data from the 2000 Breeding Bird Atlas.

The target for the Focus Areas was to “capture” or include at least 50% of the BBA blocks where each of the grassland species was found to be breeding across the state. The Focus Areas were able to reach that target for all but the most ubiquitous species, while including only 21.78% of the total number of BBA blocks, or 2,797,445.5 ha (22.31 % of the area of New York State). The Focus Areas capture an average of 62.69% of the blocks in which all the grassland birds were reported and an average of 72.06% of the blocks for all but the most ubiquitous species (Bobolink, Savannah Sparrow, and Eastern Meadowlark). To see the capture rates of the Focus Areas for each species using the complete 2000-2005 BBA dataset, see Table 3, below (see [Appendix B](#) for maps of the distribution of blocks in NY in which each species was documented).

Although the BBA does not provide estimates of abundance or densities, one of the criteria for inclusion in a Focus Area was contiguity with adjacent blocks containing grassland birds, and recent analysis by Zuckerberg et al. (2006) indicates that such blocks contain significantly higher abundances of the target species than isolated blocks. Therefore, the actual capture rates of all individual grassland birds as proportions of population size are likely considerably higher than capture rates for simply the BBA blocks themselves.

The Focus Areas provide wintering habitat for many species, and information on current and historical wintering sites for Short-eared Owls was provided by Kathy Schneider (2004, 2006; for a map of historic and current Short-eared Owl wintering areas, see [Appendix D](#)). Ten of 14 currently known wintering sites are included within the Focus Areas.

Table 3. Grassland Focus Area capture rates of Breeding Bird Atlas Blocks that recorded possible breeding attempts by grassland birds from 2000-2005, where “Total # Blocks” is the total number of blocks in which a species was found across the state and “Targeted # Blocks” is the number of these blocks contained within the focus areas.

Species	Total # Blocks	Targeted # Blocks	% Captured
Northern Harrier	917	502	54.74%
Upland Sandpiper	165	116	70.30%
Short-eared Owl	24	19	79.17%
Sedge Wren	69	52	75.36%
Henslow's Sparrow	70	57	81.43%
Grasshopper Sparrow	477	285	59.75%
Bobolink	3178	1031	32.44%
Loggerhead Shrike	4	4	100.00%
Horned Lark	698	443	63.47%
Vesper Sparrow	564	363	64.36%
Eastern Meadowlark	2635	968	36.74%
Savannah Sparrow	3070	1060	34.53%
Average for all			62.69%
Average without EAME, BOBO, and SAVS			72.06%

While the focus areas are officially identified as Focus Areas 1 through 8, common names for the geographic regions of New York in which they are found are listed below:

Focus Area 1 is found in Western New York

Focus Area 2 is found in the Southern Tier

Focus Area 3 is found in the Finger Lakes Region

Focus Area 4 includes portions of both the Central Leatherstocking region and the Mohawk River Valley

Focus Area 5 is found in the St. Lawrence River Valley

Focus Area 6 includes the Ft. Edward Grasslands IBA

Focus Area 7 includes the Shawangunk Grasslands

Focus Area 8 is found in central Long Island and includes portions of the Long Island Pine Barrens

2.3 - 2005 Grassland Breeding Bird Focus Area Survey

Audubon New York conducted surveys throughout the 8 focus areas during the 2005 breeding season (~15 May to 15 July) to collect distribution and abundance data to be used in combination with the BBA data when identifying targets for each focus area. Surveys were conducted using 5-minute point counts (both double and single-observer), and were randomly distributed across the focus areas. Survey effort was allocated according to the relative size of the focus area. Surveys were conducted at both roadside and in-field locations (when landowner permission was granted), in a variety of grassland habitats.

A total of 487 different habitat patches were surveyed (see Figure 3). Although vegetation and habitat data were collected during this survey, of particular interest was determining the species composition within each focus area to guide conservation activities. In addition, the data were assessed to determine the value of various methods for collecting data in support of the planning and development of a monitoring system for grassland birds, which will be discussed in more detail in that section.

Because a portion of the data was collected using double observer point counts (333 of 487 locations), detection abilities of the various observers were calculated and used to adjust the relative abundance estimates (see Table 4 for detection rates by the four observers). Because Northern Harrier, Vesper Sparrow, Upland Sandpiper, and Sedge Wren were rarely encountered,

the overall detection rates for each observer were used when calculating abundances for those species. Please see Table 5 for the average relative abundances of each species within each focus area; for maps depicting the corrected relative abundances for each species, please see [Appendix C](#).

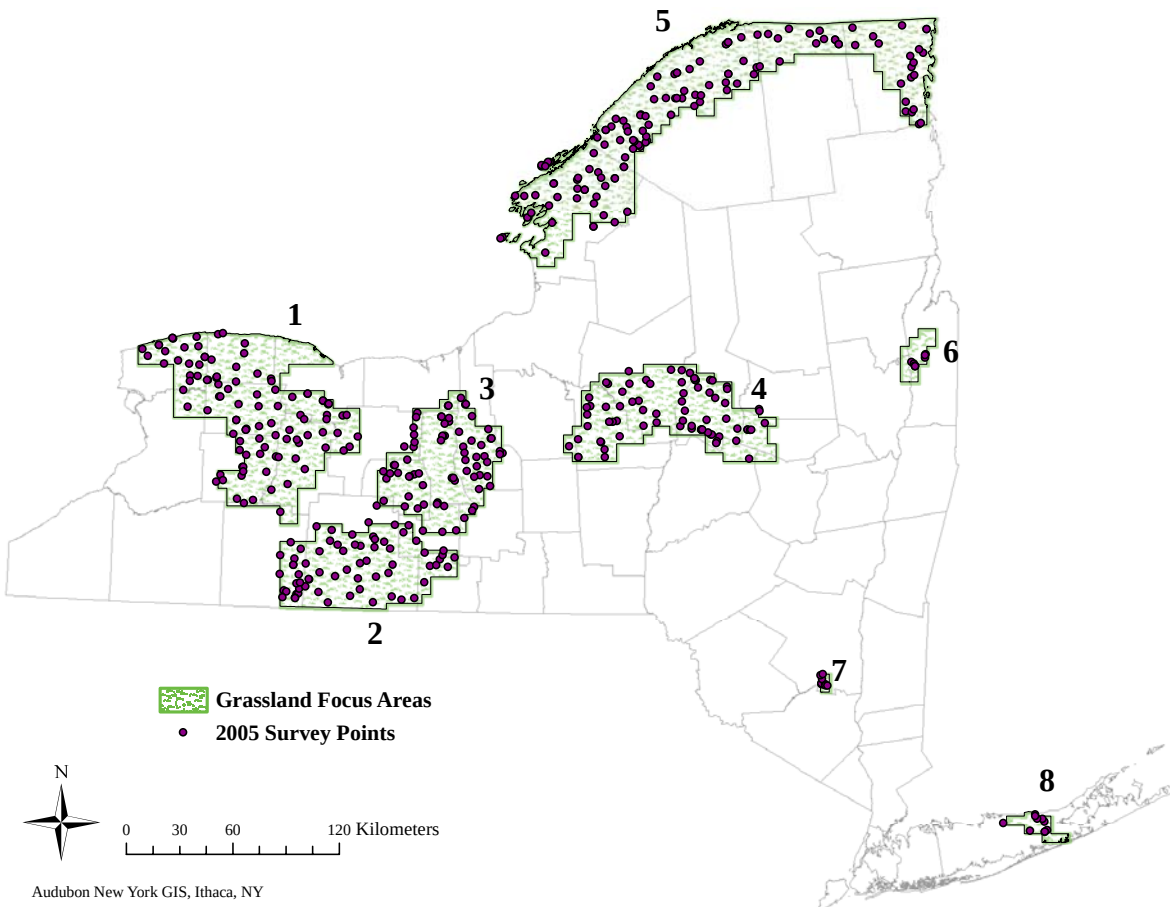


Figure 3. Locations surveyed during the 2005 grassland breeding bird focus area survey.

No Henslow’s Sparrows, Short-eared Owls, or Loggerhead Shrikes were detected at any of the point count locations, and several other species had relatively low representation in the survey, as was expected based on the population trends for those species and the low numbers of BBA blocks in which those species were documented. Below is a table (Table 5) indicating the number of points sampled and the adjusted relative abundances for the detected species in each focus area as determined from 2005 survey data.

Table 4. Detection rates for each observer for each species during the 2005 focus area surveys ([alpha codes listed here](#)).

Observer	Category	BOBO	SAVS	EAME	GRSP	HOLA	NOHA	VESP	UPSA	SEWR	Total
ED	Observed	233	173	79	15	12	0	1	1	1	515
	Missed	38	26	10	4	4	1	1	2	0	86
	% Observed	0.860	0.869	0.888	0.789	0.750	0.000	0.500	0.333	1.000	0.857
GL	Observed	160	153	72	16	16	1	3	3	1	425
	Missed	41	16	9	4	4	1	1	2	0	78
	% Observed	0.796	0.905	0.889	0.800	0.800	0.500	0.750	0.600	1.000	0.845
JM	Observed	194	195	46	9	20	1	3	1	2	471
	Missed	29	22	7	1	5	0	2	3	0	69
	% Observed	0.870	0.899	0.868	0.900	0.800	1.000	0.600	0.250	1.000	0.872
MM	Observed	293	208	56	9	31	1	8	7	2	615
	Missed	45	20	12	0	8	1	0	0	0	86
	% Observed	0.867	0.912	0.824	1.000	0.795	0.500	1.000	1.000	1.000	0.877

Table 5. Number of points sampled and the corrected relative abundances for each species after adjusting for observer detection ability in each focus area.

Focus Area	Number points	Relative Abundances								
		BOBO	SAVS	EAME	GRSP	HOLA	NOHA	VESP	UPSA	SEWR
1	105	1.176	1.434	0.220	0.053	0.172	0.000	0.044	0.044	0.000
2	68	2.146	1.522	0.735	0.143	0.000	0.051	0.000	0.000	0.000
3	76	0.968	1.500	0.211	0.080	0.417	0.000	0.046	0.030	0.000
4	81	1.971	1.075	0.200	0.016	0.000	0.029	0.000	0.014	0.000
5	130	2.151	1.095	0.704	0.064	0.000	0.026	0.000	0.018	0.054
6	8	2.740	0.548	0.607	0.000	0.000	0.285	0.142	0.000	0.000
7	9	6.939	0.511	0.915	0.000	0.000	0.000	0.000	0.127	0.000
8	10	0.000	0.000	0.000	0.477	0.000	0.000	0.000	0.000	0.000
Total	487	1.779	1.246	0.431	0.073	0.102	0.024	0.019	0.024	0.014

The results of the 2005 Grassland Breeding Bird Focus Area Survey were assessed to determine if they supported any further prioritization within the Focus Area boundaries. The initial step in this assessment was to interpolate relative abundances across each focus area for each species using the ArcGIS Geospatial Analyst kriging function (Oliver and Webster 1990). This technique allows the graphical display of estimated relative abundances for each species across the Focus Areas as a surface based upon known values from the nearby sample sites. Values upon the surface are displayed using specified colors, and the values estimated using these surfaces ranged between the high and low counts provided for each species from the 2005 survey data.

Once kriging was concluded, the results for each species were reclassified into 4 standardized classes or tiers (using geometric intervals). Zero relative abundance was scored a zero and the other groups were ranked low (given a score of 1), medium (given a score of 2), and high (given a score of 5). This allowed the results to be compiled and standardized among all the species, providing a comprehensive review of the relative importance to all grassland bird populations of all the areas included within the Focus Areas. In addition, due to the disparity in relative abundances of the various grassland bird species, the least common species were given twice as much weight in the final calculations. The final compilation of the ranked surfaces is displayed in the following figure (figure 4), which aggregates both species diversity and high relative abundances. The surfaces calculated for each species using the kriging technique, as well as surfaces that depict only high relative abundances and only diversity are provided in Appendix E.

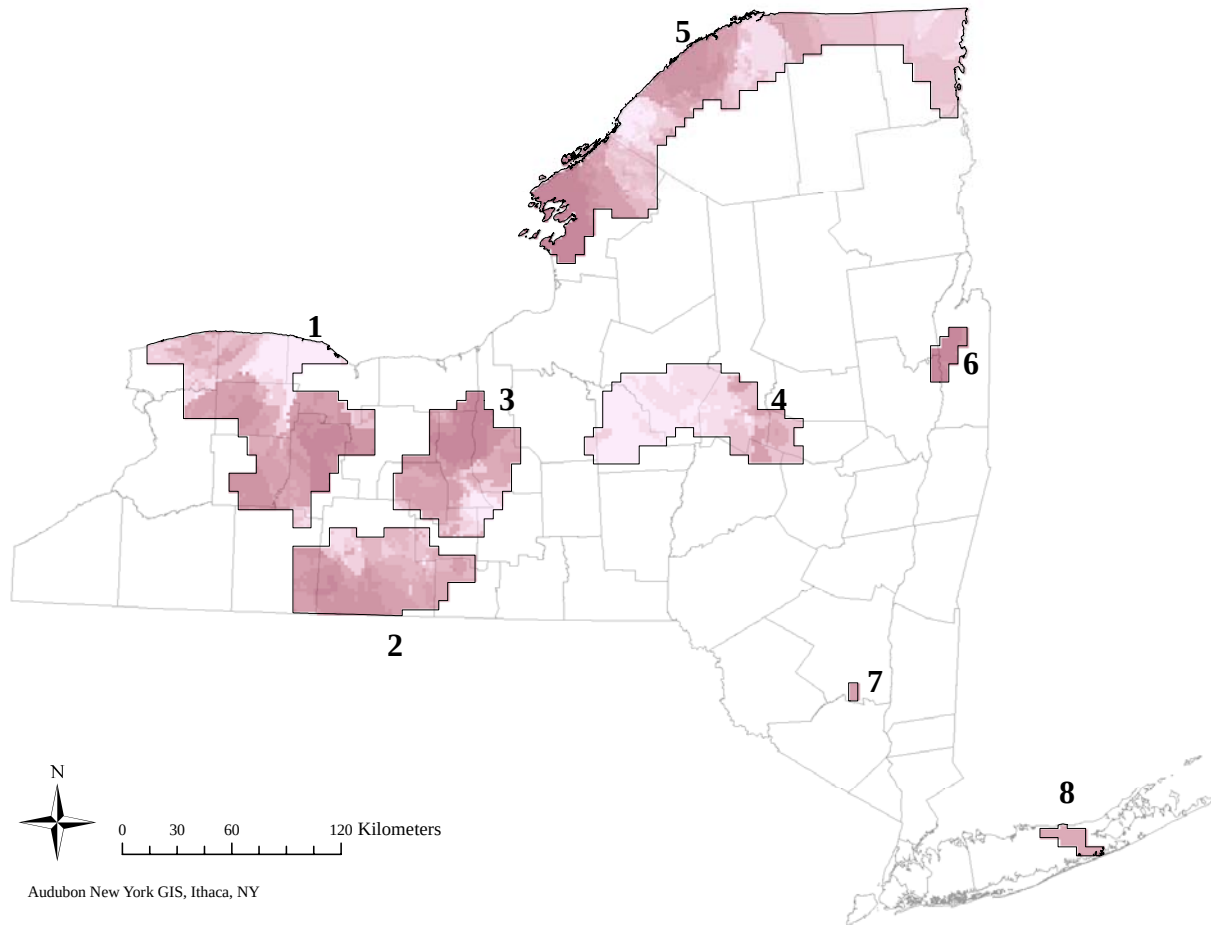


Figure 4. Surfaces displaying the combined scores of the reclassification of the kriging interpolation of 2005 point count survey data. Darker shading indicates more important areas, i.e. areas that generally support higher relative abundances, higher richness, and rarer species than areas with lighter shading.

The value of this analysis applies to those conservation efforts with the capacity to direct especially focused efforts at distinct regions of the state at scales finer than those provided by the focus areas. Other efforts with limited resources may also desire to target important areas with exceptional diversity or abundances of grassland birds. The following map (Figure 5) indicates the highest priority regions of the state that scored in the upper quartile of this combined index of abundance and diversity for breeding grassland birds. Locations important for wintering raptors, especially the Short-eared Owl, should also be considered as highest priority when directing

conservation towards highest priority areas (for a map of historic and current Short-eared Owl wintering areas, see [Appendix D](#)).

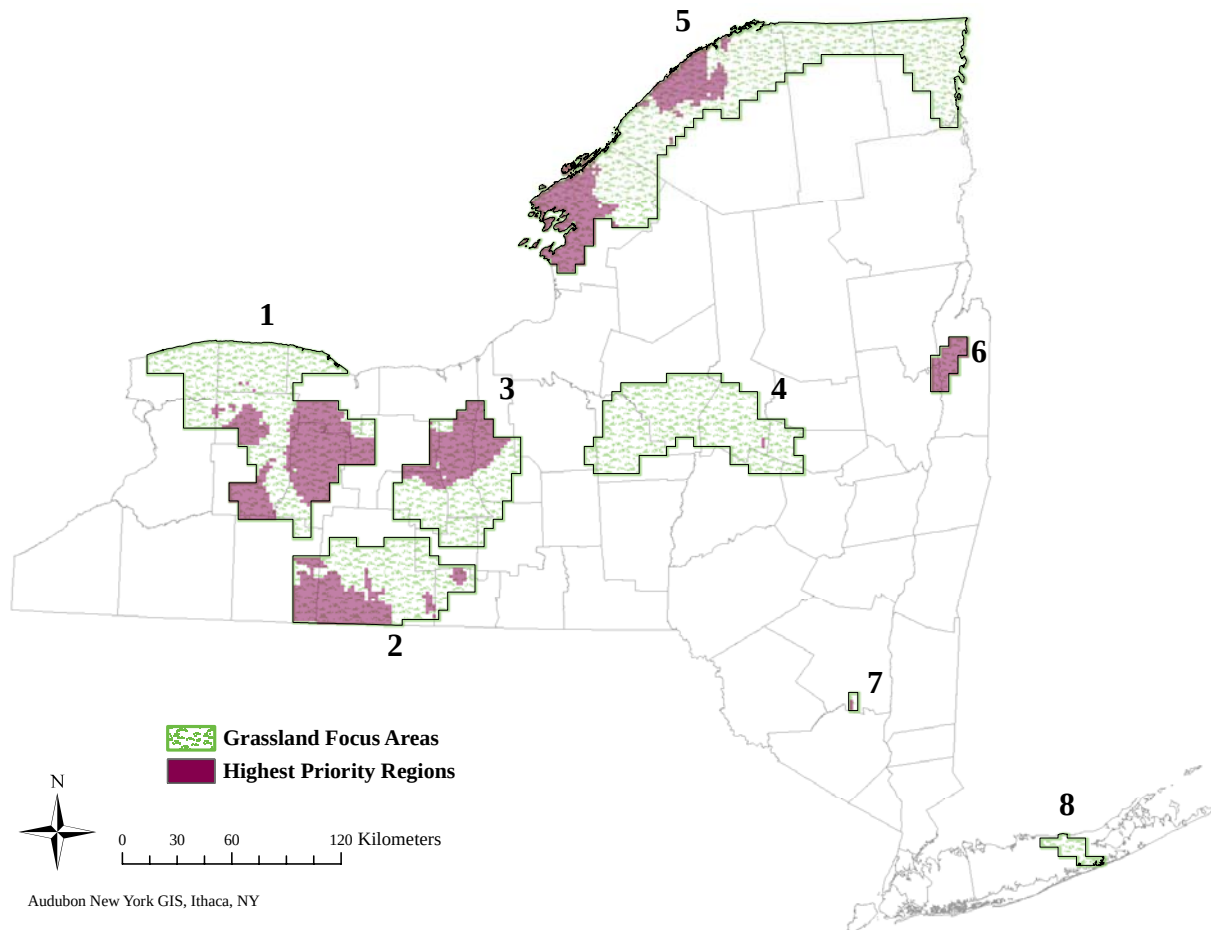


Figure 5. Highest priority regions within the Focus Areas that scored in the highest of four geometric intervals of the combined diversity and abundance index.

2.4 - 2006 Pittman–Robertson funded Targeted Surveys for Uncommon Grassland Birds

In 2006, the NYSDEC obtained Pittman-Robertson funding through to employ technicians to conduct targeted surveys for grassland bird species poorly represented (or not represented at all) in the 2005 survey. The primary species targeted were Short-eared Owl, Upland Sandpiper, Henslow’s Sparrow, Grasshopper Sparrow, and Sedge Wren; however, all grassland birds detected during the survey effort were recorded. The target population contained all records for which the NYSDEC had received “notable species forms” during the 2000 BBA effort. These

forms documented specific locations where rare species or “species of management concern” were observed in the state. Birding listservs, the Natural Heritage Database, and other sources were also reviewed for additional locations.

A particular goal of the 2006 survey was to determine locations that continue to support remnant populations of the least common grassland birds, as these populations are sufficiently small and isolated that they were rarely encountered through the fairly coarse scale of the 2005 survey effort. Unfortunately, data collected by one of the observers were not suitable for further analysis, because the geographic locations recorded for the surveys are suspect and do not allow detailed geo-referencing of the data. However, this observer’s observations of Short-eared Owls, Henslow’s Sparrows, Sedge Wrens, along with numbers of the more common grassland birds, indicate the value of the St. Lawrence River Valley and Ft. Edward Grassland Focus Areas in general (areas this observer surveyed and for which the coordinates were invalid). Observations of the target species (with valid coordinates) by other participants in this survey effort (see Figure 6) will be useful for targeting highest priority areas for conservation efforts in other focus areas.

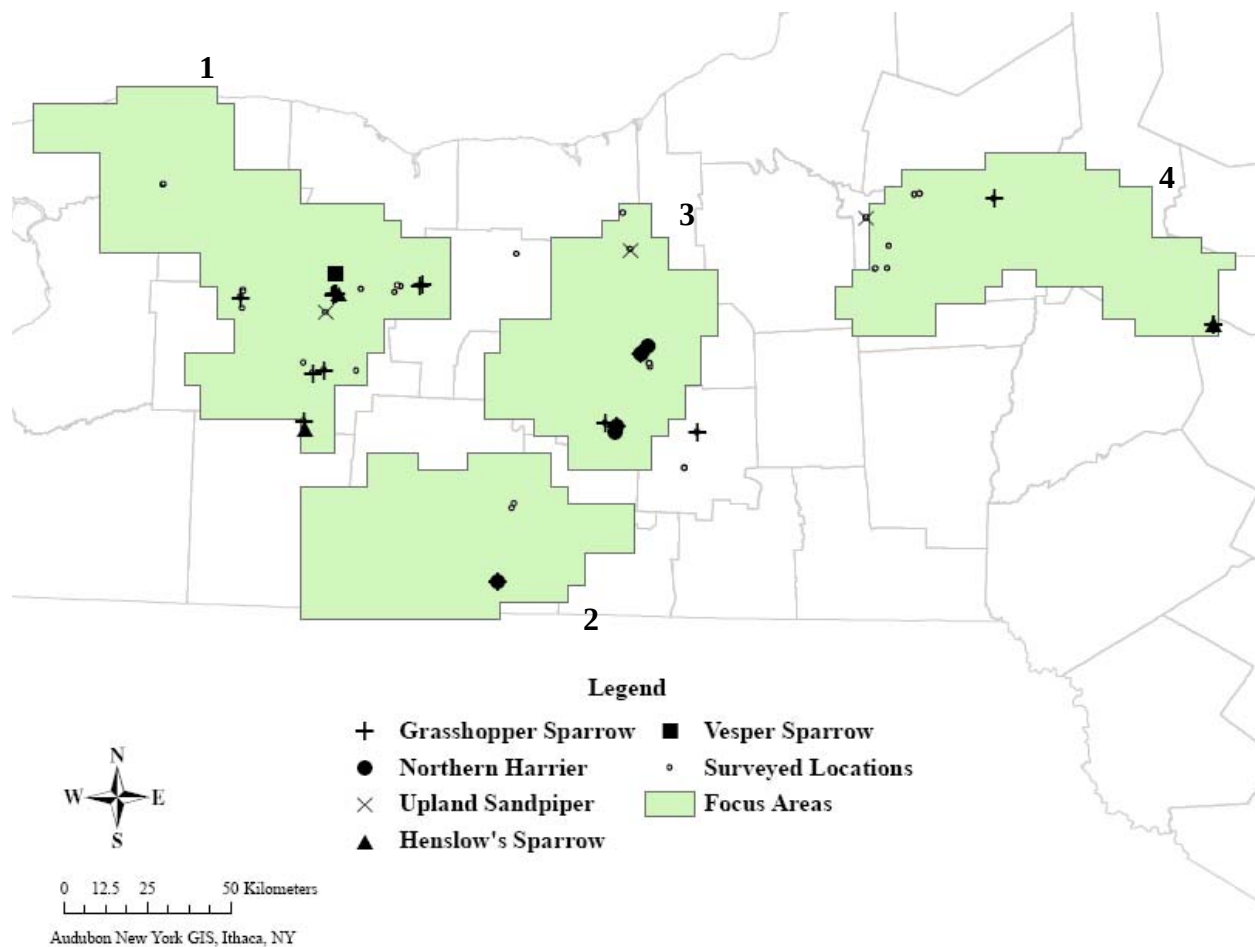


Figure 6. Locations surveyed during the NYSDEC 2006 Uncommon Grassland Bird Survey, along with symbols indicating the species identified at certain locations.

2.5 - Principal Species within each Focus Area

As the information in following sections will show, grassland birds vary in their preferences for the various habitat characteristics that distinguish different grasslands. To determine which focus areas are relatively more important for supporting each of the grassland bird species, the relative abundances for each species as determined by previous survey efforts should be considered (see [Table 5](#)). This information can be used as a preliminary review by managers and landowners to ensure that they provide the proper habitat characteristics needed by the important species in that area, although a thorough review must also include BBA data for the block in which the project is found, along with on-site monitoring and surveys.

As populations of Henslow's Sparrows and Short-eared Owls were not assessed effectively by the survey effort, additional information on the distributions of those species was solicited from researchers with pertinent data. Sarah Lazazzero provided a report given to the Biodiversity Research Institute about the results of her research on grassland birds (and particularly Henslow's Sparrows) in the St. Lawrence Valley (primarily in Jefferson County; Lazazzero and Norment 2006).

Kathy Schneider provided information on Short-eared Owl wintering areas in New York collected from reports to birding listservs and surveys of important roosts (Schneider 2004, 2006; for a map of historic and current Short-eared Owl wintering areas, see [Appendix D](#)). Ten of 14 currently known wintering areas are captured by the Focus Areas, including important sites such as the Washington County grasslands and several areas in Jefferson County. Eight of all 34 current and historic sites are included within the Focus Areas.

Loggerhead Shrike is now likely extirpated from New York as a breeder, and therefore distribution data for that species were not collected. However, an occasional pair may attempt to breed in the St. Lawrence Valley in areas rarely visited by birders or other observers (Paul Novak, pers. comm.).

The following table (Table 6) lists important species for each focus area based upon this information and the abundances calculated from 2005 survey data ([Table 5](#)). This list may be subject to revision based upon follow monitoring and surveys.

Table 6. Principal species within each focus area (from 2005 survey data, Lazazzero and Norment 2006, and Schneider 2006).

Focus Area Targeted Species	
1	Upland Sandpiper, Vesper Sparrow, Horned Lark, Savannah Sparrow, Short-eared Owl*
2	Northern Harrier, Grasshopper Sparrow, Eastern Meadowlark, Savannah Sparrow
3	Vesper Sparrow, Grasshopper Sparrow, Horned Lark, Savannah Sparrow, Short-eared Owl*
4	Northern Harrier, Upland Sandpiper, Short-eared Owl*
5	Henslow's Sparrow, Upland Sandpiper, Sedge Wren, Eastern Meadowlark, Bobolink, Short-eared Owl*
6	Northern Harrier, Vesper Sparrow, Bobolink, Short-eared Owl*
7	Upland Sandpiper, Eastern Meadowlark, Bobolink, Short-eared Owl*
8	Grasshopper Sparrow, Short-eared Owl*
*Wintering only	

2.6 - Predicting Grassland Bird Habitat using Landcover Data

As described above, in [section 2.1](#), newer landcover data are available from the Multi-Resolution Land Characteristics Consortium as part of the National Land Cover Database (NLCD) 2001. Although a full accuracy assessment is underway, it is unlikely that data collected 6 or more years ago will be sufficiently recent to address the issues of crop rotation, succession, and development that plague efforts to predict grassland habitat in New York. However, the general group of “potential grassland habitat,” which includes the NLCD 2001 land cover classes most likely to include suitable grassland bird habitat (listed below) may be useful when classifying certain habitat characteristics such as landscape level habitat fragmentation, or as a sampling frame for regional monitoring efforts.

36% of the area considered to be potential grassland bird habitat is captured by the Focus Areas (see Table 7), which in turn capture 22.3% of the geographic area of New York. Land characterized as class 71-Grassland/Herbaceous, in particular, is well represented within the Focus Areas, as 46% of the area included in that class is captured by the Focus Areas. The distribution of area of these classes within and outside of the Grassland Focus Areas supports the conclusion that the Focus Areas contain areas of New York characterized by relatively large amounts of open space, such as agricultural lands and other potential grassland bird habitat.

The land cover classes of interest that may contain potential grassland bird habitat are:

21. Developed, Open Space - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes

31. Barren Land (Rock/Sand/Clay) - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

52. Shrub/Scrub - Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

71. Grassland/Herbaceous - Areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

81. Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

82. Cultivated Crops - Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

95. Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Table 7. Area in each NLCD 2001 Land Cover Class that includes potential grassland bird habitat in New York and in the Grassland Focus Areas.

Land Cover Class	New York	Focus Areas	
	Area (ha)	Area captured (ha)	% captured
21 - Developed, Open Space	613,736	122,608	20.0%
31 - Barren Land	23,495	3,639	15.5%
52 - Shrub/Scrub	383,466	124,319	32.4%
71 - Grassland/Herbaceous	124,525	53,719	43.1%
81 - Pasture/Hay	1,745,252	635,852	36.4%
82 - Cultivated Crops	1,071,545	492,919	46.0%
95 - Emergent Herbaceous Wetlands	78,442	21,013	26.8%
All Potential Grassland Habitat	4,040,461	1,454,068	36.0%

3 - Habitat Management and Considerations

Before deciding to implement grassland habitat projects, managers (defined as anyone considering implementing grassland habitat management, including private landowners) should consider the efficacy of the potential project and ensure that the parcel being considered can contribute to the conservation of grassland birds, while considering other conservation priorities. To facilitate this decision-making process, the flowchart in Figure 7 provides an example of the process for considering the viability of new grassland habitat projects when early successional habitat management is another option (adapted from the NY Wildlife Habitat Incentives Program planning process). It should be noted, however, that the presence of grassland birds actively using any existing habitat patch anywhere within New York supports the decision to continue maintenance of that habitat patch. If the general decision is made to move forward with a new project that will contribute to grassland conservation efforts, the following sections provide the

information needed to target appropriate species and habitat characteristics when developing a site management plan.

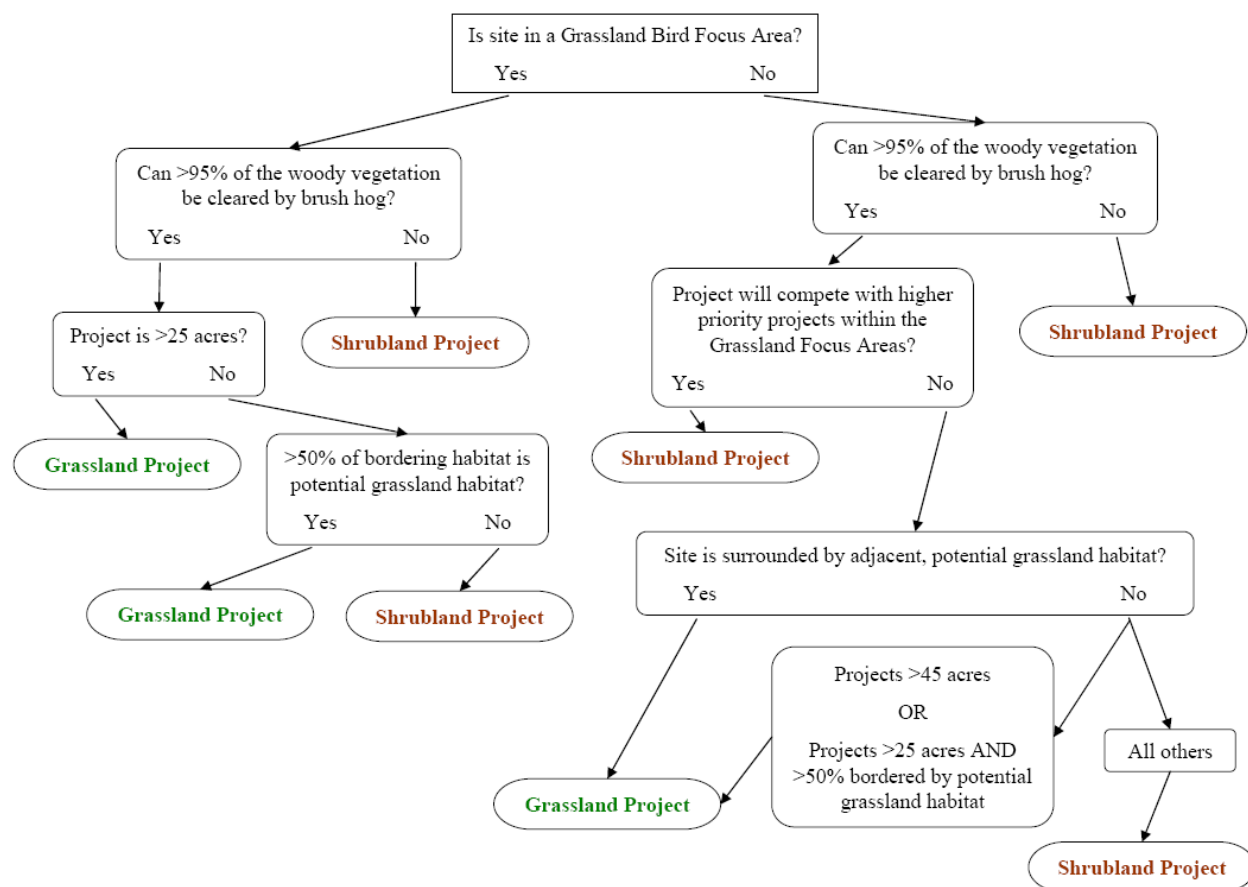


Figure 7. Example process for deciding between grassland and shrubland/early successional habitat projects (adapted from the NY Wildlife Habitat Incentives Program planning process).

3.1 - Tailoring Management to the Targeted Breeding Species

[Table 6](#) lists suggested important species for each focus area, and these species can be used as initial targets for the management and implementation of conservation strategies within each focus area. Because the grassland bird communities vary among the focus areas, using this approach can help to avoid unproductive efforts to provide habitat for a species not breeding in the general area, although these data should not supplant information provided by surveys and monitoring at the project site or from the local area.

When developing management strategies, it is tempting to simply implement the management that requires the simplest (or cheapest) techniques and readily-available equipment. This often results in a basic mowing rotation of 2 to 4 years to prevent encroachment by woody vegetation or invasive plants. Alternatively, management may be based primarily on maintaining the substantial investment made to plant and establish native grass species.

However, the following is proposed as the optimal formulation for creating management plans for sites or complexes within the Focus Areas:

Step 1. Assess local grassland bird community and identify reasonable targets.

Those involved in habitat restoration and management often operate under the assumption “if you build it, they will come”, which does not necessarily hold true for grassland species (Ahlering and Faaborg 2006). Site-specific factors are only a portion of the overall probability that a particular patch will be used by the targeted species. Of particular importance are landscape level characteristics (e.g. prevalence of the preferred habitat in the vicinity of the patch, Winter et al. 2006, Renfrew and Ribic 2008; and the amount of development, Lazazzero and Normont 2006), and perhaps most important is the role of conspecific attraction (Ahlering and Faaborg 2006). These considerations strongly support the concept of grassland “focus areas” delineated around the key populations of the grassland bird species, and bring into question the judiciousness of grassland conservation projects outside these focus areas.

Therefore, it is important to review all available data on presence of grasslands birds within the focus areas at two scales. First, review the species present in the local area, and whose offspring may be most likely to colonize the site. Second, monitoring of the project site itself will indicate which species currently use the site (and targeted management may increase their productivity and thus benefit the local population).

Recommended sources for these data are (in order of resolution, from coarse to fine):

1. The important species for each focus area listed in this plan in [Table 6](#).
2. Data from the most recent NY Breeding Bird Atlas for the Atlas block in which the project site is found. It can also be useful to review adjacent blocks as a very rough indication of the relative abundance of the species in that area (Zuckerberg et al. 2006), and in case observer effort in that particular block was lacking.

-Data and maps available at: <http://www.dec.ny.gov/animals/7312.html>.

3. Monitoring done at the project site (or local complex) and in the vicinity. This is probably the most important source for tailoring management guidance for existing grasslands, while the coarser datasets may be slightly more appropriate for new plantings.

Monitoring is an important part of the management process, and feeds back into several stages of the conservation planning process. For details on coordination of grassland bird monitoring, see that section (or [click here](#)).

These data should be used to select the highest priority species targets from the list of grassland birds, and those priority species are then used in the next steps to evaluate habitat characteristics.

Step 2. Determine if project site meets the minimum habitat size requirements for the targeted species.

While the area-sensitivity of grassland breeding birds is well-known, often the majority of the consideration regarding a patch's quality is given to vegetation characteristics within the patch. However, the importance of the size and landscape components cannot be emphasized enough.

It is easy to define size as the total area bounded by a contrasting habitat type; however, grassland birds likely perceive size as a function of their requirements (e.g. able to view a long distance in all directions). This is supported by habitat models which indicate that the Perimeter-to-Area ratio of habitat patches accounts for more of the variation in grassland bird abundance and species richness than Area alone (Lazazzero and Norment 2006). This relationship between Perimeter-to-Area and bird response is inverse, with abundance and species richness increasing with a decrease in the Perimeter-to-Area ratio. Therefore, optimal habitat patches will be both large and of a shape that minimizes the perimeter (e.g. circular or square rather than elongated).

However, thresholds for calculating probability of occurrences using this ratio have yet to be rigorously assessed, so Perimeter-to-Area should be considered along with the delineated size of the habitat patch. Thresholds of 50% probability of occurrence (Robbins et al. 1989) for the grassland birds within a range of patch sizes have been well documented, and have been summarized for each species and included in a [following section](#) describing the habitat needs of grassland birds in New York.

In addition to patch size and shape, the surrounding landscape should be considered. As mentioned above, the amount of potential habitat in the vicinity of the patch (along with the inverse, or amount of trees and other woody cover) also contributes to the likelihood that the patch will be occupied by the targeted species (Winter et al. 2006), and also affects productivity of the targeted species (Gates and Gysel 1978). The distances at which this effect has been demonstrated commonly range from 200 m to 1200 m (Ribic and Sample 2001, Fletcher and Koford 2002, Winter et al. 2006), although it may extend farther (Renfrew and Ribic 2008).

If more than one priority species is selected (likely for most sites), and if the project site is sufficiently large, it may be recommended that the site be managed as subdivisions to provide multiple habitat conditions (Winter et al 2006). Once again, it is important to ensure that the “sub-patches” are of a sufficient size and shape to reflect the needs of the priority species.

However, for some species (notably Savannah Sparrow and Vesper Sparrow, and others to a lesser extent) the size of the actual habitat patch matters less than the size of the overall “open area”. For example, during Audubon New York’s 2005 survey, the observers occasionally noted grassland birds using extremely small habitat patches (occasionally as small as 5 meters in diameter, or 1 meter wide strips at field transitions) surrounded by agricultural fields that were likely providing little additional useful habitat but extended the “apparent” size of the habitat patch. Quantifying this benefit requires additional study, although it may simply be an extreme effect demonstrating the importance of the amount of potential (or open) habitat in the surrounding landscape, as described above.

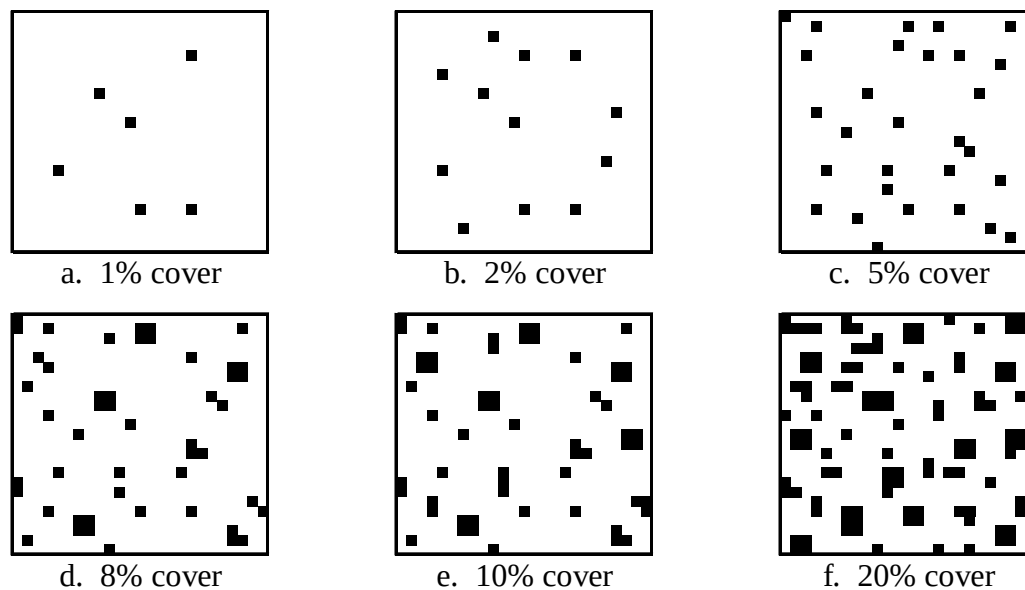
Step 3. Identify habitat characteristics preferred by the targeted species.

While the portion of the spectrum of early-successional habitat that is commonly described as “grasslands” has many characteristics in common, a considerable amount of variation exists in the preferences of grassland bird species for specific habitat attributes. In addition to the importance of size as a habitat characteristics (described above), several other habitat attributes, discussed below, come into play. The specific requirements for each species have been summarized in the following table ([Table 8](#)) using the best available and most geographically relevant sources.

Shrub Tolerance

Grasslands are at the very beginning of the natural tendency of habitats in the Northeast to “succeed” to shrubland and then forest. As a result, management often includes control of the woody shrubs that attempt to colonize grasslands. The thresholds of shrub cover at which most grassland birds cease to find grasslands to be suitable are at relatively small percentages (less than 5% cover; Wheelwright and Rising 1993, Martin and Gavin 1995, Winter et al. 2006).

However, quantifying the amount of woody vegetation within a grassland while in the field is very challenging due to issues associated with observer inconsistency and the different growth forms of various species of shrubs and saplings. Estimating percent cover is one possible alternative, but frequent review of a set of illustrations of percent cover (Figure 8) is very important to “calibrate” estimates both among different observers and even to maintain some level of consistency by a single observer.



Figures 8a-f. Illustration of various percent cover categories.

Another alternative for quantifying the distribution of woody vegetation is to measure the distance from the sampling point to the nearest woody stem (>0.5 m tall), or the number of stems within a relatively small, specified distance from the sampling point. Some variation may exist according to the random location of sampling points within a field, particularly when the percent cover is low, so data should be collected from a number of points. Data

collected using these techniques would need to be adjusted to allow comparisons to be made to the indicated thresholds of tolerance for grassland birds in Table 8.

Forb Component

The distribution of forbs (broad-leaved herbaceous vegetation) is another site-specific characteristic that influences a habitat patch's suitability for various species. Some particular groups or species of forbs may even have a stronger influence than others, so percent cover of forbs could be expanded to a broader estimate of various cover of: live goldenrod, live legume, standing dead vegetation (include both grass and forb), and total cover (or the inverse—percent bare soil). These are typically estimated using a sampling frame (of pvc or other material) placed in pre-selected random locations, and multiple points are sampled to calculate within-patch variation. As with estimating percent cover of woody vegetation, frequent calibration by reviewing illustrations is helpful.

The percent cover of grass should be the inverse of the percent cover of all forbs combined with other estimated cover categories (such as bare soil and standing dead vegetation), and may be useful to include on data sheets as an error checking mechanism (if the sums do not add to 1, then they were estimated incorrectly).

Litter Depth

Litter (used interchangeably with “thatch”) results from either lodging of residual dead vegetation from the previous growing seasons, or from the layer of detritus formed when mowing. Some species prefer more litter as they build nests directly into or covered by the layer (e.g. Savannah Sparrow and Eastern Meadowlark), while other prefer little to no litter (e.g. Grasshopper Sparrow, Horned Lark, and Vesper Sparrow).

Litter depth alone (measured with a meter stick by carefully inserting it through the layer until the soil is reached, and without compressing the layer) may be a useful measure of habitat quality for grassland birds, although multiple measurements are necessary to account for the considerable variability for this measurement that exists in a relatively small area.

Vegetation Height and Vegetation Density

Vegetation height varies dramatically according to phenology, particularly after graminoid inflorescences develop. Vegetation height is linked to nesting success, but migratory grassland birds return and begin establishing territories while most vegetation is

still dormant, so their site selection may be based on characteristics other than vegetation height. Vegetation height does explain some variation in grassland bird distributions, but a measure (or an index) that combines measurements of both height and density is most useful (Robel et al. 1970).

A “Robel” pole is a fast and simple approach to assess vegetation height and density. However, care must be used in its application to ensure that the individual/s applying the technique do not excessively trample the vegetation and alter the measurements as the observer circles the sampling point to collect measurement from four directions 90 degrees apart. For more information on this technique, review the article by Robel et al. (1970).

Perches

While territorial grassland birds sing and display both in flight and while stationary, some species have been reported to prefer sites with suitable perches (e.g. Eastern Meadowlark and Upland Sandpiper; Lanyon 1995, Houston and Bowen 2001). It is particularly difficult to reasonably quantify the availability of perches within a site. Reports of this characteristic may be attributable to the fact that the cryptic coloration of grassland birds makes observing the species on the ground fairly difficult and observers are most likely to detect the species when perched. Nevertheless, it may be an important characteristic and is easily modified (through the addition of fence posts or maintenance of limited amounts of woody vegetation), and thus the need for available perches is included as a category in Table 8.

Data for each species’ habitat preferences are included in the following table (Table 8) and are averaged from various sources; however, as habitat preferences vary by individuals within a species according to geographic region (e.g. Northeast vs. Midwest US; Sample and Mossman 1997), some sources were weighted according to geographic representation. Data collected in New York (when available) is probably more specific to habitat management in New York than data collected in other parts of the Northeast region, and Northeast regional data (when available) are probably somewhat more relevant than data collected throughout the ranges of the grassland breeding birds. Therefore, when characteristics reported from multiple studies and from multiple locations varied widely, studies from the Midwest were excluded from the averaged results.

Table 8. Breeding habitat characteristics preferred by the grassland bird species.

Species ¹	Northern Harrier	Upland Sandpiper	Short-eared Owl	Sedge Wren
Recommended Field Size (ha)	30+	30+	Large (exact sizes not available)	10 – 20
Shrub Tolerance (% cover)	Medium to high (1-5%)	Low (1%)	None indicated	Medium to high (3-8%)
Forb Component (% cover)	Low (10%)	Low (10 - 15%)	Medium (20%)	Very Low (0 - 10%)
Litter Depth (cm)	No preference indicated	Low (1)	No preference indicated	Medium (1-4)
Vegetation Height (cm)	Tall (60+)	Mixed (<15 & 40+)	Medium (40 - 60)	Tall (80+)
Vegetation Density	High	Low	High	High
Perches Important		Yes	Possible	
Notes	Nest success may be higher in wetter sites. Variable in vegetation preferences.	Requires low, sparse vegetation for loafing, feeding, and brood-rearing. Maintenance of perches beneficial.	Shares sites with Northern Harrier, but avoids wetter areas.	Prefer wetter areas with tall, dense vegetation--often reed canarygrass, switchgrass, or sedges.
Descriptions: Recommended Field Size - based on estimates of 50% probability of occurrence for each species, commonly accepted as the standard for minimum size targets.				
Maximum Shrub Tolerance - estimates of the maximum percentage of total cover of a habitat patch that each species will tolerate as covered by woody vegetation.				
Preferred Forb Component - estimates of the percentage of total cover of a habitat patch that each species prefers as covered by herbaceous vegetation (non-grass).				
Preferred Litter Depth - estimates of the preferred litter depth (thatch) tolerated by each species. Continued in next section...				

Species ¹	Henslow's Sparrow	Grasshopper Sparrow	Bobolink	Loggerhead Shrike*
Recommended Field Size (ha)	60+	50 - 100+	10	
Shrub Tolerance (% cover)	High (3 - 4%?)	Medium (1-3%)	Low (<1%)	High (10%+)
Forb Component (% cover)	High (25%+)	Medium	High (50%+)	No preference indicated
Litter Depth (cm)	High (6+)	Low (<1)	Medium (3 - 4)	Low
Vegetation Height (cm)	Tall (60)	Medium (30)	Medium (30 - 40)	Low to medium (15 - 40)
Vegetation Density	High	Low	Medium to Low	Low
Perches Important	Yes			
Notes	Requires undisturbed fields (often >10 years), with some standing dead vegetation.	Prefers little or no litter and >20% bare soil (evenly distributed, not patchy).	Still fairly ubiquitous across New York, and may be found in habitat patches that are less than ideal.	Prefer short, patchy grassy fields (pastures), clumps of woody vegetation for nesting and perches.
Descriptions (continued): Preferred Vegetation Height/Density - Estimates of the vegetation height and approximate density preferred by each species (generally early in breeding season when establishing territories).				
Perches - "Yes" when literature suggests that suitable perches may be an important habitat selection factor for that species.				
¹ Data pooled from various sources but weighted according to geographic representation: New York>Northeastern US>Rangewide.				

Species ¹	Horned Lark	Vesper Sparrow	Eastern Meadowlark	Savannah Sparrow
Recommended Field Size (ha)	1 - 10	10	15	5 – 10
Shrub Tolerance (% cover)	None (0%)	Low (<1%)	Medium (2-3%)	Medium (2 - 3%)
Forb Component (% cover)	High**	High**	High (20 - 30%)	< 40%
Litter Depth (cm)	0	Low (<1)	Medium (2 - 6)	4 (+)
Vegetation Height (cm)	Very Short (0 - 10)	Short (< 20)	Medium (20 - 40)	Medium (30 - 40)
Vegetation Density	Minimal	Low	High	Medium
Perches Important		Yes	Yes	
Notes	Prefer barren (or patchy) areas with exposed soil. Early disturbances on portion of habitat beneficial (before 15 March).	Prefer areas with exposed soil and little litter, such as newly planted grass or seed crops.	Accepts wide variety of habitat conditions.	May be found in small habitat patches, particularly when surrounded by open land.

*Likely extirpated.

**When overall vegetation density is low.

Sources: Audubon New York grassland bird survey 2005; Bent 1929, 1932, 1938, 1942, 1948, 1950, 1958; Birds of North America Online (Beason 1995; Herkert et al. 2001, 2002; Houston 2001; Jones and Cornely 2002; Lanyon 1995; MacWhirter and Bildstein 1996; Martin and Gavin 1995; Temple 2002; Vickery 1996; Wheelwright and Rising 1993; Wiggins et al. 2006; and Yosef 1996); Lazazzero and Norment 2006; Mitchell et al. 2000; and unpublished data provided by Michael Morgan.

Step 4. Determine capacity to implement management and conduct monitoring.

Following the identification of desirable habitat characteristics, and the techniques needed to make any changes (described in the following sections), a manager should assess the ability to provide these characteristics. This includes an assessment of the current conditions of the habitat under the manager's control, along with the ability to effect the desired changes.

There are some site-specific factors that may influence the applicability of the various management techniques. These include: soil type, hydrology, and the length of the growing season (and their influence on vegetation within the site and the necessary frequency of management), proximity of housing or other development that may influence the ability to use prescribed fire, availability of personnel and equipment, and availability of farmers willing to provide either livestock for grazing or a market for hay and straw.

Should the manager find that the necessary capacity is lacking, or find through monitoring that no individuals of the targeted species are utilizing the habitat (despite rigorous monitoring indicating that the recommended habitat conditions for the targeted priority species are being maintained), it may be necessary to revisit the species prioritization process. Additional research is needed on the amount of time necessary for the grassland bird species to encounter and "colonize" previously unoccupied sites in order to more fully inform such decisions to make a management change. In addition, prior to revising management plans should the managers be dissatisfied with the apparent lack of success of their habitat project, consideration should be given to the benefit "their" patch provides to the overall character of the landscape, and its effect on the suitability of neighboring patches.

For an additional approach to improving the desirability of a newly converted habitat patch, Ahlring and Faaborg (2006) suggest considering the use of playbacks of recorded calls to simulate occupancy of a patch and encourage conspecifics to take up residency.

3.2 - Management Options

Grasslands are one of the most ephemeral habitat conditions in the process of ecological succession in the Northeast. Quite rapidly, grasslands revert to shrublands and other early successional habitats. This process is expedited by the prevalence of invasive shrubs such as honeysuckle (*Lonicera spp.*), buckthorn (*Rhamnus cathartica*), and multiflora rose (*Rosa multiflora*), among others. Invasive plants such as mugwort (common wormwood, *Artemisia*

vulgaris) and swallowwort (*Cynanchum spp.*) can also alter natural successional processes, and can rapidly out-compete desirable grassland vegetation. Some native vegetation, such as goldenrod (*Solidago sp.*) and asters (various members of the Asteraceae family) can also rapidly alter the forb component and dominate a grassland, thereby reducing its suitability as habitat for grassland birds.

To prevent degradation of grassland habitat due to succession or invasion by undesirable vegetation, a regular pattern of disturbance (i.e. management) is needed. While mowing or grazing of agricultural lands during the breeding season causes many grassland bird breeding attempts to fail (Perlut et al. 2006), this frequent disturbance also maintains vegetation in a condition attractive to grassland birds, causing those fields to function as ecological traps (Schlaepfer et al. 2002; Shochat et al. 2005). Potential management options and the tradeoffs between management and impacts to breeding bird communities are discussed in some detail in the following sections.

The three general methods for maintaining grassland vegetation are mowing, grazing, and burning. Considerable variation exists in how each method can be applied, and the methods can also be applied inappropriately, thereby degrading habitat quality. The basic premise for each management technique is that they disturb (or remove) standing vegetation; however, their effect on ground litter (or thatch) and other habitat characteristics can vary depending on their application. Despite the potential variation in their application, some research indicates that grassland vegetation response (primarily controlling dominant invasive grasses and subordinate native vegetation) does not vary significantly among these different methods (MacDougall and Turkington 2007). However, site-specific factors such as soil moisture or the different growing periods of warm-season or cool-season grasses may lend themselves well to a particular method.

Grassland habitats vary across several characteristics (for more information, see the [section which describes the habitat characteristics](#) preferred by grassland birds) and result from a variety of land uses (for example hayfields, pastures, conservation grasslands, landfills, airports, parks, and more). Different applications of the methods for maintaining grasslands can yield different habitat characteristics and are described in more detail in the following sections.

Timing of management actions requires a delicate balance between selecting the optimal time to initiate the disturbance to select for the desired vegetation characteristics and avoiding potential impacts to the local population of grassland birds within the managed habitat patch.

Occasionally, if habitat conditions are severely degraded, it may become necessary to temporarily forgo attempting to provide undisturbed breeding sites in favor of bringing the conditions back to those more suitable as breeding habitat, under the assumption that the long-term benefits of the management actions outweigh the temporary loss of habitat. In addition, suitable monitoring of birds present in the habitat patch will indicate to managers whether or not any priority species are present that will be impacted by management during the breeding season. If habitat conditions are degraded to the point that the habitat patch is no longer being used by individuals of the target species, then aggressive management actions will have no impact on the local population.

The timing of the various stages in the breeding cycle of New York's grassland birds is presented in Table 9 and Figure 9. The earliest date that grassland breeding birds return (for non-overwintering species) during spring migration is around 15 March. However, management may occur somewhat later as territorial boundaries and locations remain extremely dynamic well into April. The general rule-of-thumb date for ceasing management activities in the spring is suggested as 23 April (based on dates for initiation of nesting reported in Table 9).

Mowing and harvesting of hay within grasslands has commonly been permitted following 15 July, and allows several grassland bird species sufficient opportunity to breed successfully. However, given the relatively high failure rate of nests and the need to renest later in the breeding season, along with the protracted breeding season of some grassland birds, a more suitable date is suggested as 15 August. As mentioned above, although it is tempting to simply postpone mowing as late as conditions permit, regular mowing is needed as soon as possible after the breeding season to maintain suitable vegetation conditions, by retarding the competition by forbs and shrubs. Should regular mowing after 15 August not be sufficiently early to control undesirable vegetation, a temporary shift to earlier dates may be warranted. However, spot mowing or treatment is preferable to complete mowing of a habitat patch during the breeding season (i.e. prior to 15 August).

Table 9. Approximate timing of stages in the breeding cycle of grassland breeding birds in New York.

Species ¹	Dates (1 May = 0)						Double-brooded*
	Arrival	Nesting	Hatching	Fledging	Flighted	End of Cycle	
Northern Harrier	-45**	-7	37	63	77	105	No
Upland Sandpiper	-5	10	44	44-45	74	94	No
Short-eared Owl	N/A**	-15	17	32	53	96	Possible
Sedge Wren	10	25+	48	61	Unk (+14?)	111+	Yes
Henslow's Sparrow	8	15	37	46	Unk (+14?)	109	Yes
Grasshopper Sparrow	0	10	29	38	Unk (+14?)	91	Yes
Bobolink	2	14	35	46	51 (+)	89	Occasionally
Loggerhead Shrike ²	-30	-13	15	33	47	62	Yes
Horned Lark	N/A**	-15 (+)	7	17	35	105	Yes
Vesper Sparrow	-23	0	21	31	51	90	Yes
Eastern Meadowlark	-45**	7	31	43	51	80	Yes
Savannah Sparrow	-30**	5	34	43	63	96	Yes

* All species may re-nest if disturbed sufficiently early in the cycle.

** May overwinter (Savannah Sparrow and Eastern Meadowlark in limited numbers).

Descriptions: Arrivals = Pooled early arrival date. Nesting = Pooled early initiation of nesting (site selection and construction). Hatching = Pooled early hatching date. Fledging = pooled early departure from nest. Flighted = Pooled early date when young capable of sustained flight (generally >1 min. or >200 m). End of Cycle = Latest date at which young may become flighted.

¹ Unless otherwise noted, dates pooled from: Birds of North America Online (Beason 1995; Herkert et al. 2001, 2002; Houston 2001; Jones and Cornely 2002; Lanyon 1995; MacWhirter and Bildstein 1996; Martin and Gavin 1995; Temple 2002; Vickery 1996; Wheelwright and Rising 1993; Wiggins et al. 2006; and Yosef 1996); Cayuga Bird Club's "Spring Arrival Dates", compiled by Matthew Medler (2004); Bent 1929, 1932, 1938, 1942, 1948, 1950, 1958; eBird.org; and unpublished nest data collected by Michael Morgan.

² Likely extirpated as a breeder. Data provided from Paul Novak's thesis *Breeding ecology and status of the Loggerhead Shrike in New York state* (1989).

Species	March		April		May			June			July			August		
	1	22	1	22	1	15	27	1	10	27	1	15	27	1	15	29
NOHA*		A		N					H			F	W		E	
UPSA				A		N			H	F			W		E	
SEOW*				N			H		F		W	Possibly Double Brooded			E	
SEWR							A	N		H		F	W		Double Brooded	E
HESP						A	N			F		W		Double Brooded		E
GRSP						A	N			H		F	W		Double Brooded	E
BOBO						A	N			H		F	W	Occasionally Double Brooded		
LOSH				A	N			H		F		W	Double Brooded			E
HOLA*				N			H	F		W			Double Brooded		E	
VESP				A		N		H		F		W		Double Brooded	E	
EAME		A					N		H		F	W		Double Brooded	E	
SAVS				A		N			H	F			W		Double Brooded	E

Key: A = Arrival Date; N=Nesting; H = Hatching; F = Fledging; W = Young capable of sustained flight; E = End of Breeding Cycle.

* Present year-round (resident)

Figure 9. Approximate timing of stages in the breeding cycle for grassland breeding birds in New York (adapted from the information provided in Table 9). Dashed line indicates the suggested window for avoiding management activities.

3.2.1 - Mowing

Mowing is likely the primary method by which grasslands are maintained in New York. Included in this category are haying (with removal of the cut vegetation) and “brush-hogging” or similar techniques that leave behind chopped vegetation. Mowing grassland habitat can be done in early spring or fall without concern of impacting nesting grassland birds (see Table 9 for breeding season dates). Spring mowing is intended to set back the development and growth of forbs (Mitchell et al. 2000) under the general premise that their growth buds, or meristematic tissue is concentrated in the tips of the plant, while the meristematic tissue of grasses is found closer to the ground (Fynn et al. 2004). Therefore mowing should be done with the mower deck set high above the ground. Shortly following the spring mowing, grass should begin growing rapidly (particularly cool season grass which grows most rapidly during the spring), and will have a slight competitive advantage over forbs, which should be reallocating growth resources due to the loss of their meristematic tissue.

Fall mowing should be done after the breeding season has concluded for grassland birds (see Table 9 and Figure 9), but as early as possible if the objective is to maintain grasses as the dominant component of the vegetation. Grasses spread primarily via extensions of the rhizomes or tillers (Emoto and Ikeda 2005), while most forbs spread by seeds. Mowing prior the time at which seed of forbs become viable will help facilitate the dominance of grasses over forbs. However, mowing later in the fall can facilitate the spread of fully developed seeds, should a higher forb component be desired (Fynn et al. 2004).

While mowing during the breeding season holds considerable potential to negatively impact grassland birds during their breeding cycle, doing so is occasionally necessary to maintain control over the spread of invasive species (particularly if the undesirable plants spread by seeds and mature early in the growing season). The impacts of mowing on breeding birds can be minimized by limiting mowing to the patches where the invasive species are present (spot mowing), or conducting surveys to determine whether or not any grassland species are in fact attempting to breed in a given patch or field. If grassland birds are avoiding a field that has been degraded by invasive species, intensive management can be conducted all season long with little or no impact to the targeted species.

Simply mowing or “brush-hogging” (as opposed to haying) has one drawback, in that the cut vegetation is left to accumulate on the ground in the form of “thatch” (ground litter;

Rudnický et al. 1997). Grassland species vary in their preferences regarding thatch, and several prefer little or none (see [Table 8](#) – Grassland Bird Habitat Preferences). When species preferring little or no thatch are the targets for management, or when thatch has accumulated to the point of hindering the growth of desirable vegetation, haying may be recommended. Another alternative may be to use one of the two other general methods—grazing or burning.

The frequency of mowing that should be prescribed varies according to soil types, moisture, and presence of invasive species or dominant vegetation that rapidly shifts habitat conditions to later successional stages. As a very general rule, maintenance mowing needs to be done only every two or three years (although Henslow's Sparrows may require a longer undisturbed period), as annual mowing may increase the depth of the thatch layer, reduce the amount of erect or partially erect vegetation (and perches), and therefore reduce the habitat's attractiveness.

3.2.2 - Grazing

Grazing performs many of the same functions as mowing, with the added benefits of little or no accumulation of thatch, along with replacement of many nutrients in a form that may enhance the soil (i.e. manure and urine). In addition, the patchy nature of the vegetation removal by livestock can benefit species that prefer a mix of vegetation heights and densities (including Horned Larks and Upland Sandpipers; see Table 8-Habitat Preferences of New York's Grassland Birds).

However, the quality of the habitat may be limited if grazing is done at too high a stocking rate (i.e. the number of animals grazed per acre), even if done in a rotational grazing scheme if it involves very high densities of animals that reduce vegetation characteristics (Adler et al. 2001) below the thresholds required by grassland birds. Often, high-density rotational grazing functions as repeated disturbances throughout the breeding season, and the rotations are scheduled to maximize use of peak vegetation growing rates, with periods between grazing too short to allow successful breeding attempts by grassland birds. Grazing at high densities can result in excessive trampling of the vegetation/soil (including trampling/ingestion of nests, eggs, and nestlings), as well as removal of nesting cover, leading to increased predation and exposure of nests (Ammon and Stacey 1997, Rohrbaugh et al. 1999). In addition, livestock (cows, sheep,

horses, etc.) can be selective, leading to the spread of undesirable plant species (such as invasive shrubs, thistle, etc.) that must be controlled by regular clipping (mowing) of the pastures.

Grazing may be conducted within the project site during the breeding season and still provide opportunity for successful breeding, given that the minimum habitat requirements of the grassland birds are met (Jones and Vickery 1997). These requirements can be met by maintaining a low stocking rate and ensuring that only a small portion of the pasture (the areas being actively grazed at any given time) is impacted to the detriment of the habitat. Low density, continuous grazing may be preferable, and the impacts to the vegetation are diffuse across the season; however, if a rotational grazing scheme is employed, careful monitoring of pasture conditions will indicate the necessary timing to rotate livestock to the next pasture (Mitchell et al. 2000). Clipping of pastures to control invasives and woody vegetation should follow the guidelines listed for management by mowing.

Grazing outside of the breeding season may function very similarly to mowing and haying, in that the disturbance reduces the amount of vegetation biomass of standing vegetation and prevents the accumulation of thatch.

3.2.3 - Burning

While burning is occasionally considered to be the most ideal or “natural” method of maintaining a grassland, it is gradually becoming less practical for widespread application. Costs associated with personnel and training, equipment, and the trouble of coordinating all the resources and planning that must occur before a burn can be conducted combine to make burning unviable for many public land managers. Private landowners may or may not have the same problems; however, encouraging untrained, private landowners to conduct burning as management may have potential to become a public relations liability, should the burn injure someone or escape beyond the intended patch.

In general, burning is conducted in early spring, to accomplish many of the same objectives described in the section on mowing. In particular, spring burning immediately prior to the rapid growth season of many warm season grasses is commonly employed, as it can greatly facilitate their establishment. Timing burning to occur in early spring often has the added benefit that potential fuels in adjacent habitats (e.g., dormant vegetation or compressed ground litter that take

longer to dry out than residual warm season grasses) may hold high moisture contents, which helps to limit the spread of out-of-control fires.

Refer to section [3.2.5.1 - Warm-season versus cool-season grasses](#) for a brief description of a project to assess using summer burns to improve habitat conditions for grassland birds in a warm-season grassland.

3.2.4 - Comparison of management techniques

For a simplified comparison of the effects of mowing, grazing, and burning on the habitat characteristics preferred by grassland breeding birds, please see the following table (Table 10).

Table 10. Effects of management techniques on selected grassland bird habitat characteristics.

	Mowing			Grazing		Prescribed Fire		
	Spring¹	Summer	Fall	Rotational	Continuous	Spring	Summer	Fall
Field Size	Can increase	Can increase	Can increase	No effect	No effect	No effect	No effect	No effect
Shrubs (% cover)	Decrease	Slight decrease to slight increase	Decrease to slight increase	Slight increase to slight decrease	Increase	Decrease to no change (varies with species)	Slight decrease to no change	No effect
Forbs (% cover)	Decrease	Decrease	Decrease (early fall mowing) to increase (late fall mowing)	Slight increase to increase (especially weeds)	No change to slight increase	Decrease	Slight increase (in warm season grasses) or decrease (aggressive late-flowering forbs)	Decrease to no change
Litter Depth	Increase (if not hayed)	Increase (if not hayed)	Increase (if not hayed)	Decrease	Decrease	Decrease	Slight decrease to no change	Decrease
Vegetation Height	Decrease	No change	Slight increase to no change	Decrease	Slight decrease	Increase (temporary decrease)	No change	Increase
Vegetation Density	Increase (if hayed)	Increase (if hayed)	Increase (if not hayed)	Decrease	Slight decrease	Increase	No change to slight decrease	Increase
Perches	Removes	Removes	Removes	Maintains	Maintains	May remove	May remove	May remove

Sources: Higgins et al. 1989, Frawley and Best 1991, Mitchell et al. 2000, Lueders et al. 2006, Zuckerberg and Vickery 2006.

¹In general, spring should be interpreted as prior to the grassland bird breeding season (1 May to 15 August), summer as during the breeding season, and fall as after the breeding season.

3.2.5 - Planting or “Restoring” Grassland Vegetation

In some instances, it may be desirable to convert a field or other piece of property into a new grassland habitat. While habitat conversion is not recommended for certain forests, wetlands, or other priority habitats, occasionally farmland is taken out of production, or patchy habitat may be consolidated into a single cover type. In addition, parks, municipal lands, or other greenspace may be suitable for establishing grassland bird habitat. In these instances, it may be beneficial to plant grasses and preferred forbs, rather than relying on “natural” succession and running the risk of invasion by exotic plant species.

Planting land previously used as tillable agricultural land is often the simplest, as conditions have been maintained to facilitate planting of crops (e.g. access, relatively smooth surfaces, and active weed management). Otherwise, aggressive removal of existing vegetation is necessary, and can include various combinations of tree and shrub removal, application of herbicide, and intensive disking of the soil prior to preparing to plant. “No-till grass seed-drills” are becoming more readily available as they are acquired by conservation partners, and, if conditions allow, may ease the process of site preparation. Planting can occur in both spring and fall, although effort needed to prepare the site and specific seed varieties (and the method by which they are prepared for planting) may necessitate one or the other. The seed supplier can provide information on the preferred timing for planting for the specific seed mix selected.

For more detailed information on the mechanics of planting and establishing grass, a useful source is *Vegetation with Native Grasses in Northeastern North America* by Dickerson and Wark (1998).

3.2.5.1 - Warm-season versus cool-season grasses

Most remaining grasslands in the Northeast consist of non-native cool-season grass species established by European colonists as forage and hay for livestock (Vickery and Dunwiddie 1997, Giuliano and Daves 2002). However, in keeping with commonly accepted principles of conservation, many “restored” grasslands are planted with native warm-season grass species (George et al. 1979). The distinction between the two is that cool-season grasses achieve maximum growth rates during early spring and late fall (during relatively cooler periods), and warm-season grasses achieve their peak growth rate during the summer (or during the warm-season). In addition, warm-season grasses generally grow more robustly and achieve much

higher heights and densities than cool-season grasses. There are limited numbers of native cool-season species available, and they are only recently being evaluated for their value as grassland bird habitat (Paul Salon, pers. comm.).

The motivation for planting warm-season grasslands originally came from three factors. First, from a general conservation biology perspective, they are desirable as native vegetation in contrast to the common, non-native cool-season species mentioned above (Jones and Vickery 1997). They also are fairly resistant to flattening (lodging) by snowpack over the winter and provide dense nesting cover for upland game birds and waterfowl in the spring until new growth begins (George et al. 1979). Finally, they also lend themselves well to management by burning (prescribed fire), since new growth primarily occurs after conditions have warmed and dried in the spring (Rorhbaugh 1999). This allows weeds and forbs to expend resources in germination and new growth early in the spring that are then unavailable following a well-timed burn as the undesirable vegetation attempts to compete with the warm-season grasses which shortly begin to rapidly grow.

Unfortunately for our application in New York, the growth habitats of warm-season grasses (especially varieties of switchgrass, *Panicum spp.*) tends to create very tall, dense stands of grass, which receive limited use by grassland birds (Norment et al. 1999, McCoy et al. 2001). This especially holds true when a very high ratio of grass to forbs is achieved following intensive management. The disparity between the habitat quality of native warm-season and non-native cool-season grasses is large enough that Lazazzero and Norment (2006) strongly advocate the use of the non-native cool-season grasses when managing grassland bird habitat in New York.

Iroquois National Wildlife Refuge conducted a prescribed fire in a portion of a warm-season grassland during the summer of 2007 (Paul Hess, pers. comm.). The purpose of this burn is counter to the traditional approach, in that the objective is to impede the growth of the warm-season grasses in an established stand, increase the vegetation diversity, lower the overall height and density, and improve conditions for grassland breeding birds. The results of this experiment will be followed closely in the event that it may prove useful for improving the grassland bird habitat value of existing warm-season grasslands.

3.2.5.2 - Seed mixes.

The USDA Natural Resource Conservation Service's Plant Materials Program in New York has been maintaining a list (Technical Guide NY-36: Plant Materials – Seeding Mixes for Wildlife) of recommended seed mixes for planting grassland vegetation (source for the list included below). The list includes four categories: non-native cool-season grasses and forbs, native warm-season grasses, native warm-season and cool-season grasses (mixed), and native cool-season grasses. In addition, a list is included of native forbs that can be added to the mixes to increase species diversity (and thus structural diversity), although colonization by forbs from the surrounding habitats often reduces the need to purchase large quantities of the relatively expensive forb seed.

This list will periodically be refined as some mixes are still relatively experimental and as they are planted and evaluated, so it is best to access the most current list in PDF format at http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=NY. The list can be located by clicking on any county within the displayed map, and then following the menu tree to: Section I→Reference lists→Technical Notes and References by Discipline/Plant Materials→TN36-Wildlife Seeding Rates. Alternatively, the lists can also be found by searching for “TN36” in the provided search box.

For more information about these mixes, contact the NY Plant Materials Specialist Paul Salon at (315) 477-6535 or Paul.Salon@ny.usda.gov.

3.3 - Management for Targeted Wintering Species

It is easy to focus on the breeding requirement of migratory birds, without considering the needs of overwintering species. Many of the targeted grassland bird species rely on New York's grassland habitats for breeding or as early staging areas for migration, but several species also rely on grassland habitats in New York during winter. Short-eared Owls overwinter in many locations throughout New York, and are often found with high numbers of Northern Harriers and many other raptors including Rough-legged Hawks, American Kestrels, Red-tailed Hawks, and even an occasional Snowy Owl (see Appendix D for Short-eared Owl wintering locations). Better management of these areas is needed to better meet the needs of this species, and other grassland species such as northern harrier. A critical component for Short-eared Owl habitat is that relatively large patches of standing grass cover be maintained into winter. Short-eared Owls have not been documented as breeding in New York since the first few years of the

2000-2005 Breeding Bird Atlas, and so the greatest contribution New York can provide for this species is to protect and maintain the critical habitat needed to sustain this wintering population.

Eastern Meadowlarks and Savannah Sparrows may remain throughout the year, or leave only for a brief period of time during the coldest winter months. Horned Larks commonly overwinter in large numbers in crop fields throughout New York, particularly in fields windswept free of snow and in areas where manure or waste grain is spread. Although spreading manure on top of packed snow is commonly discouraged by various Soil and Water Conservation Districts due to water quality concerns during snowmelt, this practice provides important foraging areas for Horned Larks (Beason 1995).

Since most habitat management activities will occur shortly after the breeding season for the grassland birds, and before most wintering individuals appear, it is challenging to predict which habitat patches will be utilized. Habitat management activities commonly occur as staggered occurrences from year to year; however, consideration of the needs of wintering grassland birds and particularly raptors should be considered. Some of the resources available to determine if a site may be important for wintering grassland birds include the map of Short-eared Owl wintering locations mentioned above, as well as the myriad of observations collected and reported by the bird watching community. These reports can be obtained from the various listservs used to report bird observations, and especially through eBird (www.ebird.org).

The practice of dividing habitat patches into sections and managing a portion of each field in each year, or rotating management activities across a complex of habitat patches can provide the undisturbed habitat needed as roosting and foraging areas for wintering raptors. Short-eared Owls in New York particularly rely on voles (*Microtus spp.*, Clark 1975), and rely on open expanses of grassland habitat for their aerial foraging. Short-eared Owls also commonly roost on the ground in low, dense, herbaceous vegetation, although they will tree roost if snowpack is particularly thick (Clark 1975, Beason 1995).

While no specific minimum ratio of undisturbed to disturbed habitat is provided in the pertinent literature, various creative techniques can be explored to ensure that some habitat remains, such as maintaining wide grassy buffers along streams and field borders. In addition, if the management objective for mowing a field is to control woody vegetation, spot mowing of shrubs allows relatively large amounts of undisturbed herbaceous vegetation to persist through the winter.

4 - Implementation of Plan

4.1 - Conservation Objective and Targets (Habitat and Population)

There have been several strategies identified for achieving success in the conservation of grassland birds in New York. The two discussed in detail in the previous sections of this plan include the focus area concept and efforts to provide guidance on how to provide optimal habitat conditions for the targeted grassland birds. In addition, establishing a partnership of the various entities concerned with conservation of grassland birds in New York could also be considered a strategy, and has already been a valuable part of the achievements to date. Prior to discussing additional strategies, it is important to establish the goals and objectives that this partnership is trying to reach by the implementation of this plan.

One important part of objective setting when attempting to conserve populations of concern is to assess the current condition of the population (e.g. population size and trend). We are able to track population trends for the grassland bird species at various scales, but estimating population sizes requires the ability to accurately estimate the amount of potential habitat available to the species combined with estimates of population density. As was discussed in the section “[The use of landcover to identify focus areas](#)”, current landcover classification datasets lack the accuracy needed to quantify the amount of potential habitat. While we now likely possess sufficient data to reasonably model the abundance of grassland birds associated with various grassland habitat types, the inability to model habitat distribution across the landscape is an important handicap, and warrants further study.

Were we able to map grassland habitats accurately across the state, population conservation targets could be established, following the form of “X hectares of habitat A would support Y individuals of a particular species in focus area 4, and if established, would double the population of that species in the focus area.” Nevertheless, as our concern for these species is founded upon their rapidly declining trends, we can establish the general objective of “improving the availability of suitable habitat to stabilize the rapidly declining trends of the grassland bird populations in the focus areas in which individuals of those species are found.”

4.2 – Strategies

In addition to the focus area concept and partnership efforts, there are several additional strategies being implemented by partners in the NY grasslands conservation group. These strategies are best categorized into one of three sections—Incentives and Easements (generally on private lands), Purchases, and Education. Each of these is discussed in more detail in the following sections. However, the value of coordinating efforts within the Focus Areas cannot be overstated, as this cooperation provides the best opportunity for developing the habitat complexes most beneficial to grassland birds. In particular, leveraging several programs to complement each other can often take a habitat conservation project past the size limitations that can handicap their usefulness. For example, the following figure illustrates how potential enrollment in the Landowner Incentive Program can complement other conservation programs to manage large expanses of habitat. Also, although landowners may not be able to enroll their entire parcels into incentive programs, their newfound knowledge of grassland bird habitat management may affect operations on the remainder of the parcel, assuming that the program representatives fully communicate the objectives and need for grassland bird conservation.

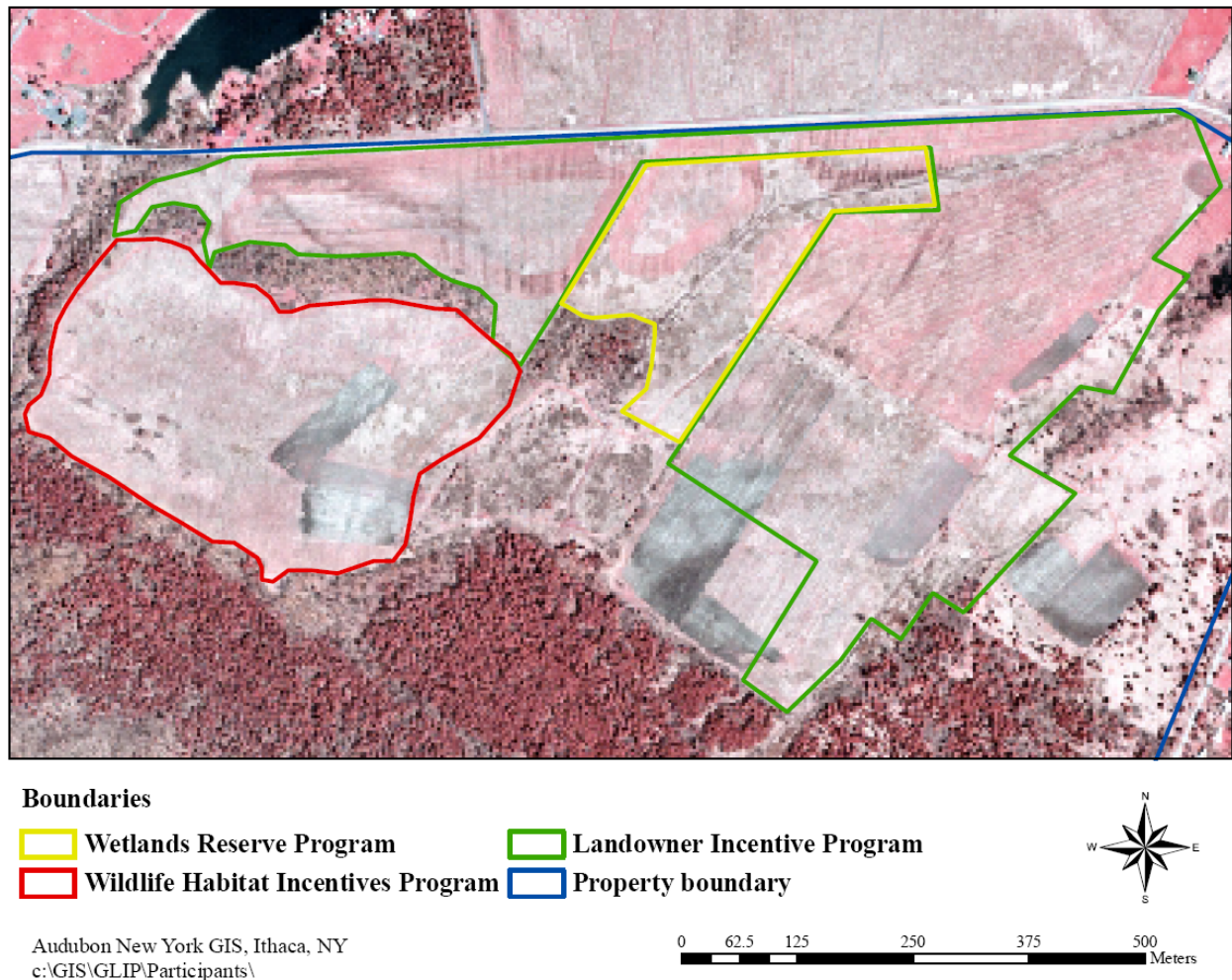


Figure 10. Over 100 acres of grassland habitat complex protected and managed through complementary conservation programs.

4.2.1 – Incentives and Easements (Private Lands)

Grassland bird populations peaked in Northeast the latter portion of the 19th century (as was described in the Introduction) as a result of the widespread clearing of forests for agricultural land. While the amount of hayfield and pastures available as grassland habitat has drastically decreased since that historic peak, the majority of habitat currently available continues to be private lands that are or have recently been agricultural lands. While farmland abandonment and reversion to forest has been the leading cause of the decreases, other threats are becoming more prevalent. These include intensification of haying (early and frequent mowing of hay), development of rural land associated with sprawl growth, and conversion of hayfields and

pastures into tillable land (crop land). This last category is of particular concern as the demand (or perception of a demand) for corn and other biomass for the production of ethanol has dramatically raised the value of agricultural land. This has led to widespread conversion of land that was previously too unproductive to allow profitable production of rowcrops (and was often left as hayfields).

Therefore, the most efficient approach to providing high quality grassland habitat will be to work closely with private landowners, rather than focusing all efforts on acquisition and management of public property. The various voluntary programs available to landowners in New York are listed below (and are summarized in Table 9).

Landowner Incentive Program: Grasslands Protection and Management (GLIP)

Coordinating Agency: NYS Department of Environmental Conservation

Contact: Marcelo del Puerto (mjdelpue@gw.dec.state.ny.us)

Website: <http://www.dec.ny.gov/animals/32722.html>

Total Enrollment: ~22 participants in 2008, contract review and signing is underway.

Average Annual enrollment: \$600,000 is available for this initial offering, and will fund approximately 2,100 acres (~\$55/acre). Additional funding has not yet been determined.

The newest incentive program is the NYS Department of Environmental Conservation's Landowner Incentive Program for Grassland Management and Protection. New York received funding for this program through a \$600,000 Tier 2 grant from the US Fish and Wildlife Service. There is a 25% landowner match requirement for the funds, which will fund the protection and management of approximately 2,100 acres of habitat for a period of 5 years at \$55/acre/year (\$60/acre/year near metropolitan areas). Applicants were required to be within or bordering the focus areas to be considered eligible, although focus area 8 (Long Island) was not included in the program as the program coordinator (with input from Audubon New York) decided that land values and the lack of suitable habitat on private lands negated any benefit LIP could provide to the area. Over 200 applications were received (Figure 6 shows the distribution of applicants), and were ranked and evaluated following a rigorous process to ensure that the highest quality habitat patches were selected for the program (to see the evaluation criteria, visit

<http://www.dec.ny.gov/pubs/32751.html>). Final preparation of contracts with the selected participants is underway.

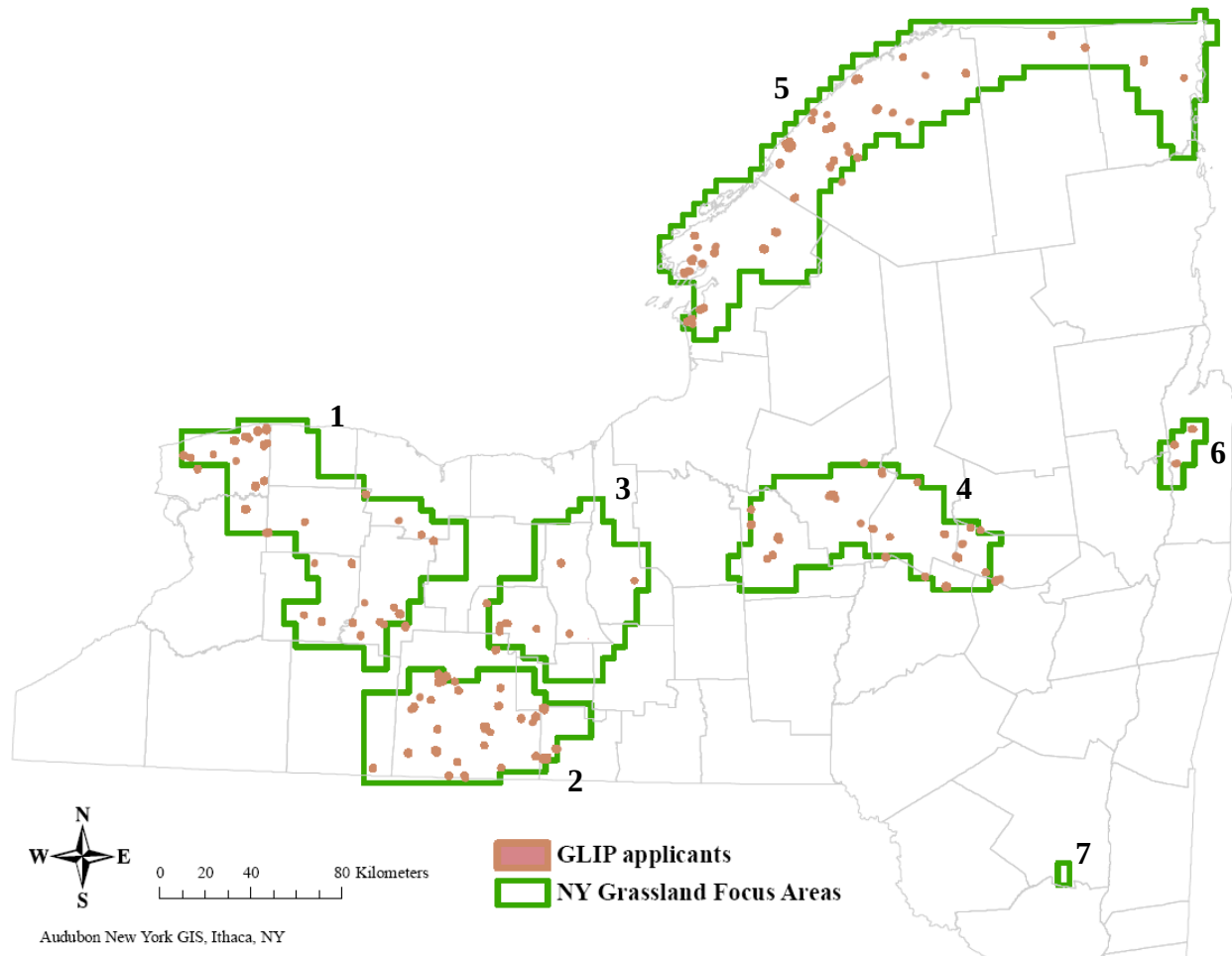


Figure 11. Locations of applicants to the Landowner Incentive Program for Grassland Protection and Management in 2006-2007.

Conservation Reserve Program (CRP)

Coordinating Agency: USDA Farm Service Agency/Natural Resource Conservation Service

Contact: Virginia Green, Supervisory Program Specialist (Virginia.Green@ny.usda.gov)

Website: <http://www.ny.nrcs.usda.gov/programs/index.html#crp>

Total Enrollment: 59,756 acres

Average Annual Enrollment: 2,500 acres

The Conservation Reserve Program offers incentives and cost-sharing opportunities for a variety of actions targeting the conservation of soil, water, wildlife, and other natural resources. The Conservation Reserve Program in general controls the largest budget of any of the listed conservation programs; however, only some of its various components may be applicable to the conservation of grassland birds. Of particular interest are the practices CP-1, CP-2, and CP-10, which involve the planting and maintenance of grasslands. The Conservation Reserve Program incorporates incentive payments for enrollment that vary according to the duration of the agreement (easement), along with cost-share payments for management and restoration activities.

This program is an important component of the Farm Security and Rural Investment Act of 2002 (or 2002 Farm Bill), and the last General Signup was in Fiscal Year (FY) 2006. The next General Signup is expected in FY 2009 at the earliest, subject to funding through a revised Farm Bill.

Most recently, New York submitted an application to the State Acres For wildlife Enhancement component of the Conservation Reserve Program (SAFE-CRP) to guide the allocation of 4,950 acres of funding towards habitat patches most valuable as grassland bird habitat. This allocation will be modeled after the ranking criteria developed by the NYSDEC LIP and in consultation with Audubon New York and the NYSDEC (and other partners).

Partners for Fish and Wildlife Program

Coordinating Agency: US Fish and Wildlife Service

Contact: Carl Schwartz (carl_schwartz@fws.gov)

Website: <http://ecos.fws.gov/partners/viewContent.do?viewPage=home>

Total Enrollment: 675 participants (~7,500 acres)

Average Annual Enrollment: Between 500 and 1,000 acres

The Partners for Fish and Wildlife Program provides financial (cost-sharing) and technical assistance to landowners for management and conservation targeting a variety of habitats. Some of the priority projects the Program participates in are wetland restoration, grassland restoration, in-stream restoration, stream bank stabilization and restoration, and restoration of riparian and floodplain areas (see Fig. 11 for a map of project site locations).

The National priority ranking factors for the Partners Program are used to assign funding priority status to proposed projects that meet these conditions:

- Improve habitat for Federal Trust Species, including migratory birds; threatened and endangered species; inter-jurisdictional fish; marine mammals; and, other declining species.
- Complement activities on National Wildlife Refuge System lands, or contribute to the resolution of problems on refuges that are caused by off-refuge practices.
- Address species and habitat priorities that have been identified through Service planning teams (with our partners), or in collaboration with state fish and wildlife agencies.
- Reduce habitat fragmentation or serve as buffers for other important Federal or state conservation lands.
- Result in self-sustaining systems that are not dependent on artificial structures.

If other considerations are generally equal, then priority is directed to those projects that link private lands to important Federal lands (such as Refuges), have cooperative agreements of longer duration, multiple partners, cost sharing, and the greatest cost effectiveness.

New York Partners for Fish & Wildlife Priority Areas

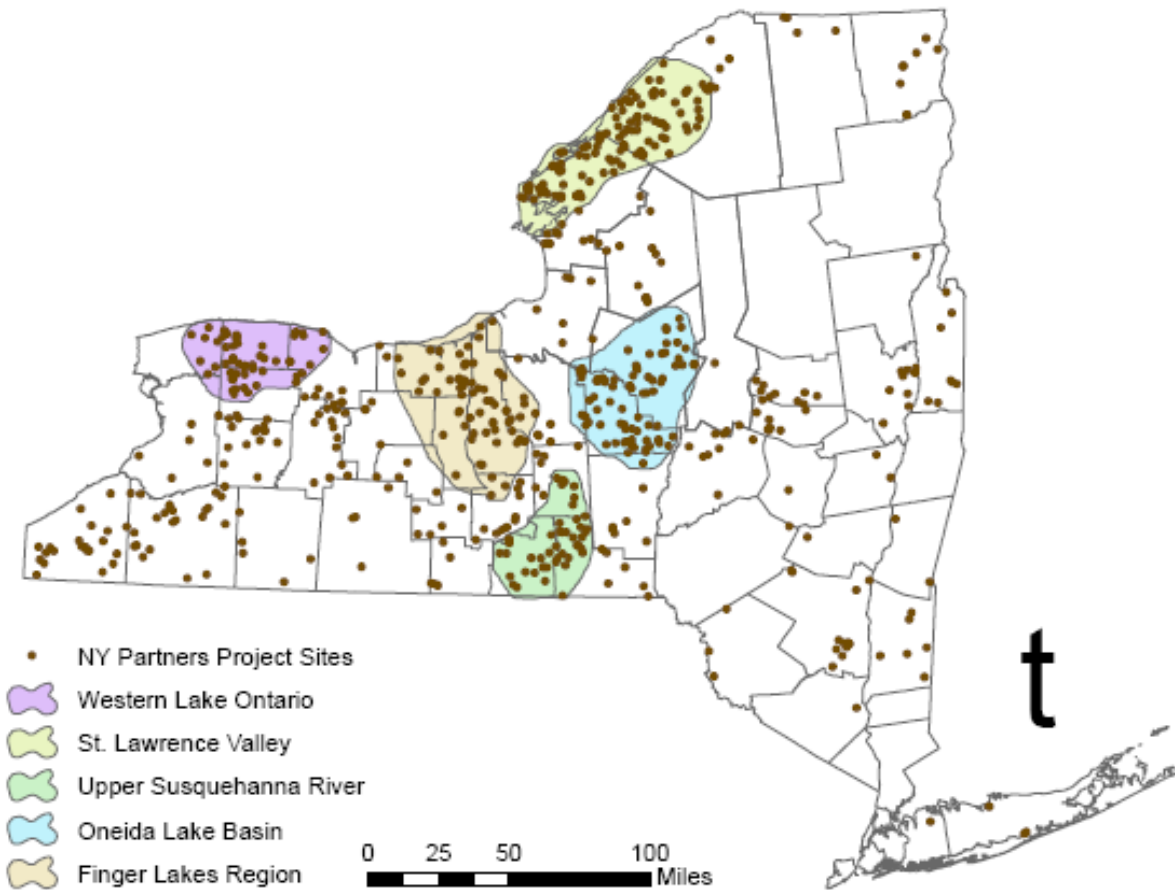


Figure 12. Project site locations for the NY Partners for Fish and Wildlife Program.

Wildlife Habitat Incentives Program (WHIP)

Coordinating Agency: USDA Natural Resource Conservation Service

Contact: Mike Townsend (michael.townsend@ny.usda.gov)

Website: <http://www.ny.nrcs.usda.gov/programs/#whip>

Total Enrollment: 559 contracts (16,500 acres, average cost of \$175/acre)

Average Annual Enrollment: 1,830 (~1,000 for 2007)

The Wildlife and Habitat Incentives Program pays landowners as a cost share for seeding and/or management activities that are undertaken for grassland bird management. There is no rental payment or incentive as in CRP.

Table 11. Private lands incentive and cost-sharing conservation programs.

Program Name	Approximate Annual Enrollment (acres)	Total Acres Enrolled	Landowner Commitment	Payment Type
Conservation Reserve Program (CRP) ¹	2,500	59,756	10-15 years	Incentive and Cost-share
Landowner Incentive Program: Grassland Protection and Management ²	N/A	~2,100*	5 years	Incentive
Partners for Fish and Wildlife Program ³	500-1,000	7,500	10+ years	Cost-share
Wildlife Habitat Incentives Program (WHIP) ¹	1,830	16,500	5-10 years	Cost-share
*Contracting with selected recipients is underway. Further funding for this program has not been confirmed.				
¹ USDA Farm Service Agency/Natural Resource Conservation Service				
² NYS Department of Environmental Conservation				
³ US Fish and Wildlife Service				

4.2.2 – Purchases (Public Lands)

While the primary strategy for reversing declining trends in populations of grassland breeding birds will be private lands conservation programs, proper management of public land remains an important component of the overall conservation effort. This management in particular likely has significant impacts on the suitability of landscape-level selection factors for grassland birds in the general vicinity of the public lands. For example, what is probably the largest remaining population of Henslow's Sparrows in New York is clustered around the Perch River Wildlife Management Area in the St. Lawrence River Valley (Focus Area 5). Although the rural, agricultural nature of the local community and soils that hinder vegetative succession are key factors in the maintenance of the population, the public grasslands managed by the NYSDEC undoubtedly play an important role in maintaining a suitable landscape.

The proportion of the total area in each Focus Area that is publicly owned averages 5.8%, and varies from less than 1% in Focus Area 6, to more than 28% in Focus Area 8 (see Table 12 and Figure 13). In addition, the percentage of potential habitat identified using the 2001 NLCD (discussed in [section 2.6](#)) that occurs on public land is 6%. This indicates that the proportion of grassland habitat on public lands reflects its distribution in the landscape, and that past public land acquisition and management efforts may not have placed any particular emphasis on grassland habitats.

One notable exception to this pattern is based on preliminary surveys, which found that practically all remaining grassland habitat in Focus Area 8 is currently in public ownership due to aggressive development on private lands, and indicates that proper management of these public lands will be critical for sustaining that region's populations of grassland birds. In particular, the largest habitat patch remaining occurs on the former Naval Weapons Industrial Reserve Plant (also known as the Grumman plant or Calverton airport), now officially referred to as the Enterprise Park at Calverton (EPCAL). Unfortunately, the site has been proposed for development, but is also receiving much attention as various partners have been advocating for continued protection and management of its habitats.

Additionally, the NYSDEC is exploring a comprehensive plan to work with various municipalities in Washington County to develop a habitat protection initiative involving acquisition and purchase of easements on several thousand acres of critical habitat in the Ft. Edward Grassland IBA portion of Focus Area 6.

For maps of each Focus Area that identify all public lands and their locations within the Focus Areas, please view [Appendix F](#).

Table 12. Proportion of focus areas in public ownership (from NYS Accident Location Information System-Public Land Boundaries 2006).

Land Ownership Category	Focus Areas								Overall
	1	2	3	4	5	6	7	8	
Federal Recreational	4,393	15	8,635	7	0	0	0	0	13,049
Federal Non-recreational	10	256	4,302	417	38,282	0	257	2,432	45,955
State Recreational	16,994	20,458	5,531	7,367	40,743	0	0	4,508	95,493
State Non-Recreational	95	0	174	517	1,469	0	213	34	2,502
State Campgrounds	41	0	96	10	257	0	0	19	422
County Recreational	2,729	0	0	1,741	118	0	0	1,371	5,362
Municipal Recreational	573	0	48	658	84	54	0	195	1,611
Totals (ha)	24,834	20,728	18,786	10,717	80,952	54	470	8,559	164,395
% of Focus Area	4.0	5.3	5.3	2.5	8.2	0.1	9.4	28.5	5.8

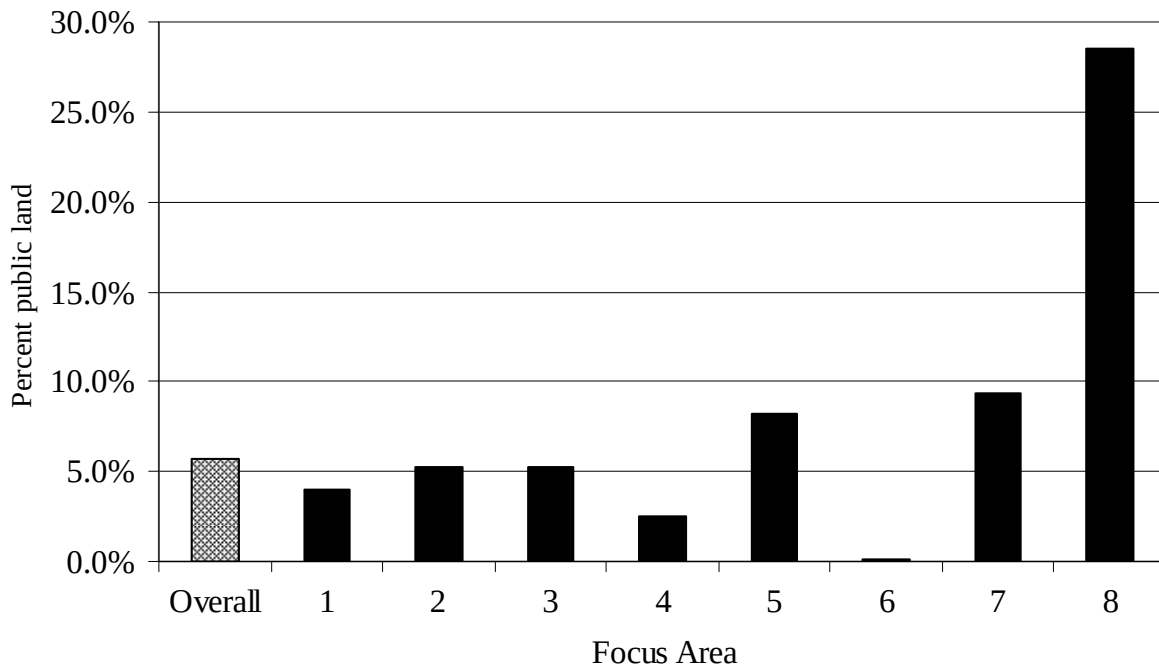


Figure 13. Chart comparing proportions of each Focus Area that are publicly owned (from NYS Accident Location Information System-Public Land Boundaries 2006).

4.2.3 - Land Trusts

Land trusts (or not for profit organizations that acquire land in both fee title and easements) are not reflected in the categories described above, as they operate independently and many focus on easements (the proportion of which varies among land trusts), and are therefore a blend of public and private land conservation efforts. There are approximately 70 land trusts that operate on a local level in New York, 3 that operate statewide, and 9 that operate nationally (with varying levels of involvement in New York). For a list of New York's land trusts that are members of the Land Trust Alliance, please see [Appendix F](http://www.lta.org/index.shtml) (from the Land Trust Alliance website at <http://www.lta.org/index.shtml>). Specific land trusts that participate in the partnership effort to conserve grassland habitat in New York include The Nature Conservancy and the Thousand Islands Land Trust.

Comprehensive data on land trust stewardship activities regarding grasslands in New York are not readily available, but this warrants further assessment, as land trusts hold potential for enrolling considerable amounts of habitat in the grassland conservation effort. Some land trust

stewardship activities are supported through the private lands conservation programs listed above.

4.2.4 - Education

Management of grassland habitat requires commitment and resources beyond those available to most private landowners. However, a minor subset of landowners in New York does maintain land voluntarily for wildlife habitat. Those landowners often are eager to implement management actions when given proper guidance, and they should not be ignored as partners in this effort.

In addition, many agricultural landowners appreciate the ability of their land to provide wildlife habitat, and are able to voluntarily implement certain conservation activities when they do not interfere with the productivity of their operations. For example, knowledge of the timing of the breeding cycle and the need for undisturbed grasslands as nesting habitat for grassland birds can encourage farmers to maintain refuge “islands” of unmowed grass in hayfields, and to delay haying of poorer quality grass (which can be used as bedding material or forage for livestock that do not have the rigorous dietary requirements of dairy cattle).

In addition to this plan, some of the resources available that should be provided to interested landowners include education materials developed by MassAudubon and Cornell Cooperative Extension. Links to these resources can be found in the “Additional Resources” section of this document.

In addition, Audubon New York is exploring opportunities for relationships with various farmland preservation efforts in New York, many of which are very interested in learning about the habitat value of carefully managed farmland, as wildlife habitat values can be used to further their farmland preservation agenda.

4.2.5 - Public Policy

While protection of threatened and endangered grassland bird species is provided by both the USFWS under the Migratory Bird Treaty Act and the NYSDEC under the Environmental Conservation Law, protection of habitats for these species has been less than adequate to prevent impacts to their populations. Further development and implementation of public policy pertaining to the protection of habitat for threatened and endangered species would alleviate

some portion of the threats associated with the loss or degradation of existing habitat. However, this process will require full participation by a wide variety of stakeholders, and must be carefully considered.

4.3 - Assessment / Monitoring

Unfortunately, no existing monitoring program provides the information required for assessing population trends and responses to management actions within the grassland focus areas of New York, but this need has been identified as a priority by multiple planning efforts, including by the partnership supporting the development of this plan, and the NY State Wildlife Grants planning process. The Breeding Bird Survey (BBS) lacks the power needed to effectively meet these needs at anything less than a regional scale, because of its extremely coarse resolution; potential bias associated with roadside point counts; its “all habitat” approach, which limits the amount of possible grassland habitat that is surveyed; and the increasingly rare nature of Northeastern grassland birds that further limits the ability of the BBS to detect meaningful population trends.

Indeed, it is challenging to develop a protocol for monitoring grassland birds that fills all the data collection needs to meet multiple objectives. When the objective of a protocol is to monitor population changes at a regional level, it may not be sufficiently precise to allow a habitat manager to determine if their actions are having a desirable effect on the local grassland bird community.

Government agencies and conservation organizations in the Northeastern states are in the process of developing a unified bird monitoring framework that will facilitate monitoring grassland birds at various scales and for various purposes across the Northeast (along with other bird groups and habitat/species suites) through the Northeast Coordinated Bird Monitoring Partnership. Audubon New York has been selected to lead the grassland component of this effort, which will ensure that the program used to monitor grassland birds in New York will be fully aligned and coordinated with the regional program, and will facilitate comparisons and interpretation of New York trends in a broader context. This coordinated bird monitoring effort is coordinated by Dan Lambert (American Bird Conservancy) and materials supporting this effort can be found at www.nebirdmonitor.org. Efforts to expand and develop this regional grassland bird monitoring program will be supported by the broader NE CBM effort; however,

the foundation for this program and assessments of various survey techniques was developed through the creation of this plan, and is reported below.

While conducting the 2005 grassland breeding bird focus area survey (described in [section 2.3](#)), additional data were evaluated to assess various techniques used to estimate grassland bird abundance. This effort is described in more detail in the following section.

4.3.1 – Assessment of data collection techniques.

During the 2005 focus area surveys, Audubon New York employed four methods of collecting grassland bird abundance data:

- a. Single observer roadside point counts (SORS)
- b. Single observer infield point counts (SOIF)
- c. Double observer roadside point counts (DORS)
- d. Double observer infield point counts (DOIF).

The use of these four techniques allowed comparisons to be made between single and double observer point counts, as well as in-field and roadside point counts. Since the value of double observer point counts was discussed in some detail in [section 2.3](#), it will not be discussed here. The differences in relative abundances estimated using roadside and in-field point counts was simply compared using a 2-tailed T test, and significant differences were only found for two species (see Table 13).

Table 13. Differences in average relative abundances estimated using roadside (RS) versus in-field (INF) point counts during the 2005 grassland breeding bird focus area survey conducted by Audubon New York (significant differences in bold).

Species	Treatment	N	Mean	SE Mean	Difference	T-Value	P-Value	95% CI
BOBO	INF	182	2.16	0.38	0.601206	1.48	0.14	(-0.197662, 1.400075)
	RS	341	1.56	0.14				
SAVS	INF	182	1.31	0.13	0.086985	0.57	0.571	(-0.214785, 0.388754)
	RS	341	1.22	0.084				
EAME	INF	182	0.311	0.06	-0.15308	-2.03	0.043	(-0.301147, -0.005017)
	RS	341	0.464	0.046				
GRSP	INF	182	0.094	0.029	0.027554	0.74	0.459	(-0.045557, 0.100665)
	RS	341	0.066	0.023				
HOLA	INF	182	0.21	0.058	0.161421	2.67	0.008	(0.042458, 0.280384)
	RS	341	0.048	0.017				
NOHA	INF	182	0.011	0.0077	-0.01834	-1.31	0.19	(-0.045807, 0.009134)
	RS	341	0.029	0.012				
VESP	INF	182	0.022	0.011	0.010248	0.79	0.433	(-0.015407, 0.035902)
	RS	341	0.012	0.0072				
UPSA	INF	182	0.027	0.012	0.01281	0.85	0.393	(-0.016661, 0.042281)
	RS	341	0.015	0.0088				
SEWR	INF	182	0.022	0.013	0.016113	1.15	0.252	(-0.011525, 0.043751)
	RS	341	0.0059	0.0041				

Based upon these preliminary results, a protocol for estimating grassland bird populations should rely on using the double observer technique to collect at least a portion of the data. This allows for assessment of (and correction for) observer accuracy in the final estimates.

In addition, due to few significant differences in relative abundance of grassland birds between roadside and infield point count locations (and contradicting “directions” of the two statistically significant differences), a survey protocol that includes roadside surveys likely would describe reasonably accurately the true relative abundance and distribution of New York’s

grassland bird populations. In New York in particular, the vast majority of grassland habitat patches are adjacent to roads, and a survey based on roadside point counts would likely be able to sample most patches. In addition, by incorporating both roadside and infield point counts into the study plan, observers will be able to visit more points than if they were to conduct only in-field point counts, as roadside points are more easily located and require less travel time to reach and return from.

However, because many land managers should be conducting in-field point counts (to assess vegetation characteristics and for rigorous site-level monitoring), it will likely be possible to combine the two techniques. An ideal monitoring scheme will be able to assess both local bird response and regional population changes to most effectively utilize the available observers. The monitoring scheme currently envisioned will likely make use of in-field point counts conducted by managers in a “fixed” set of habitat patches, along with roadside point counts conducted at randomly selected patches that are classified as “potential” grassland bird habitat.

4.3.2 Tiers or “strata” of interest for evaluation/monitoring efforts.

A robust sampling design will allow comparisons at multiple levels including comparing grassland bird response as a result of habitat management to population changes throughout the region (both site-specific and programmatically), modeling the availability of suitable habitat across the regions (of concern due to inability to precisely model habitat using landcover datasets), and assessing vegetation response to management actions. The hierarchy of specific population inferences that are of interest are below, for the primary objective of indicating the effectiveness of coordinated conservation efforts at conserving the remaining populations of grassland birds:

1. Regional population trend for the Northeast (defined as USFWS Region 5, to align with BBS and other coordinated efforts).
2. State Level Trends (states within USFWS Region 5).
3. Trends for populations within Focus Areas.
4. Trends for specific conservation programs (or lack thereof) including private lands programs (LIP, CRP, WHIP, PFW, etc.) and public land efforts (refuges and wildlife management areas) contrasted with trends for populations occurring on private, intensive

agricultural lands such as active hayfields and pastures not enrolled in conservation programs.

5 - Preliminary Research Needs

The following list describes research needs that will assist the development of future planning for the conservation of grassland birds.

1. Improved methods and data for modeling distributions and abundance of grassland landcover across the landscape.
2. Improved knowledge of impacts of management on productivity (production of viable young) of grassland birds, to amplify existing information on grassland bird abundances associated with management.
3. Further research into potential benefits of native grass species as grassland habitat in contrast with demonstrated benefit of non-native cool season grasses.

6 - Next Steps

1. Finalize a comprehensive monitoring framework for grassland birds.
2. Collection of data on activities of Land Trusts to preserve/manage grassland habitat.

7 - Additional Information and Related Planning Efforts

For additional perspectives on grassland bird conservation, please see the following selected sources of information:

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2. Herkert, James R., Robert E Szafoni, Vernon M. Kleen, and John E. Schwegman. 1993. Habitat establishment, enhancement and management for forest and grassland birds in Illinois. Division of Natural Heritage, Illinois Department of Conservation, Natural Heritage Technical Publication #1, Springfield, Illinois. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/birds/manbook/index.htm> (Version 16JUL97).

- a. Summarized version: http://www.bcnbirds.org/greenpapers_files/GPgrassland.html
3. Johnson, Douglas H., Lawrence D. Igl, and Jill A. Dechant Shaffer (Series Coordinators). 2004. Effects of management practices on grassland birds. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/index.htm> (Version 12AUG2004).
4. MassAudubon (http://www.massaudubon.org/Birds_&_Beyond/grassland/index.php)
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Appendices

Appendix A - Grassland Bird Species targeted by the NY Grassland Bird Conservation Plan.

Species	Partners in Flight Ranking (Carter et al. 2000)	NE Concern¹	NY SGCN²	NY E,T,SC³	Tier
Northern Harrier	High Regional Priority/High Regional Threats	Yes	Yes	T	1
Upland Sandpiper	High Continental Concern/High Regional Responsibility, High Regional Threats	Yes	Yes	T	1
Short-eared Owl	High Continental Concern/Low Regional Responsibility, High Regional Threats	Yes	Yes	E	1
Sedge Wren	High Regional Priority/High Regional Threats	Yes	Yes	T	1
Henslow's Sparrow	High Continental Concern/High Regional Priority; High Regional Priority/High Regional Concern, High Regional Threats	Yes	Yes	T	1
Grasshopper Sparrow	High Regional Priority/High Regional Threats	-	Yes	SC	1
Bobolink	High Regional Priority/High Regional Concern, High Regional Responsibility	-	Yes	-	1
Loggerhead Shrike	High Regional Priority/High Regional Threats	Yes	Yes	E	1
Horned Lark	-	-	Yes	SC	2
Vesper Sparrow	-	-	Yes	SC	2
Eastern Meadowlark	High Regional Priority/High Regional Concern	-	-	-	2
Savannah Sparrows	-	-	-	-	2
Wintering Raptors*	N/A	N/A	N/A	N/A	3

¹ Wildlife species of regional conservation concern by Northeast Endangered Species and Wildlife Diversity Technical Committee (2001).

² State Wildlife Grants "Species of Greatest Conservation Need" in NY (March 2003).

³ Species listed as Endangered, Threatened, or Special Concern in NY (New York State 1979).

* Including Northern Harrier, Short-eared Owl, Snowy Owl (*Bubo scandiacus*), Rough-legged Hawk (*Buteo lagopus*), Red-tailed Hawk (*Buteo jamaicensis*), American Kestrel (*Falco sparverius*), and Northern Shrike (*Lanius excubitor*).

Appendix B - Maps of Breeding Bird Atlas blocks with grassland birds documented as possible, probable, or confirmed breeders (data collected from 2000-2005).

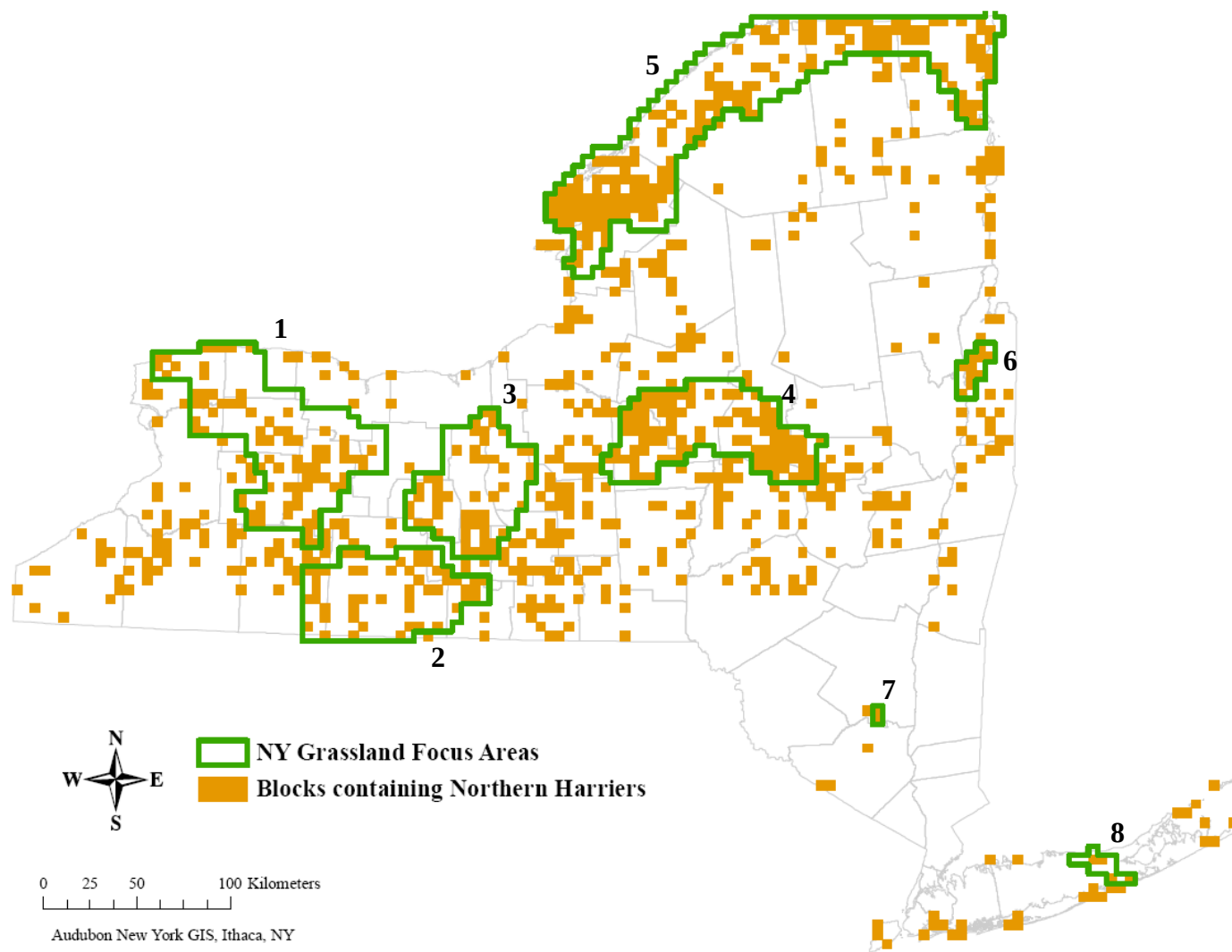


Figure 14. Breeding Bird Atlas blocks in which Northern Harriers were recorded as possible, probable, or confirmed breeders (2000-2005).

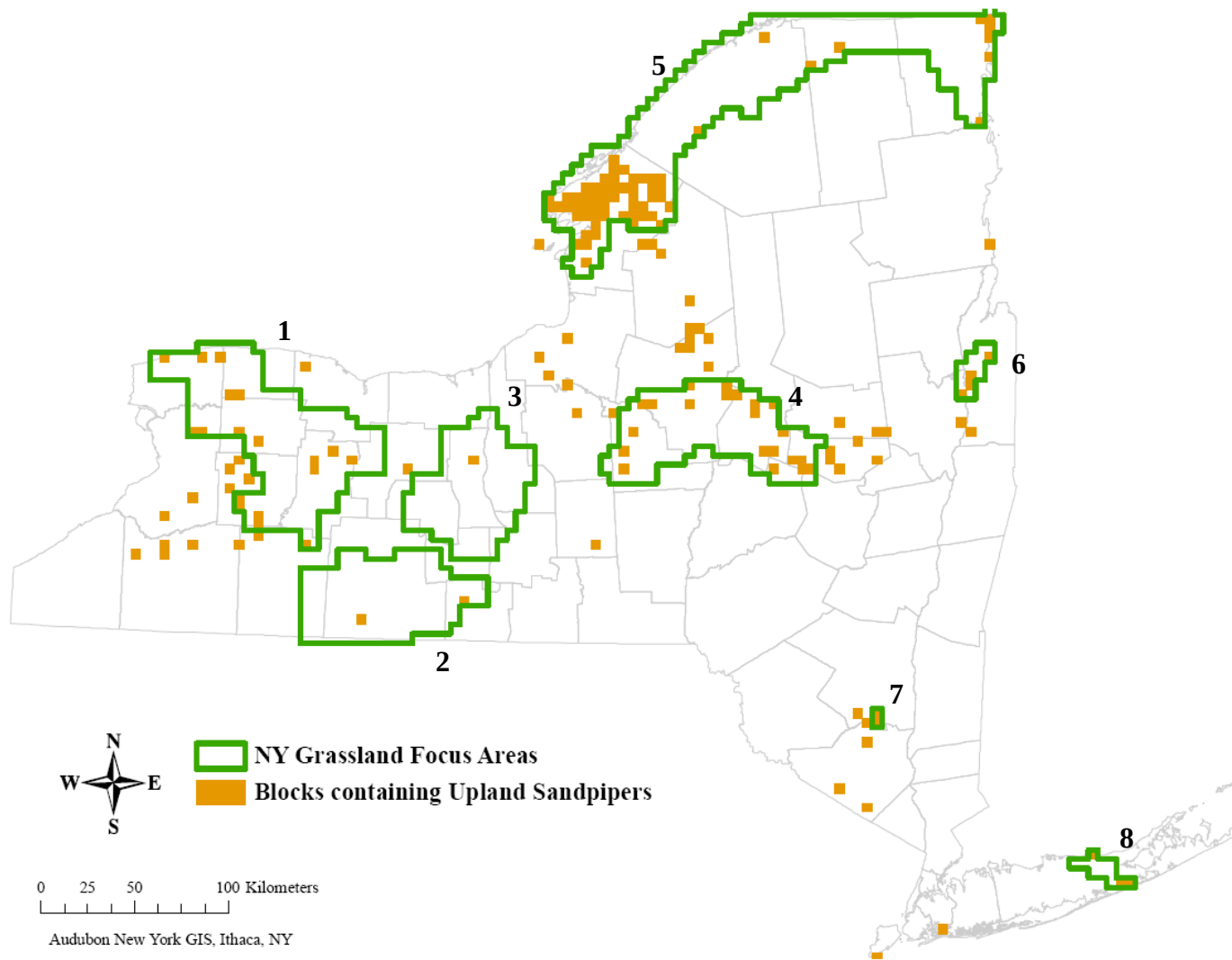


Figure 15. Breeding Bird Atlas blocks in which Upland Sandpipers were recorded as possible, probable, or confirmed breeders (2000-2005).

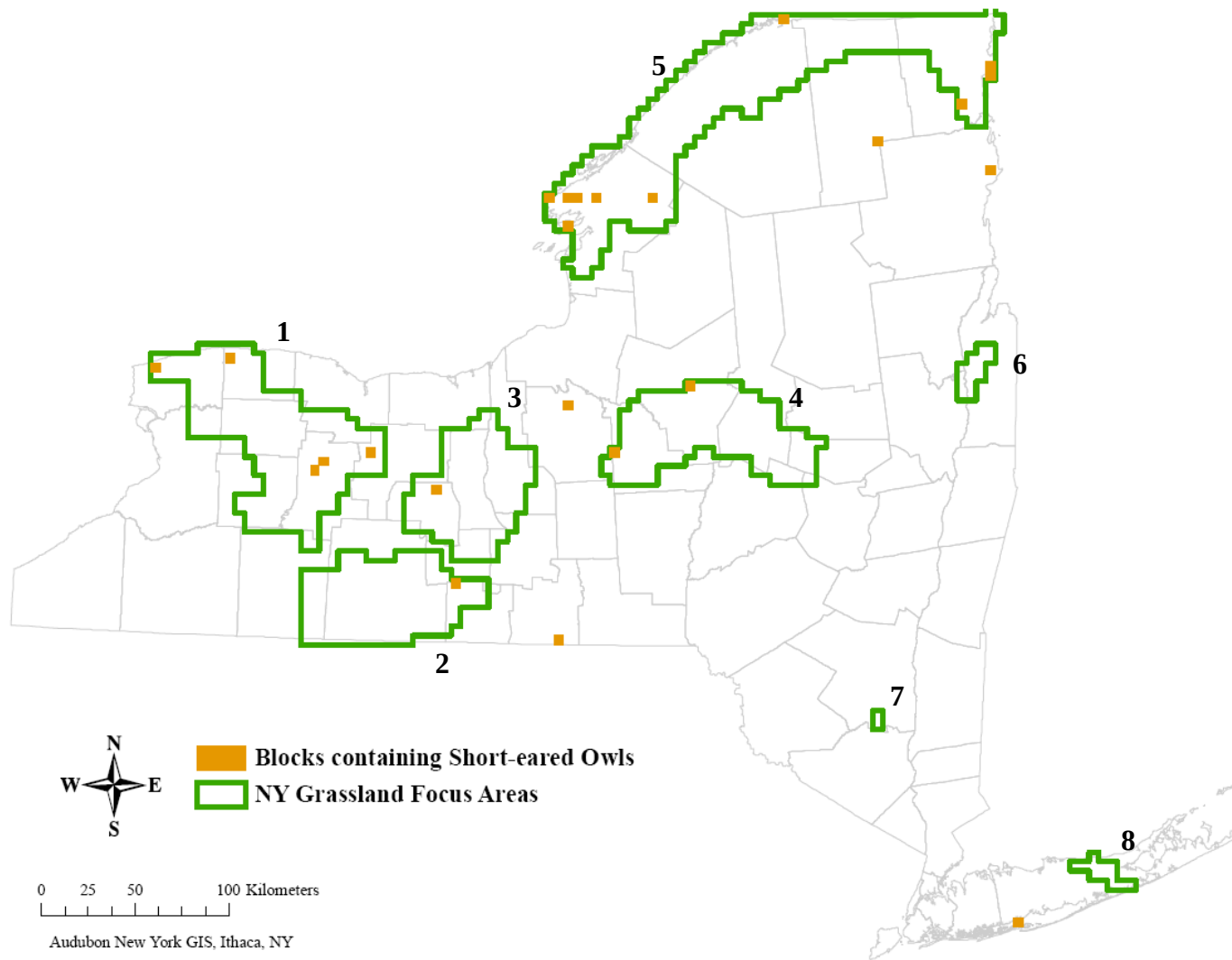


Figure 16. Breeding Bird Atlas blocks in which Short-eared Owls were recorded as possible, probable, or confirmed breeders (2000-2005).

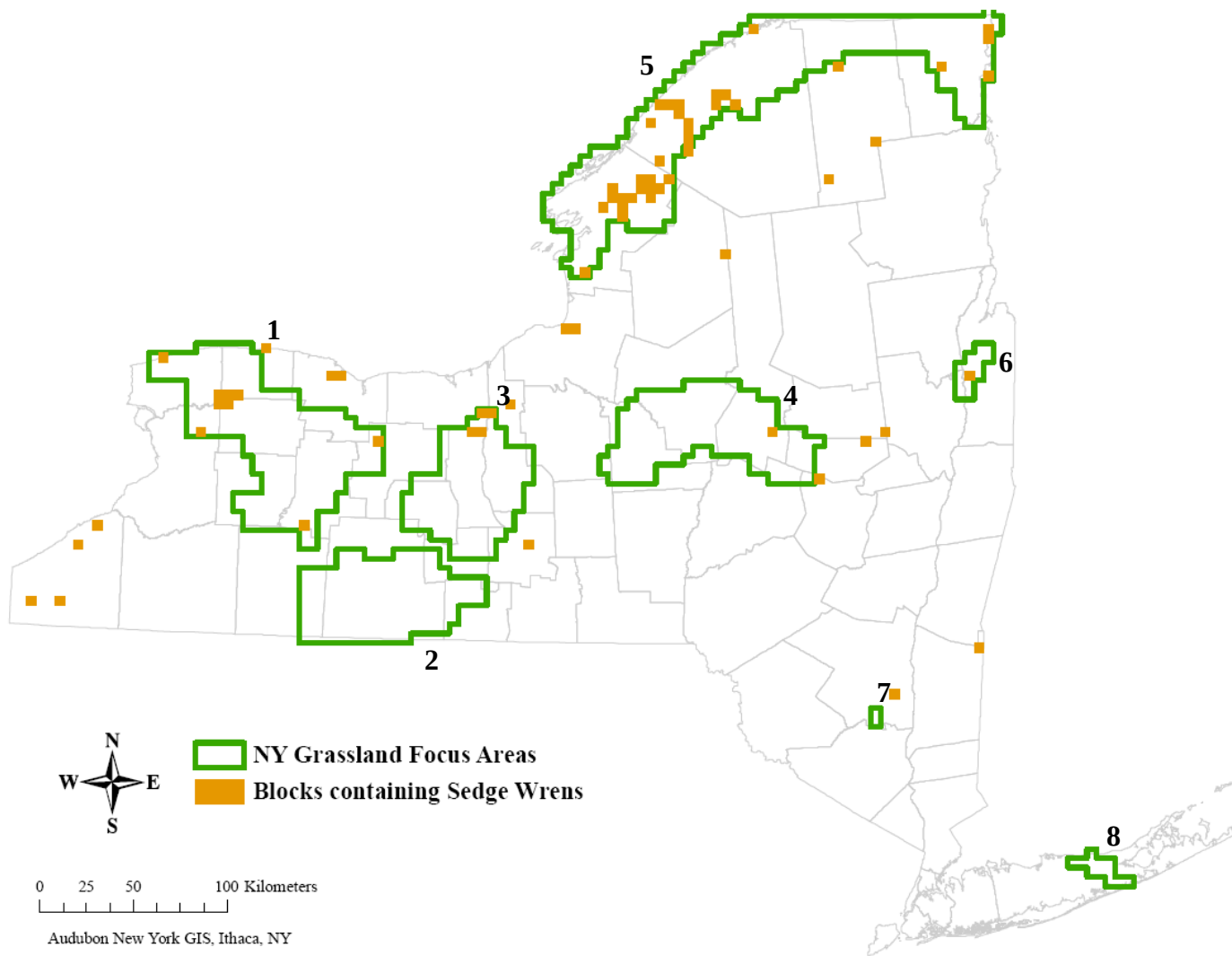


Figure 17. Breeding Bird Atlas blocks in which Sedge Wrens were recorded as possible, probable, or confirmed breeders (2000-2005).

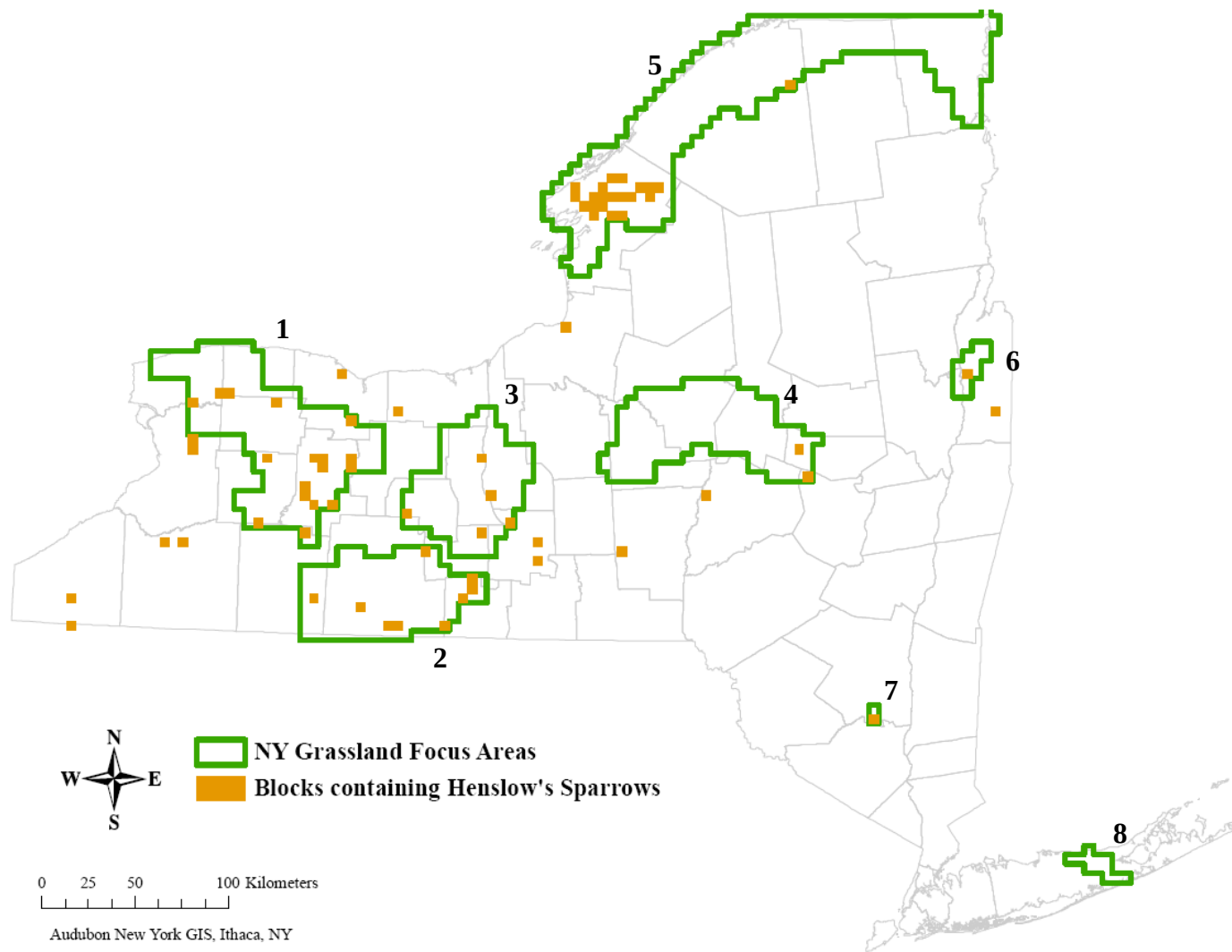


Figure 18. Breeding Bird Atlas blocks in which Henslow's Sparrows were recorded as possible, probable, or confirmed breeders (2000-2005).

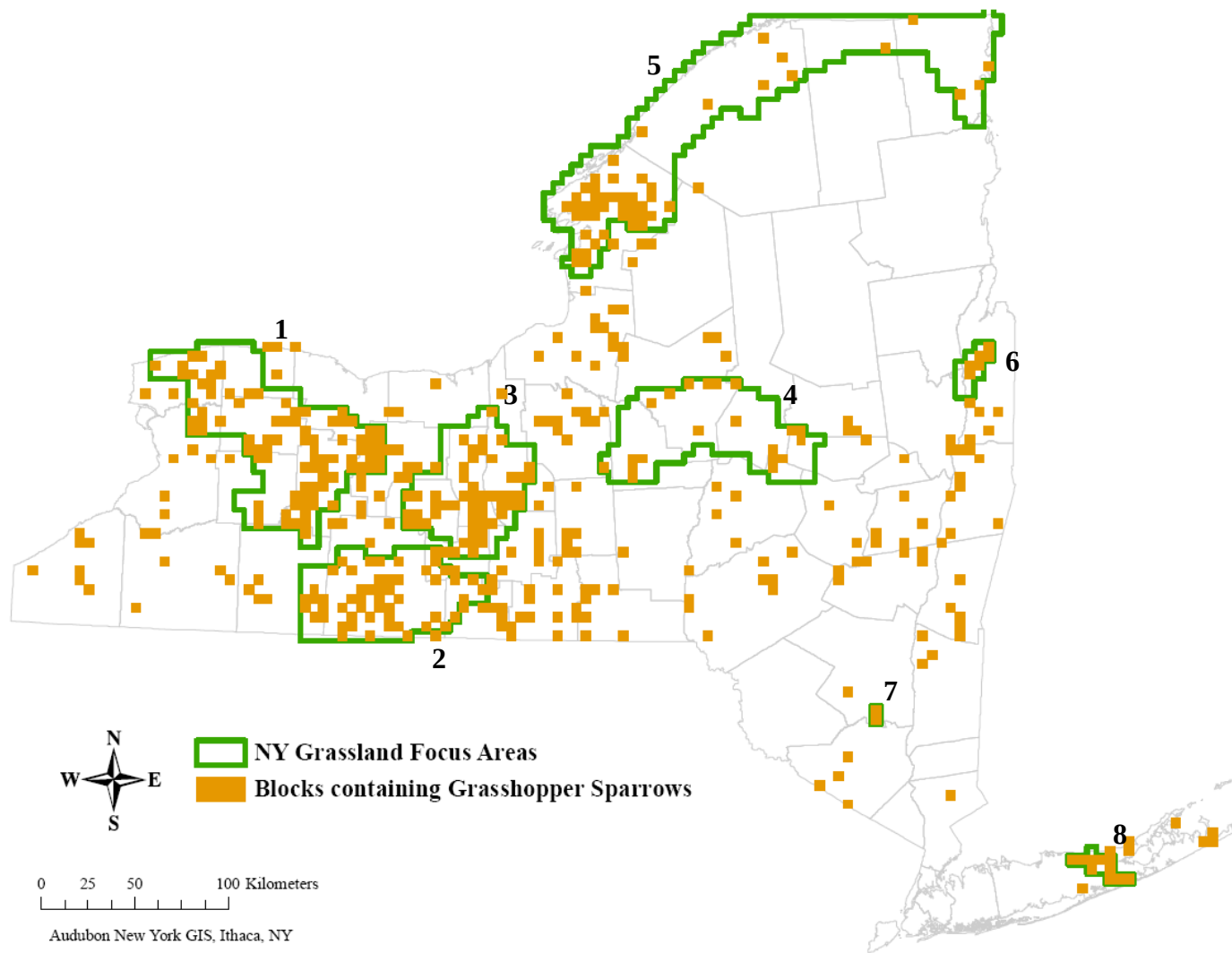


Figure 19. Breeding Bird Atlas blocks in which Grasshopper Sparrows were recorded as possible, probable, or confirmed breeders (2000-2005).

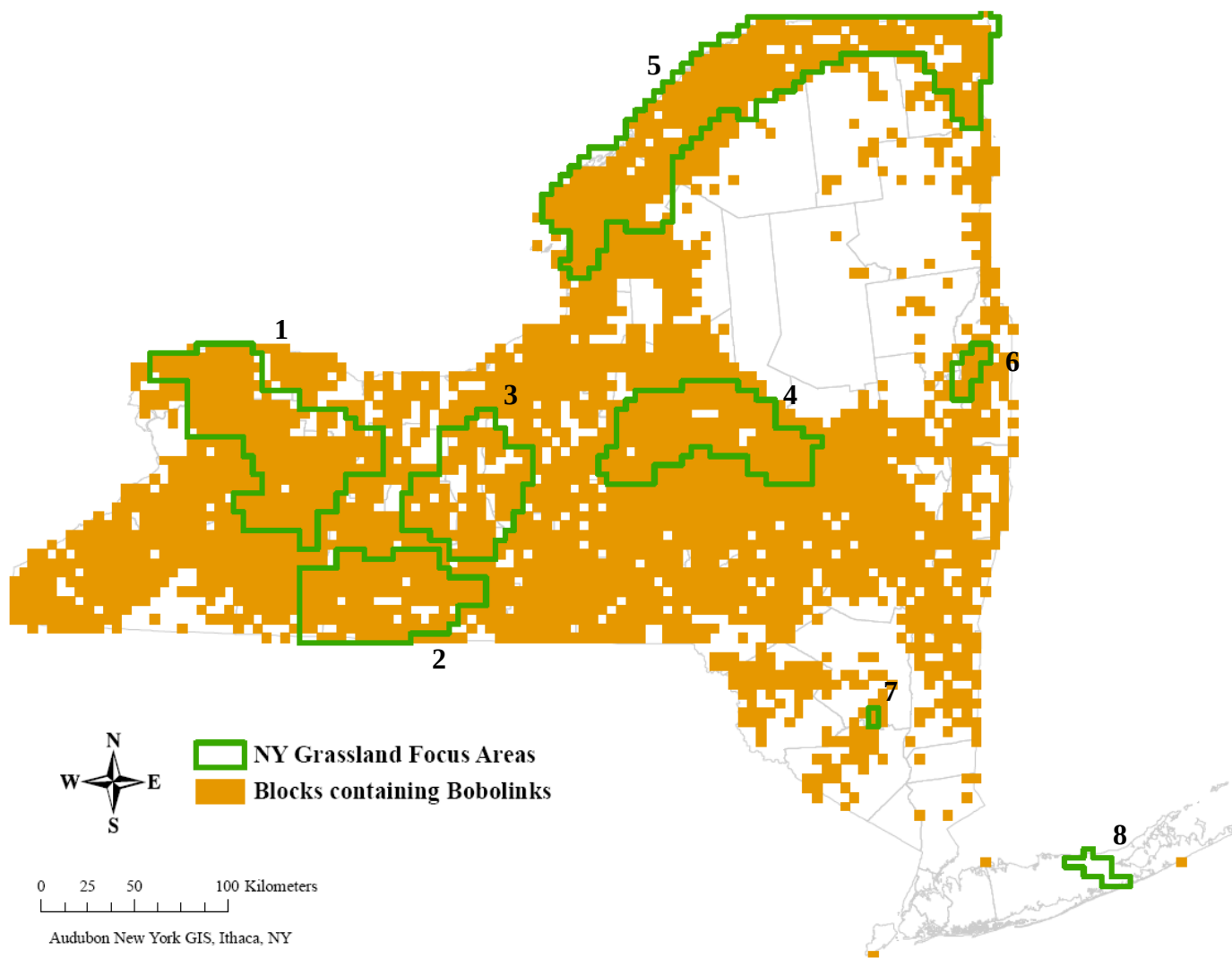


Figure 20. Breeding Bird Atlas blocks in which Bobolinks were recorded as possible, probable, or confirmed breeders (2000-2005).

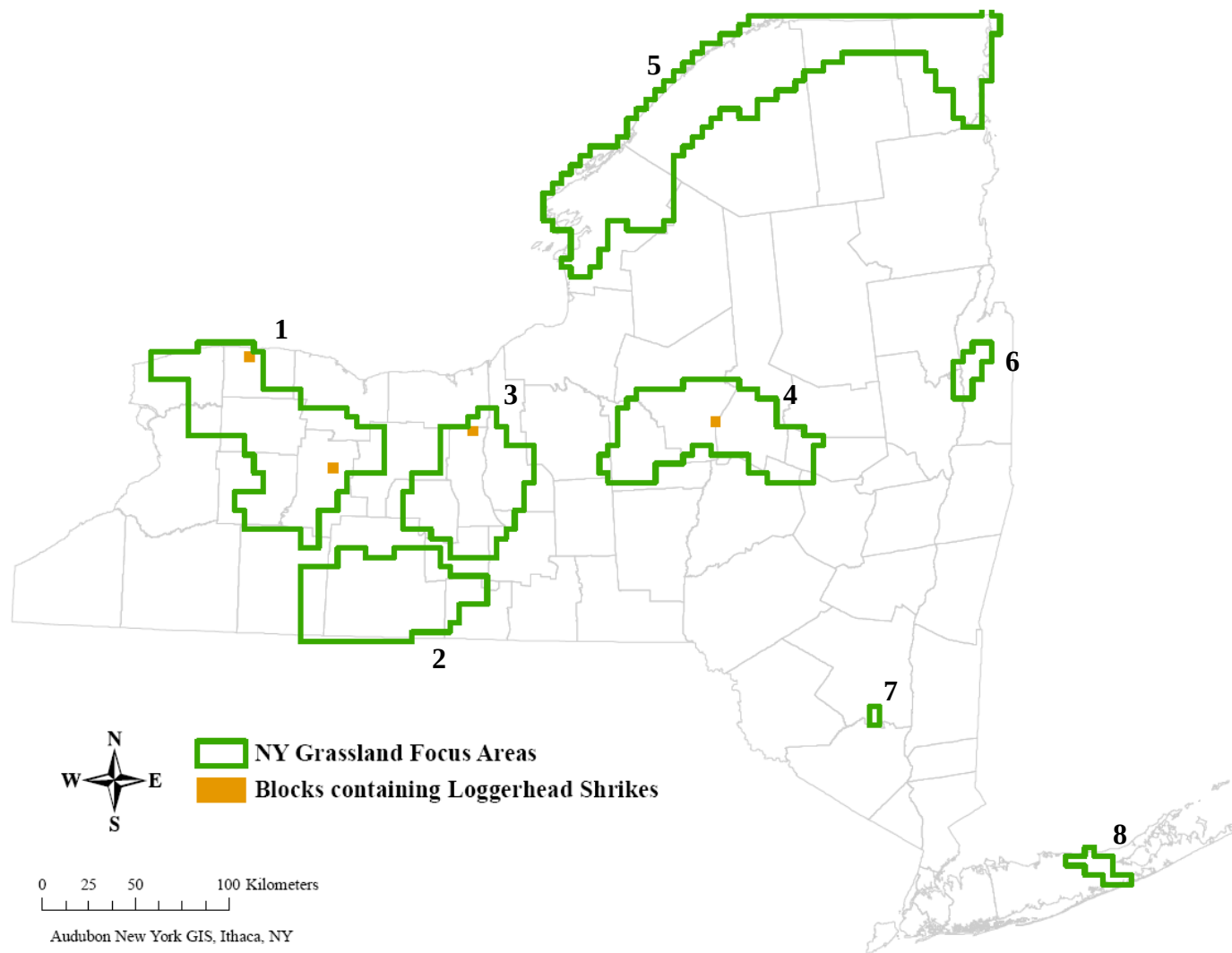


Figure 21. Breeding Bird Atlas blocks in which Loggerhead Shrikes were recorded as possible, probable, or confirmed breeders (2000-2005).

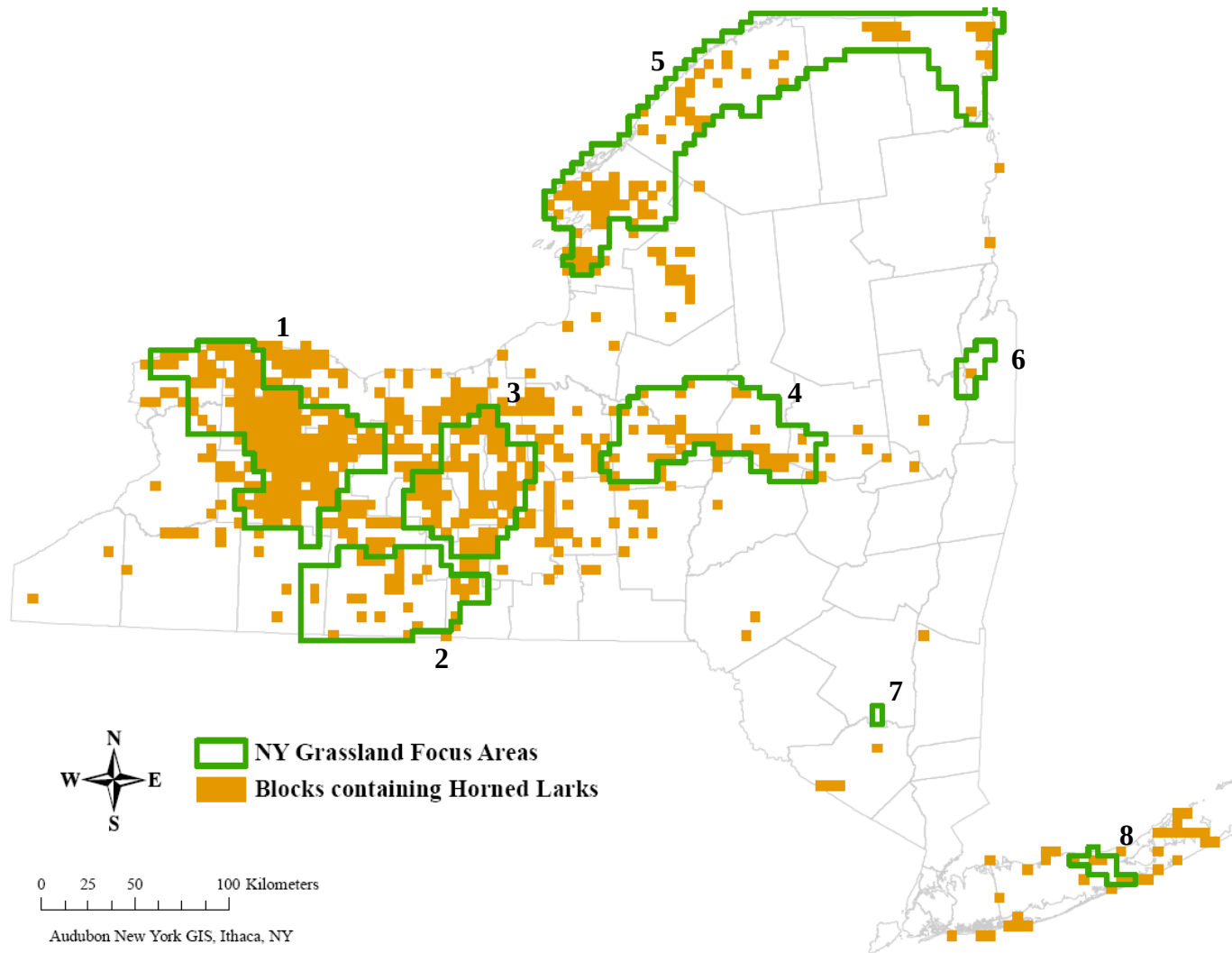


Figure 22. Breeding Bird Atlas blocks in which Horned Larks were recorded as possible, probable, or confirmed breeders (2000-2005).

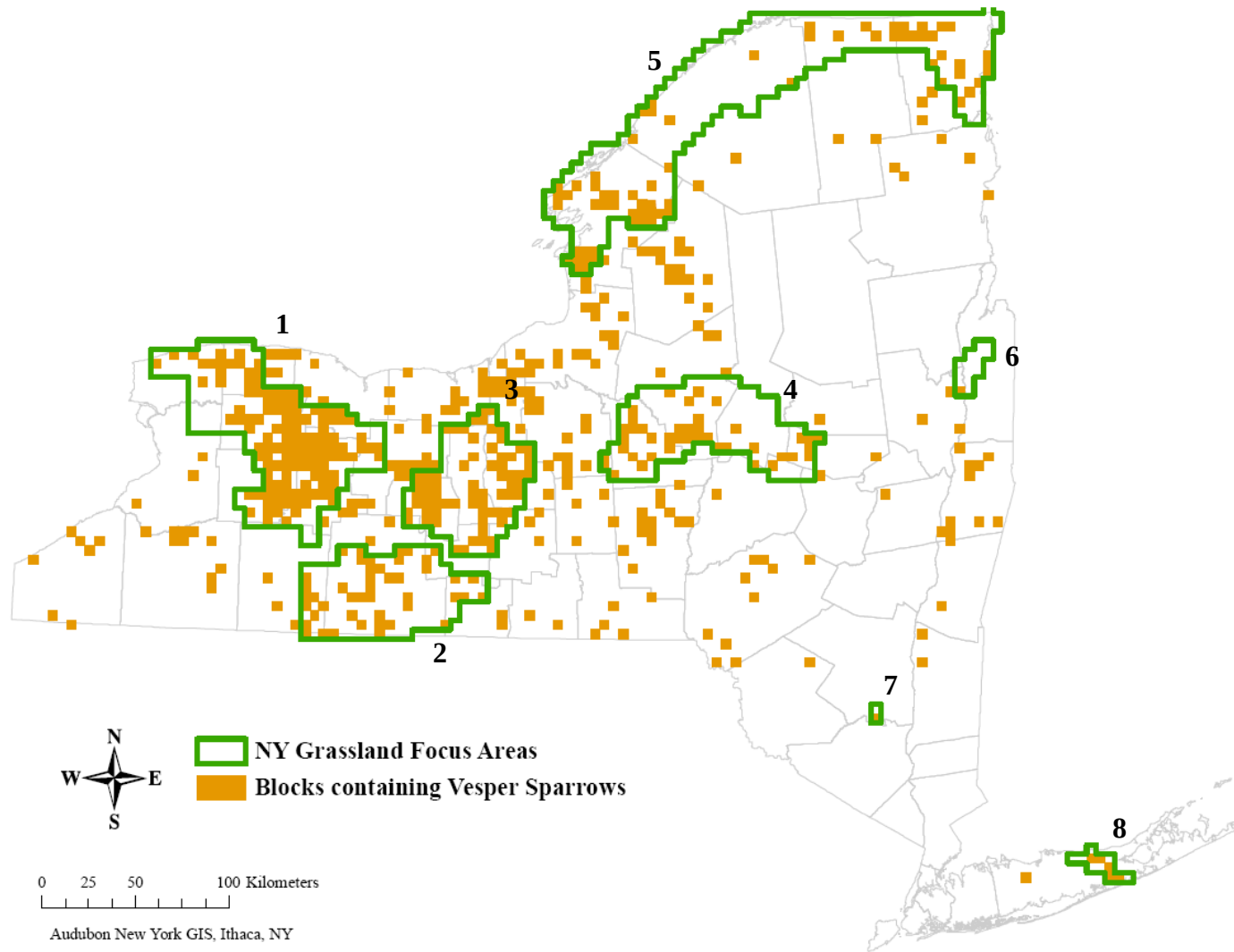


Figure 23. Breeding Bird Atlas blocks in which Vesper Sparrows were recorded as possible, probable, or confirmed breeders (2000-2005).

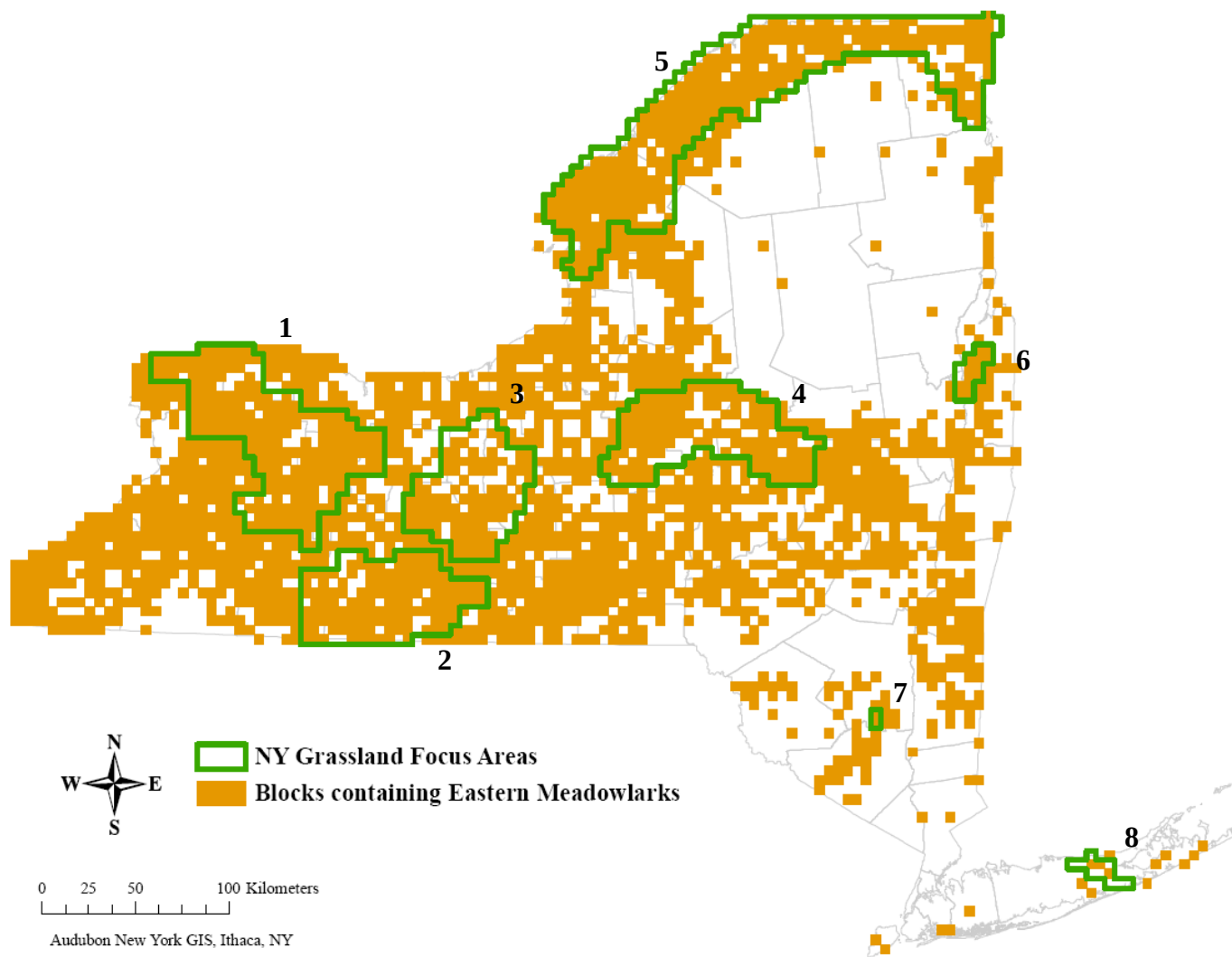


Figure 24. Breeding Bird Atlas blocks in which Eastern Meadowlarks were recorded as possible, probable, or confirmed breeders (2000-2005).

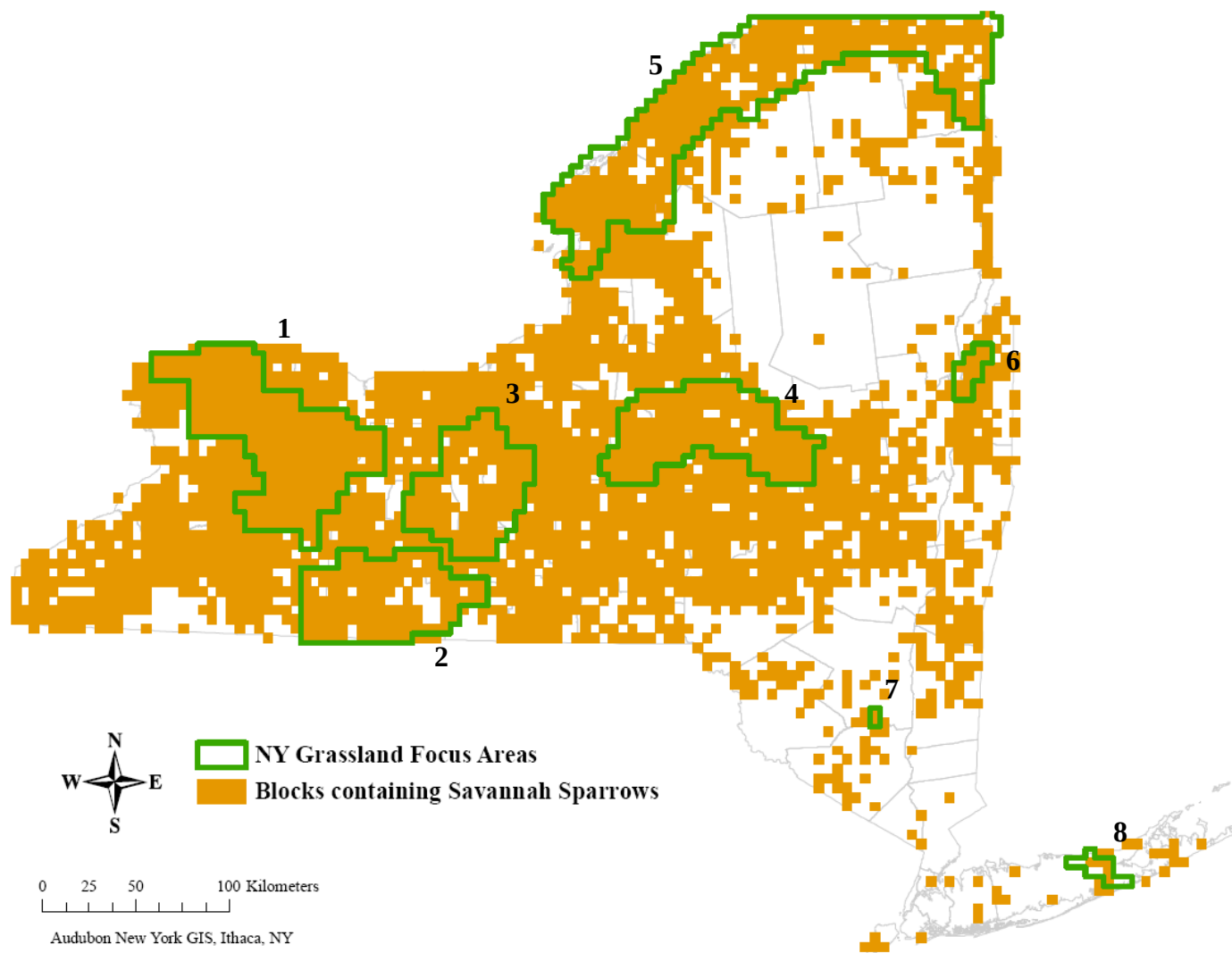


Figure 25. Breeding Bird Atlas blocks in which Savannah Sparrows were recorded as possible, probable, or confirmed breeders (2000-2005).

Appendix C – Maps of the Corrected Relative Abundances observed for each species during the 2005 Grassland Breeding Bird Focus Area Survey.

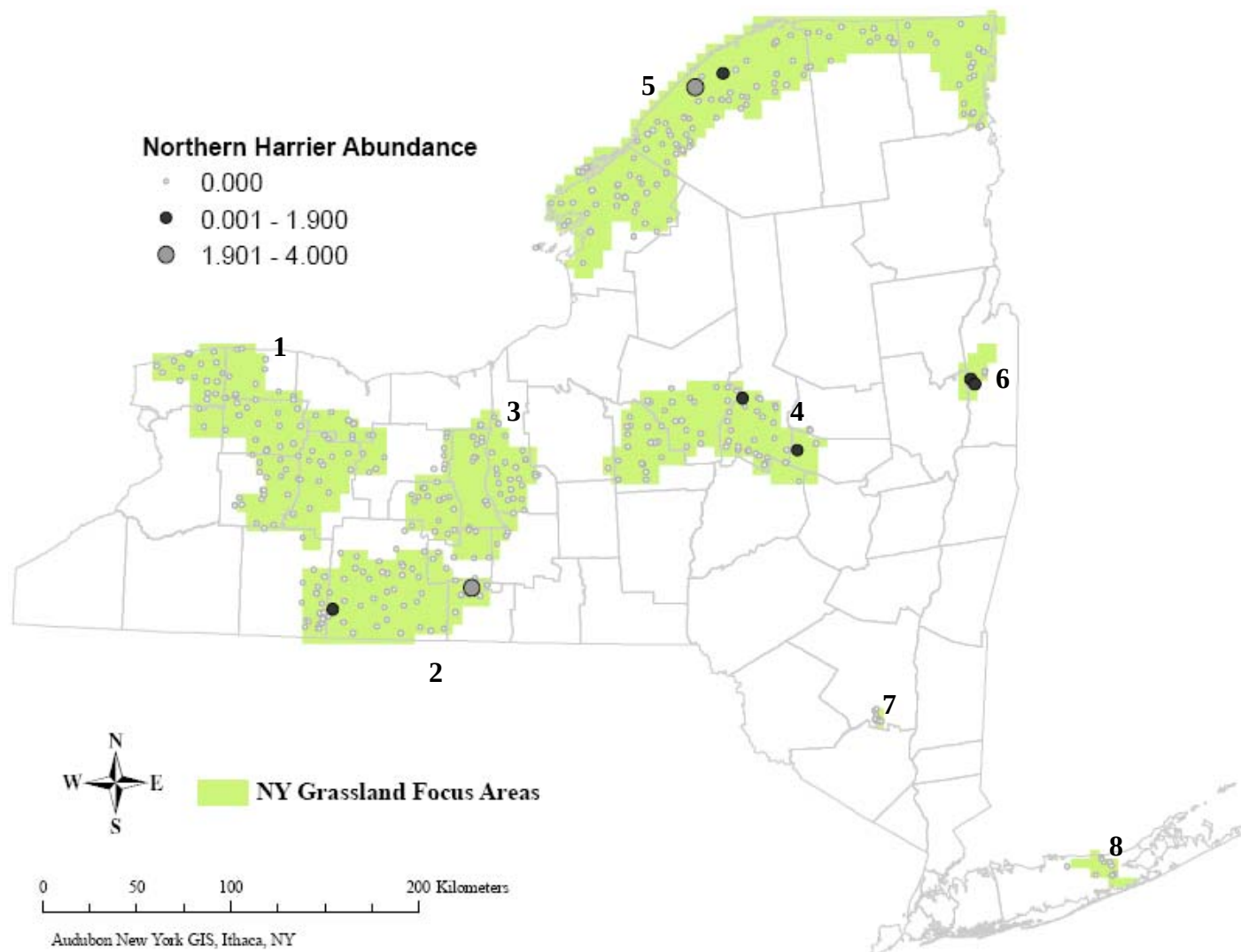


Figure 26. Corrected relative abundance of Northern Harriers detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

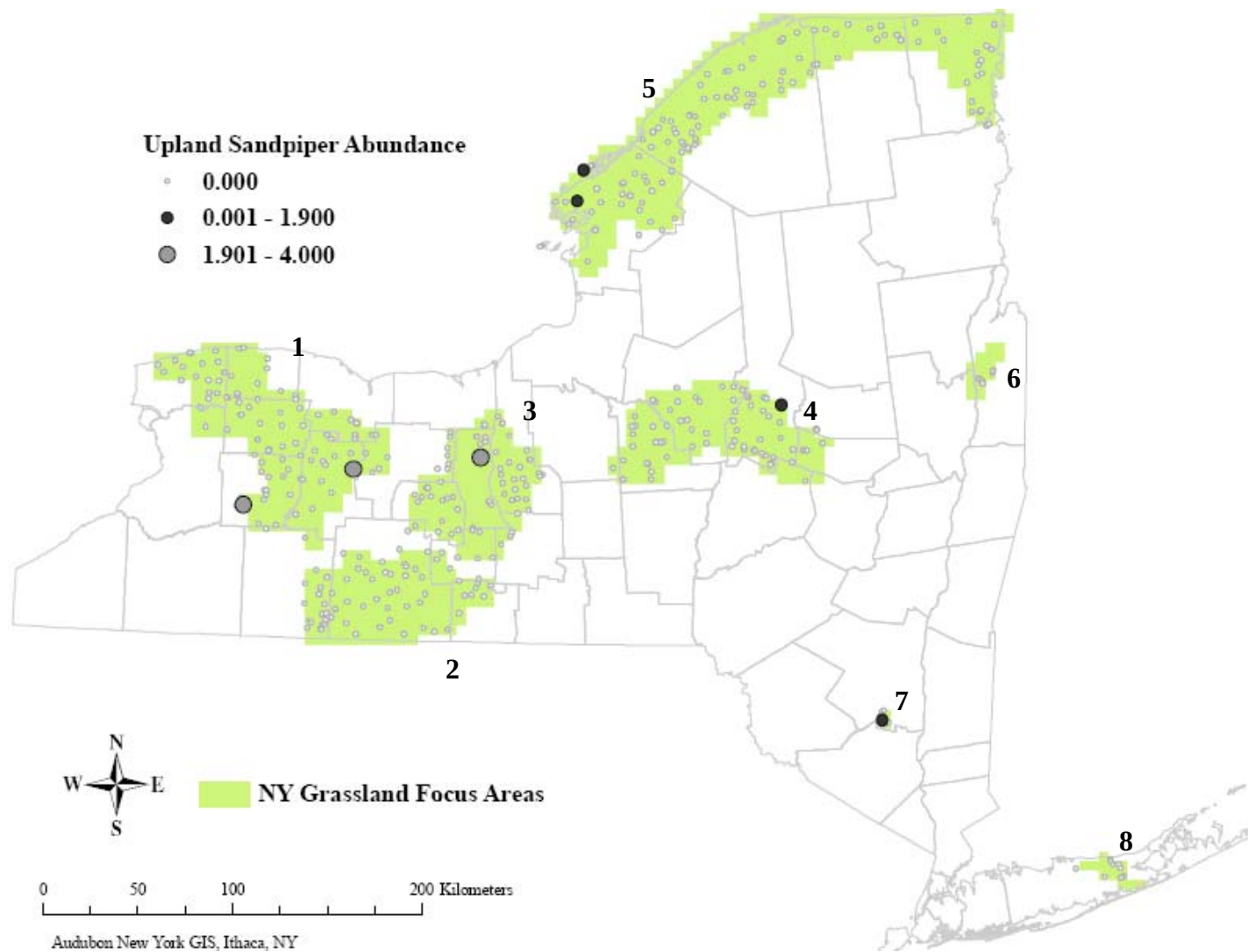


Figure 27. Corrected relative abundance of Upland Sandpipers detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

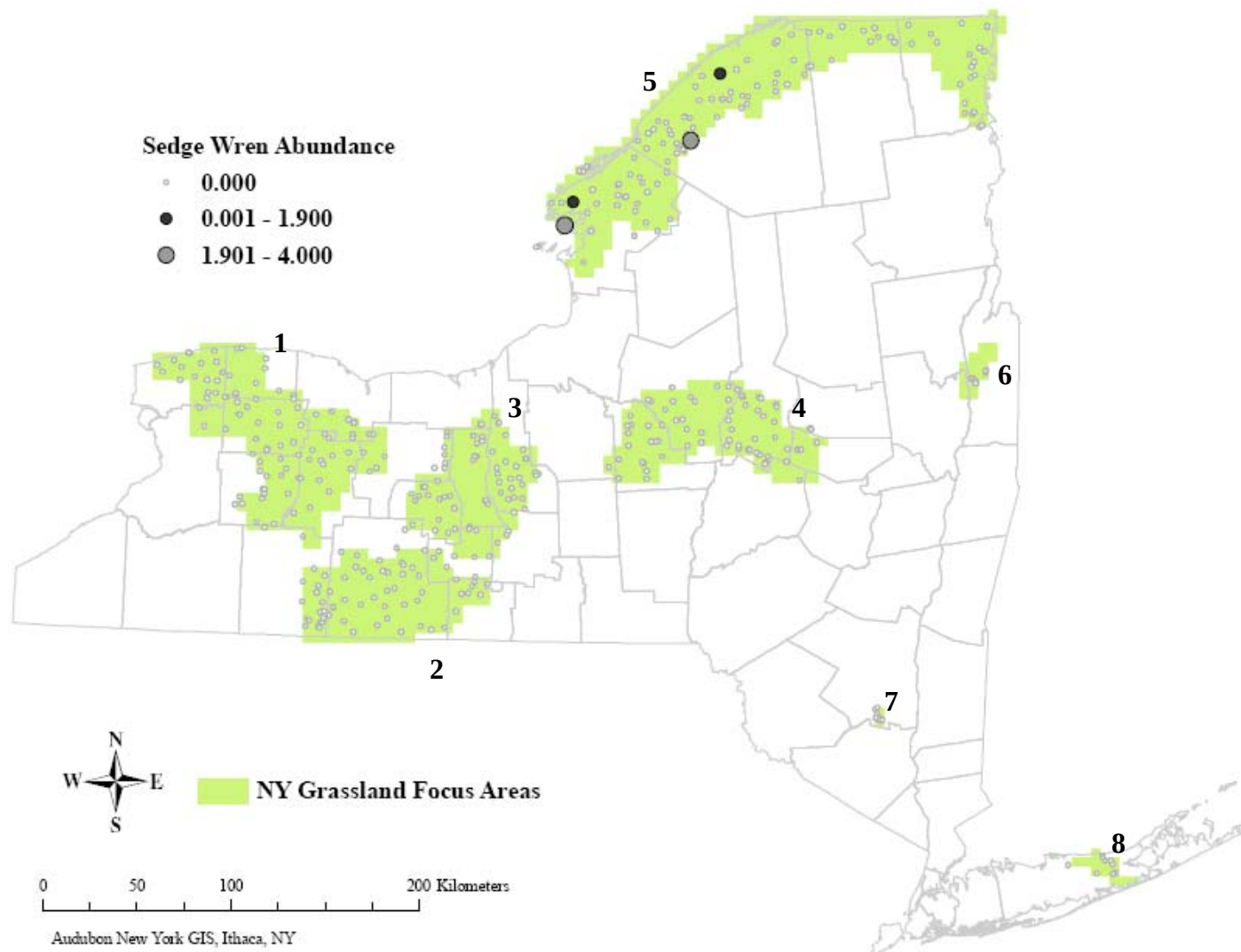


Figure 28. Corrected relative abundance of Sedge Wrens detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

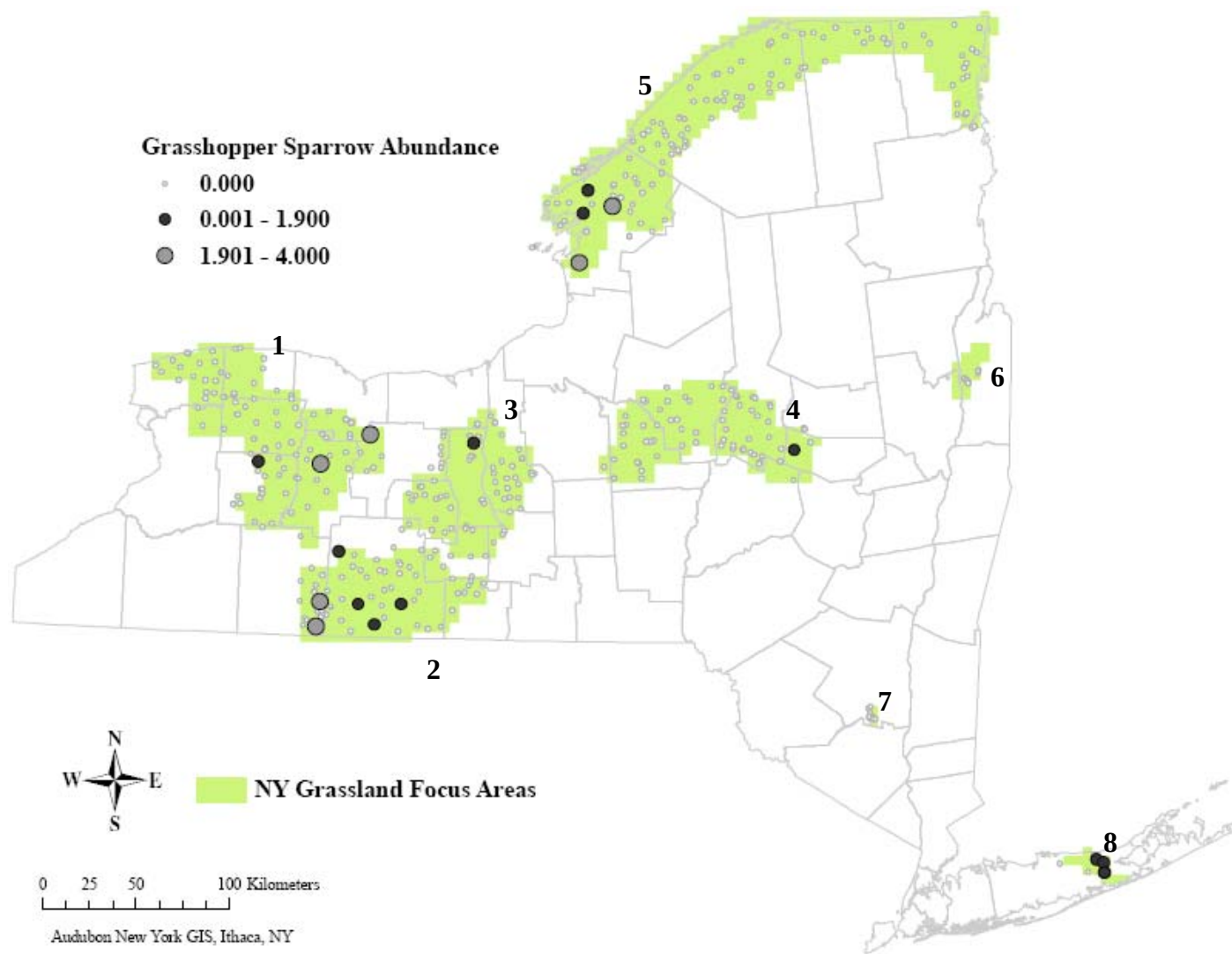


Figure 29. Corrected relative abundance of Grasshopper Sparrows detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

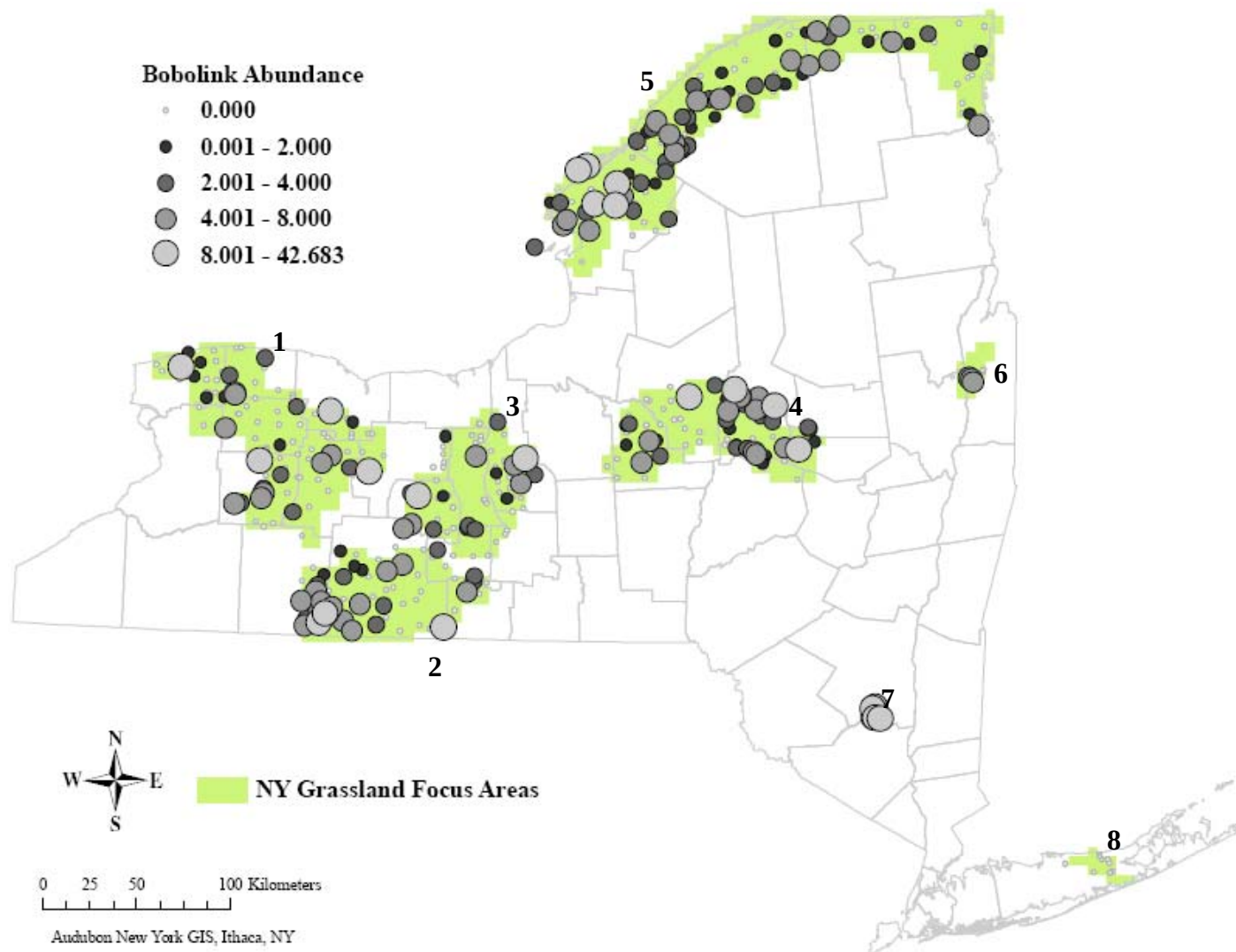


Figure 30. Corrected relative abundance of Bobolinks detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

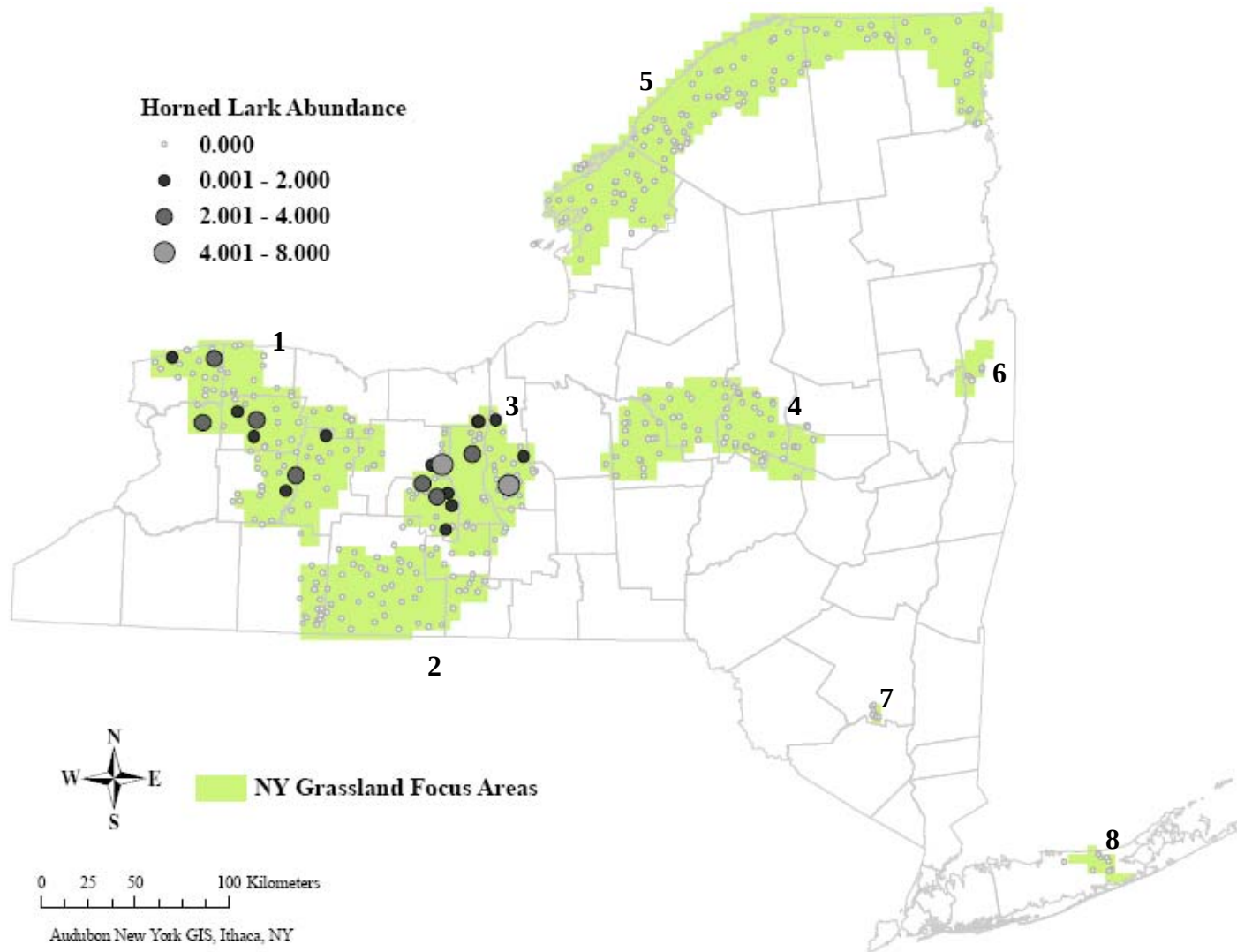


Figure 31. Corrected relative abundance of Horned Larks detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

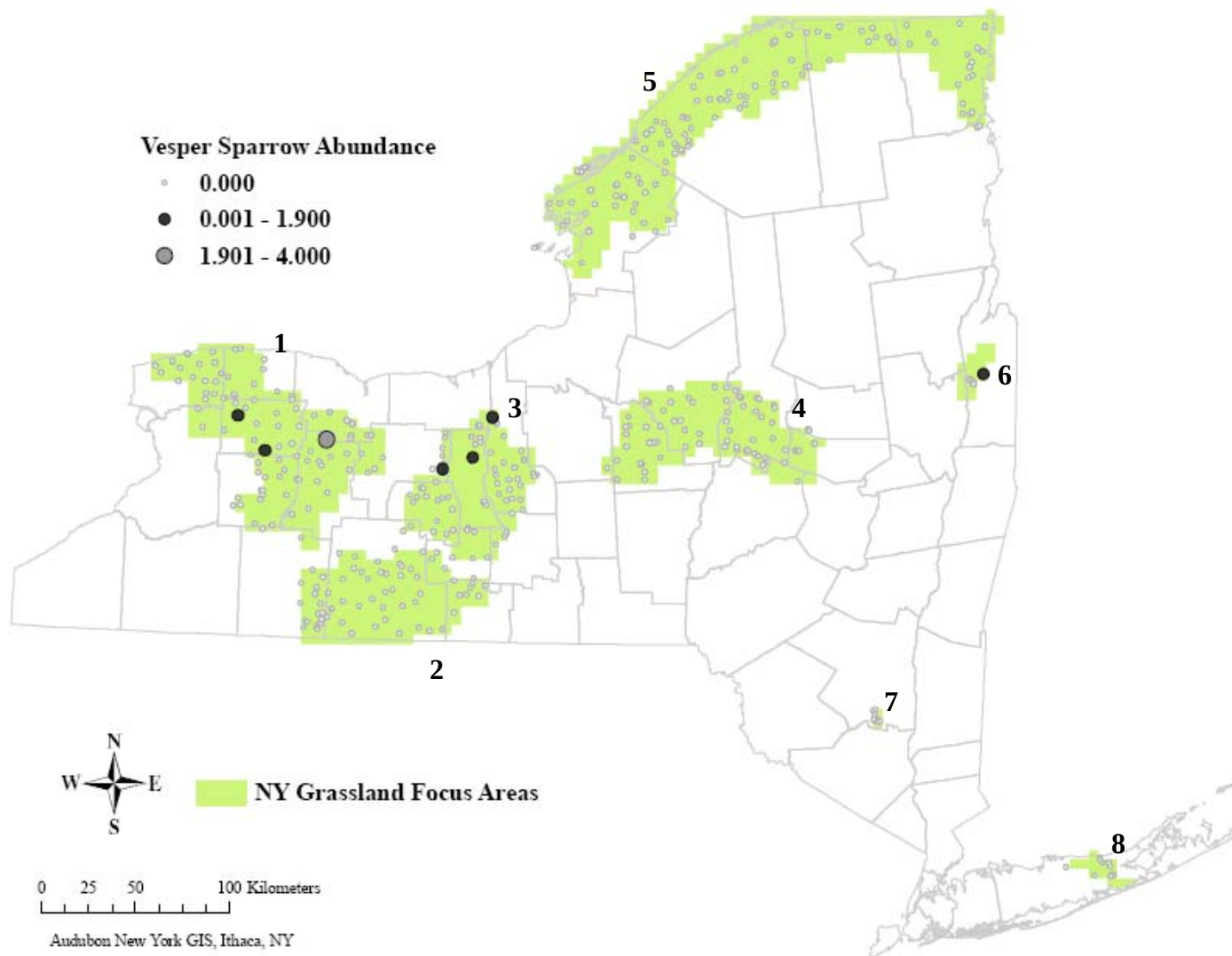


Figure 32. Corrected relative abundance of Vesper Sparrows detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

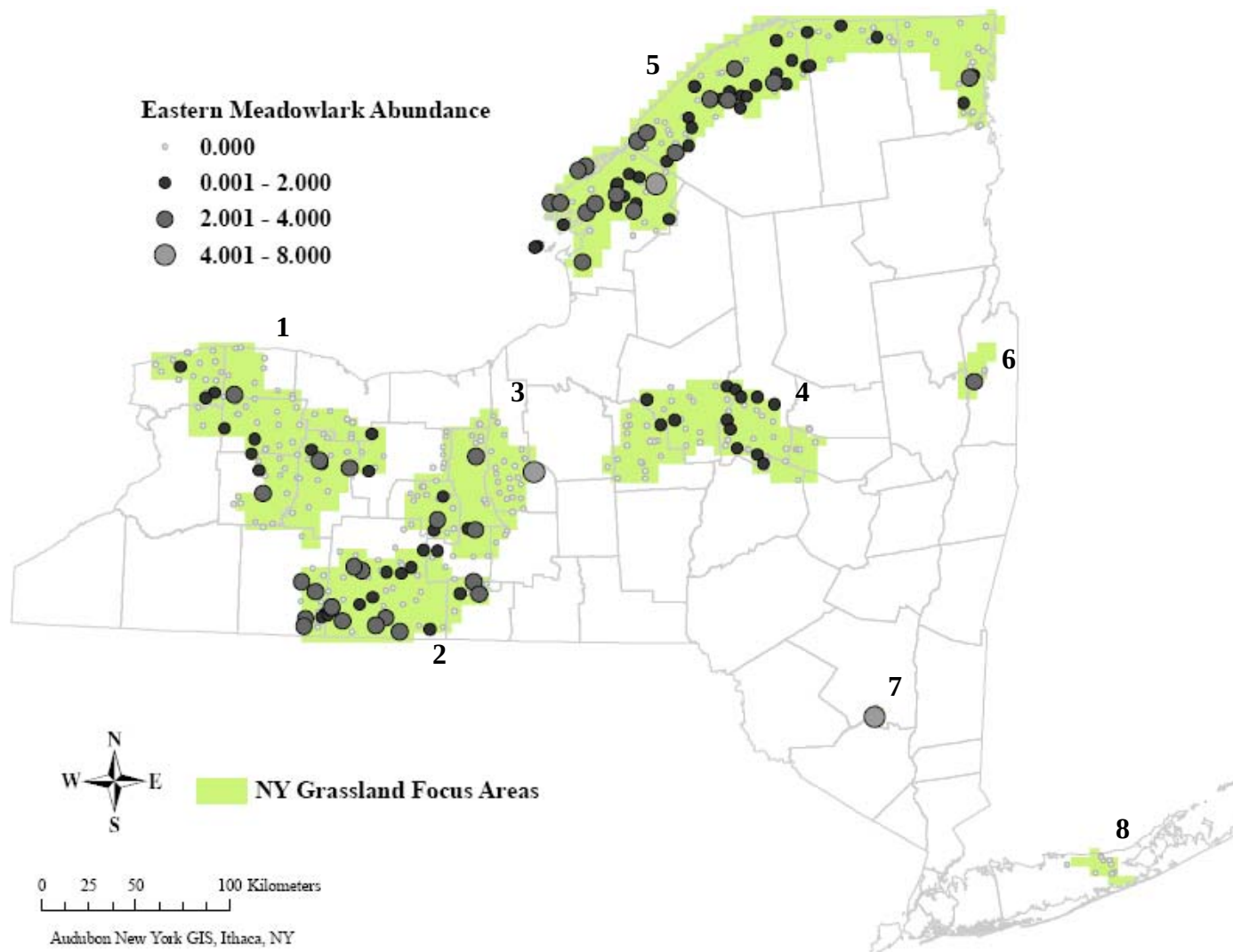


Figure 33. Corrected relative abundance of Eastern Meadowlarks detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

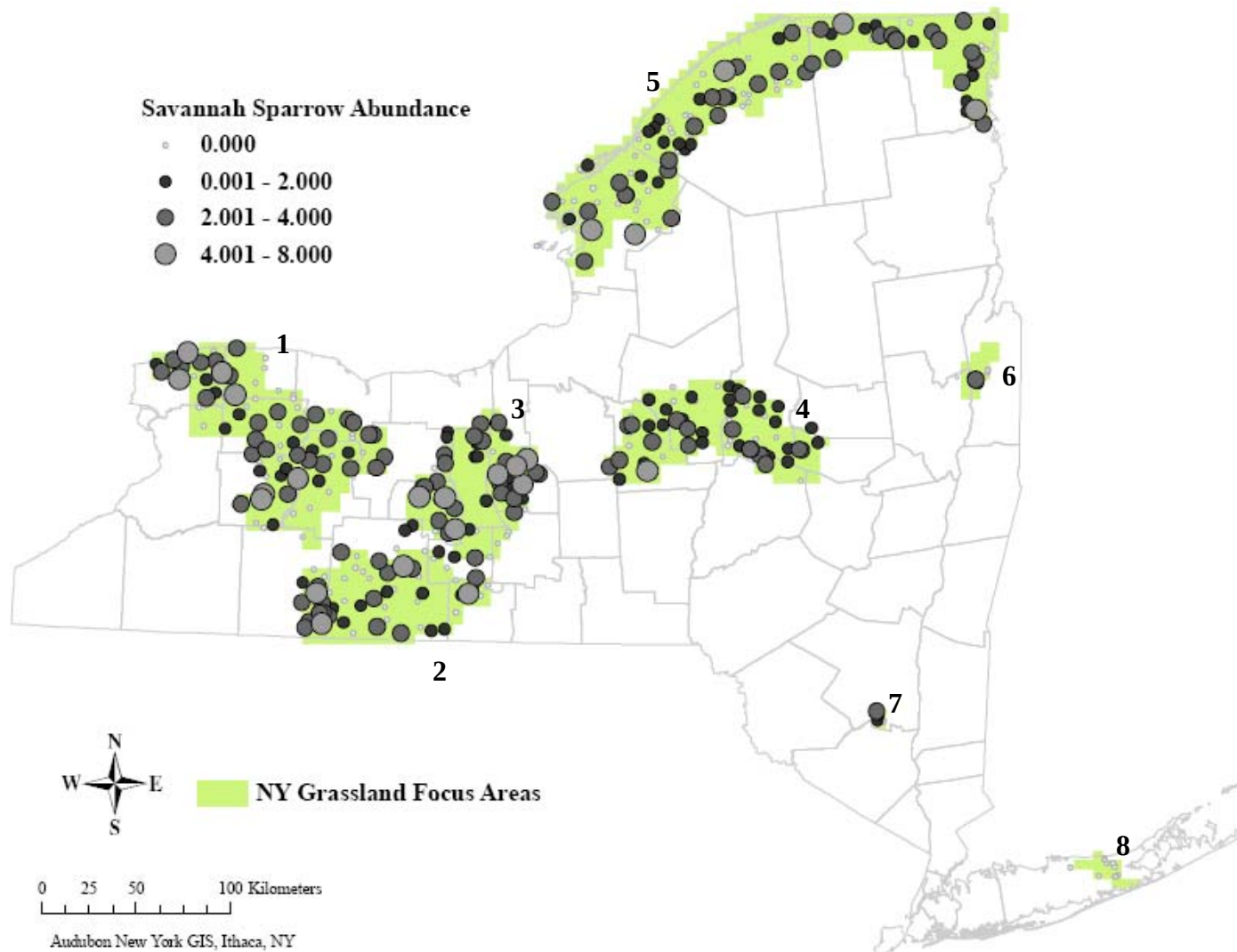


Figure 34. Corrected relative abundance of Savannah Sparrows detected during the 2005 Grassland Breeding Bird Focus Area Surveys.

Appendix D - Potential important areas for wintering Short-eared Owls.

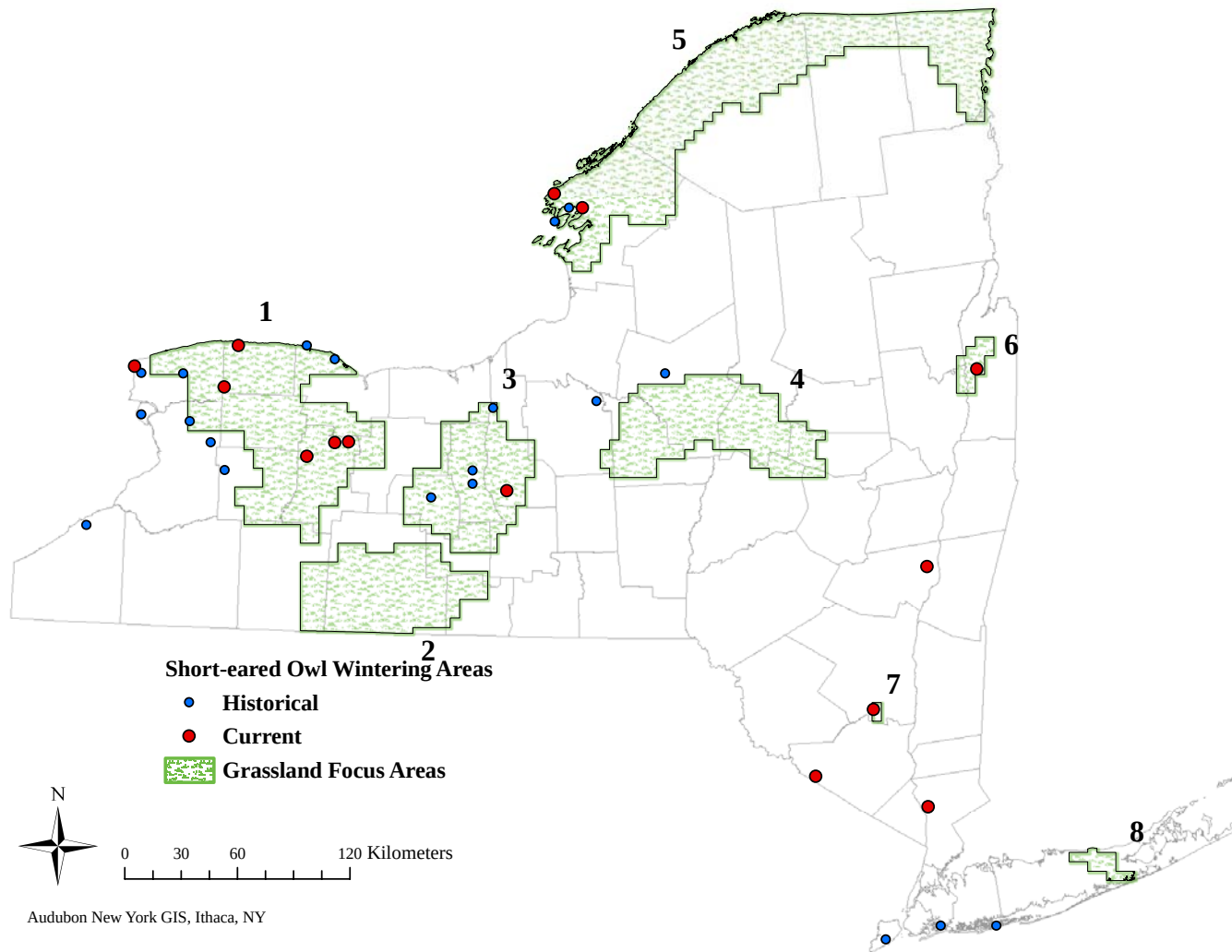


Figure 35. Approximate locations of probable Short-eared Owl wintering areas based on observations from 1995 -2006 (Schneider 2004, 2006).

Appendix E – Estimated and ranked relative abundances of each grassland bird species interpolated across each focus area using kriging.

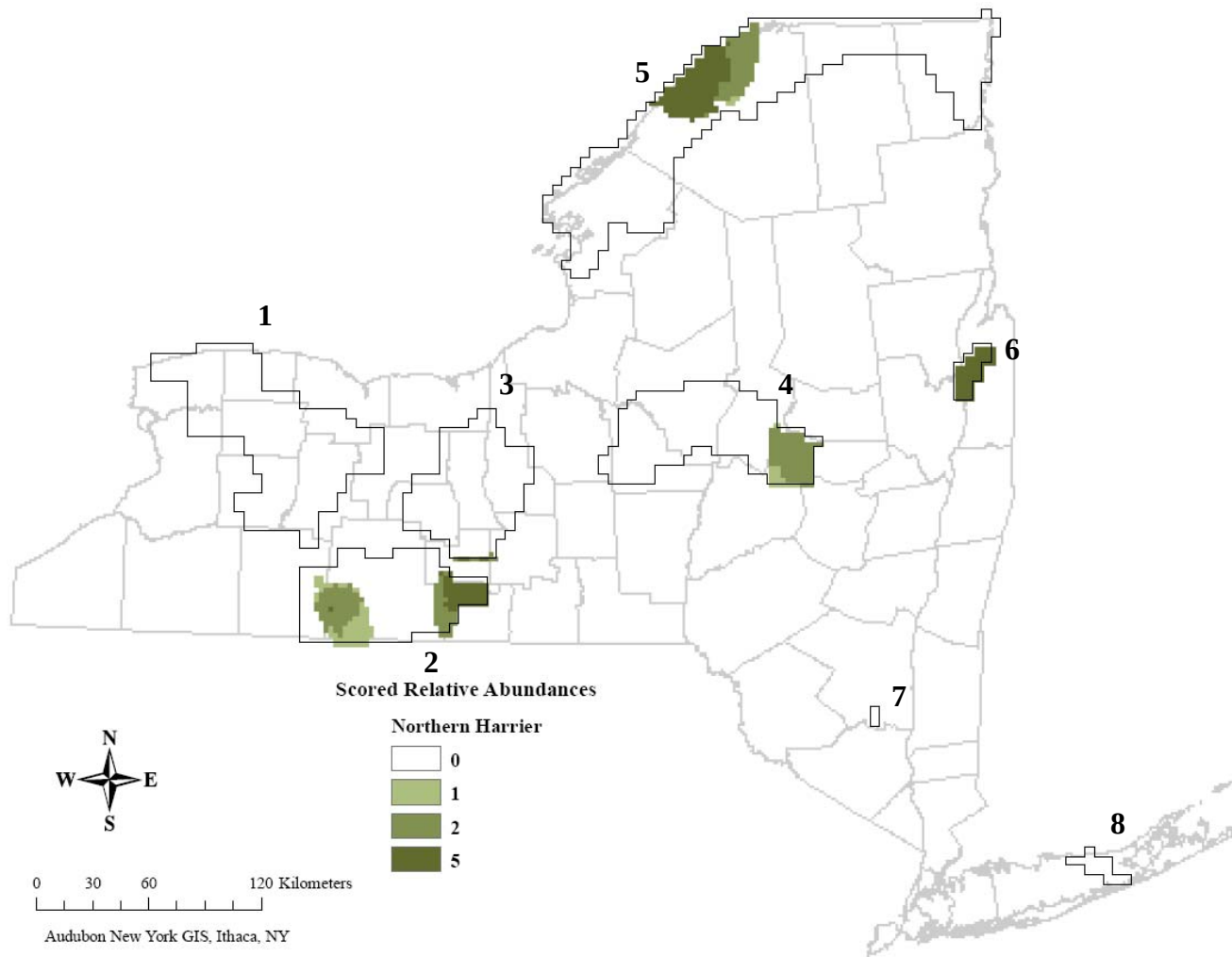


Figure 36. Ranked and scored estimates of Northern Harrier relative abundances interpolated across the Focus Areas using kriging.

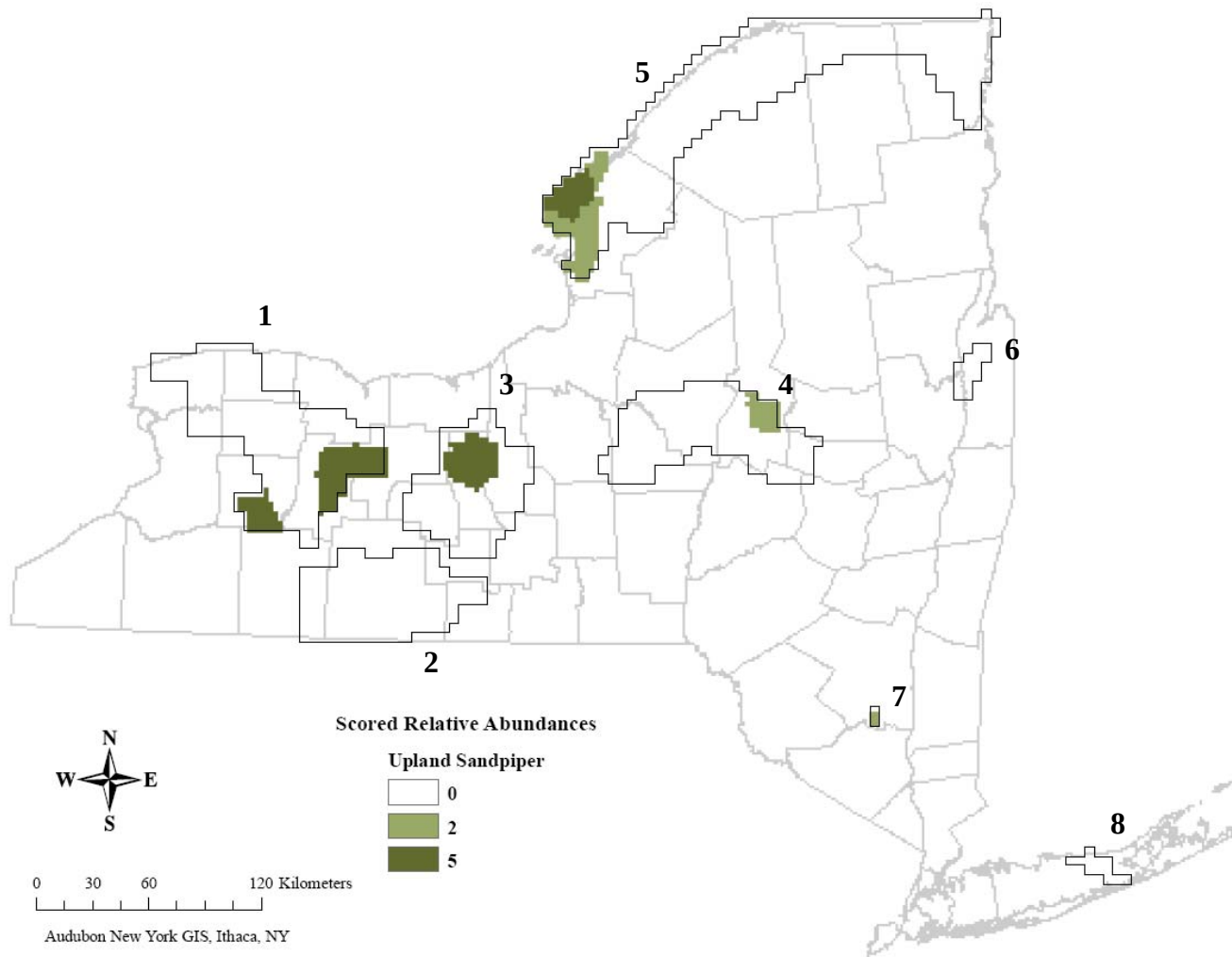


Figure 37. Ranked and scored estimates of Upland Sandpiper relative abundances interpolated across the Focus Areas using kriging.

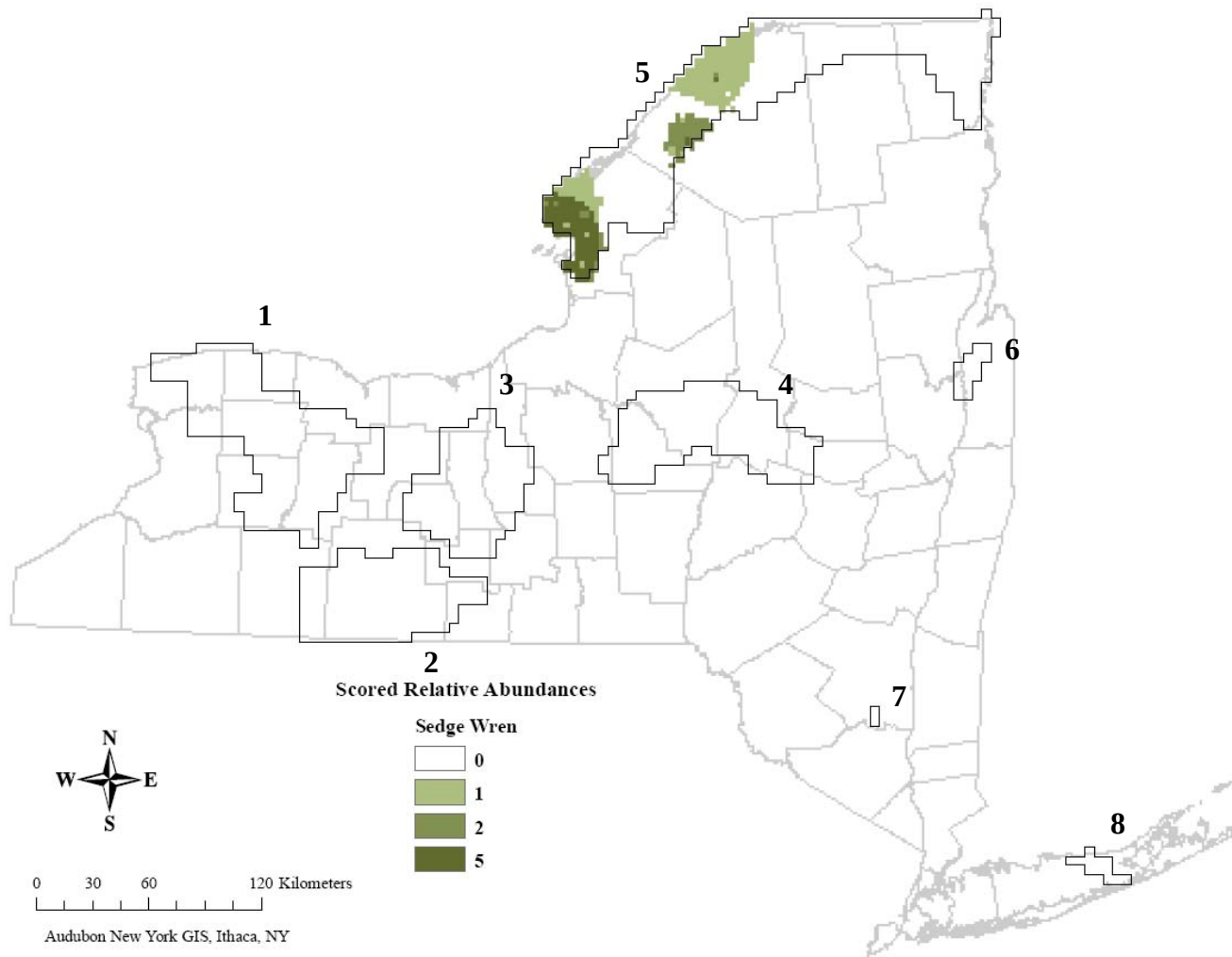


Figure 38. Ranked and scored estimates of Sedge Wren relative abundances interpolated across the Focus Areas using kriging.

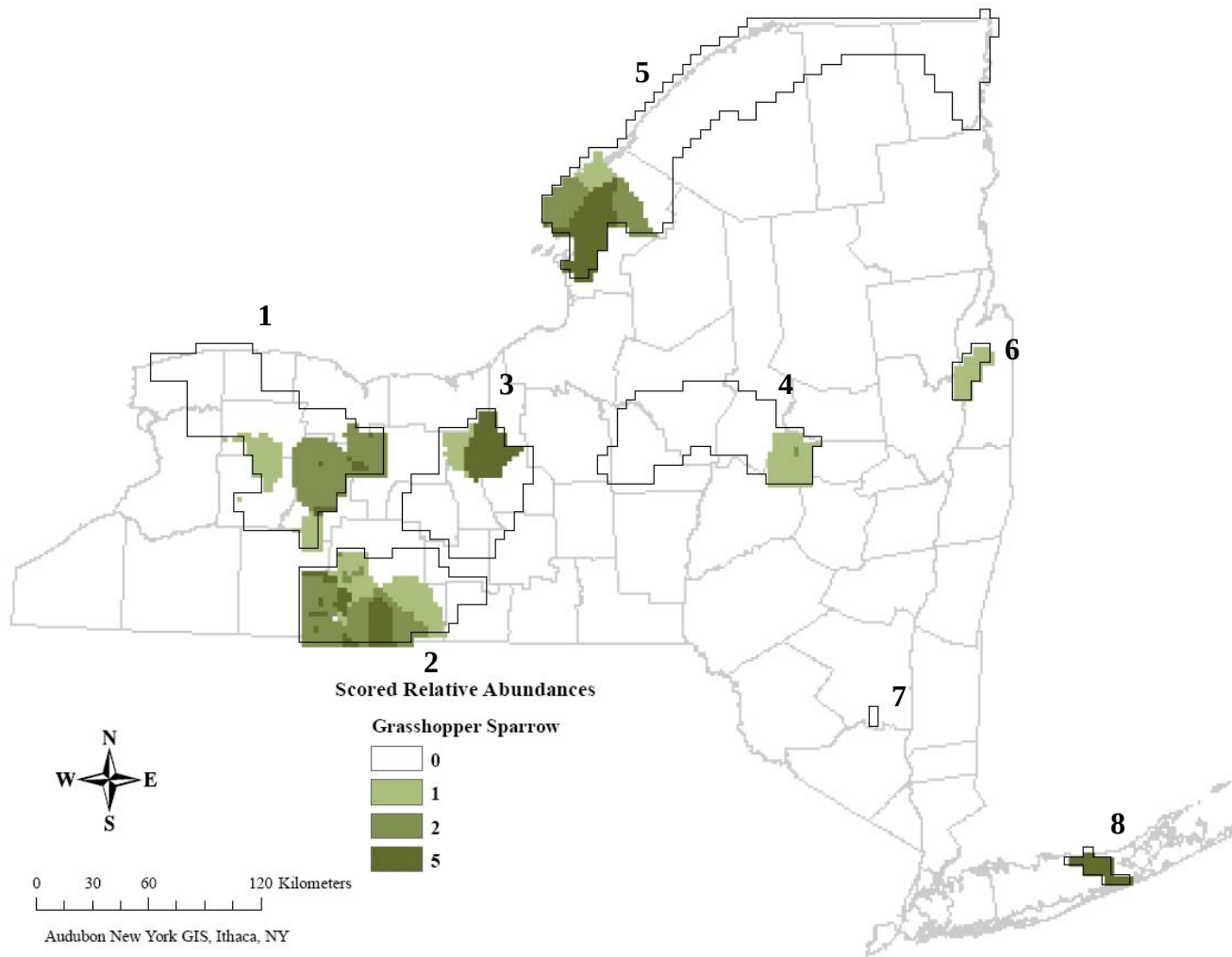


Figure 39. Ranked and scored estimates of Grasshopper Sparrow relative abundances interpolated across the Focus Areas using kriging.

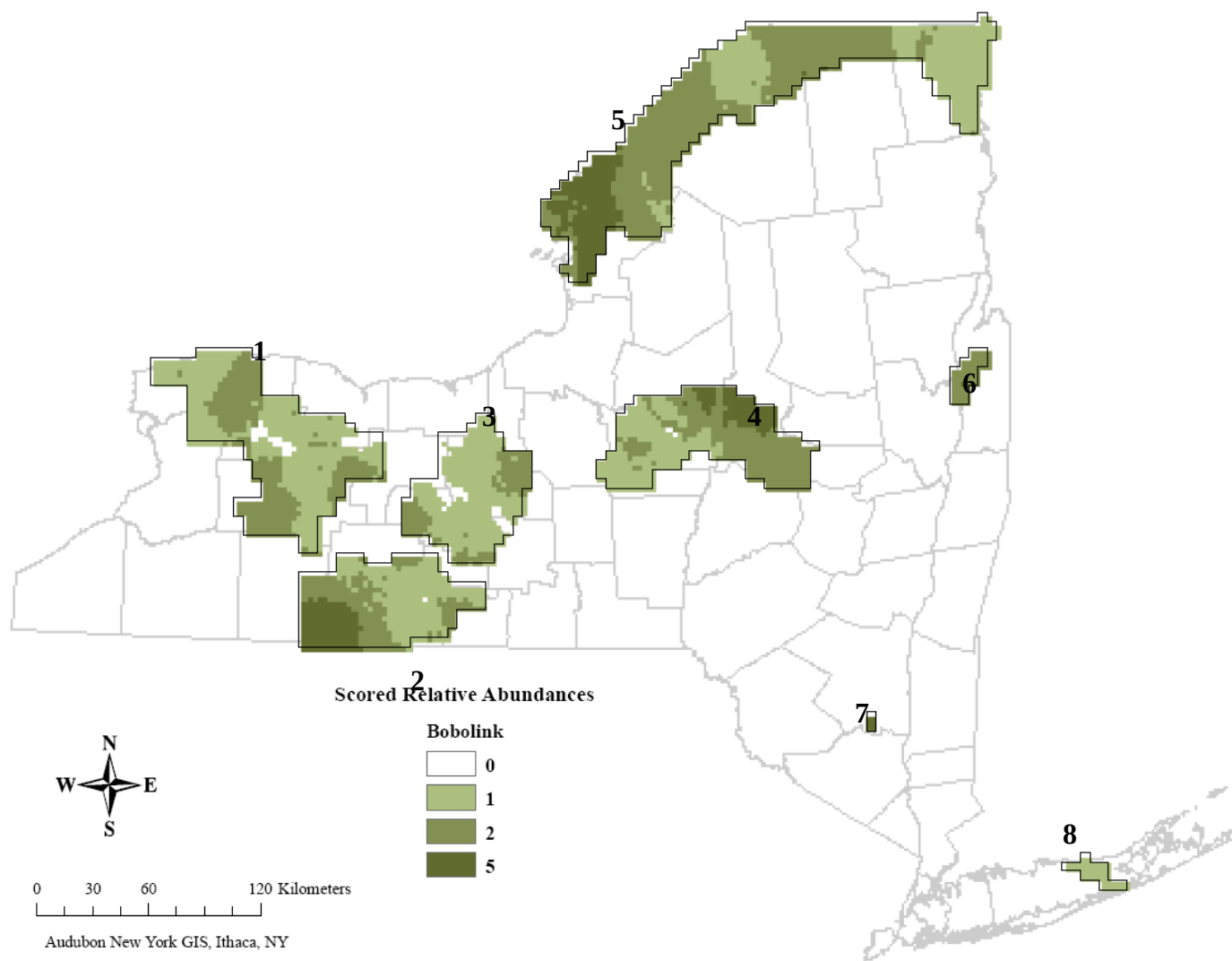


Figure 40. Ranked and scored estimates of Bobolink relative abundances interpolated across the Focus Areas using kriging.

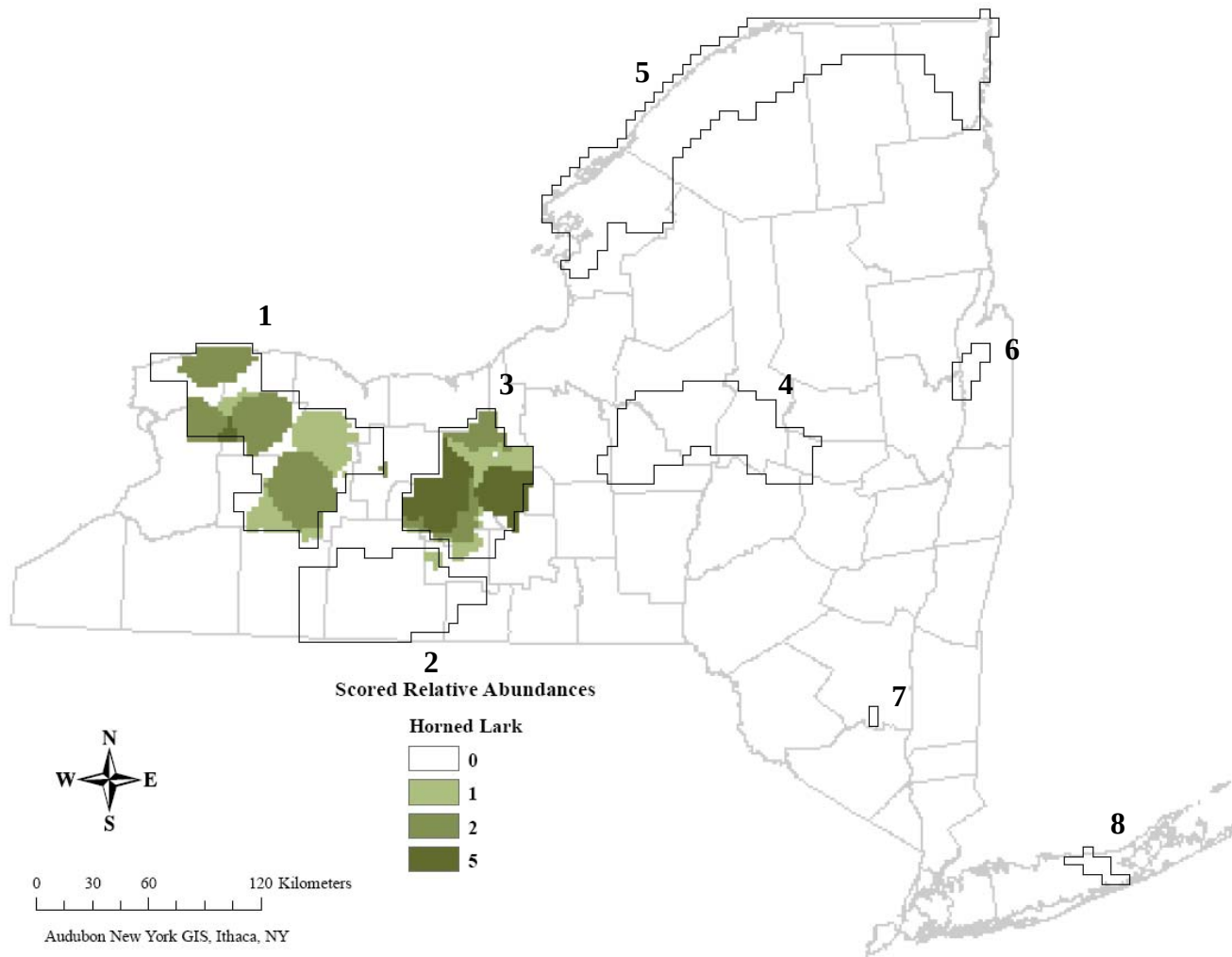


Figure 41. Ranked and scored estimates of Horned Lark relative abundances interpolated across the Focus Areas using kriging.

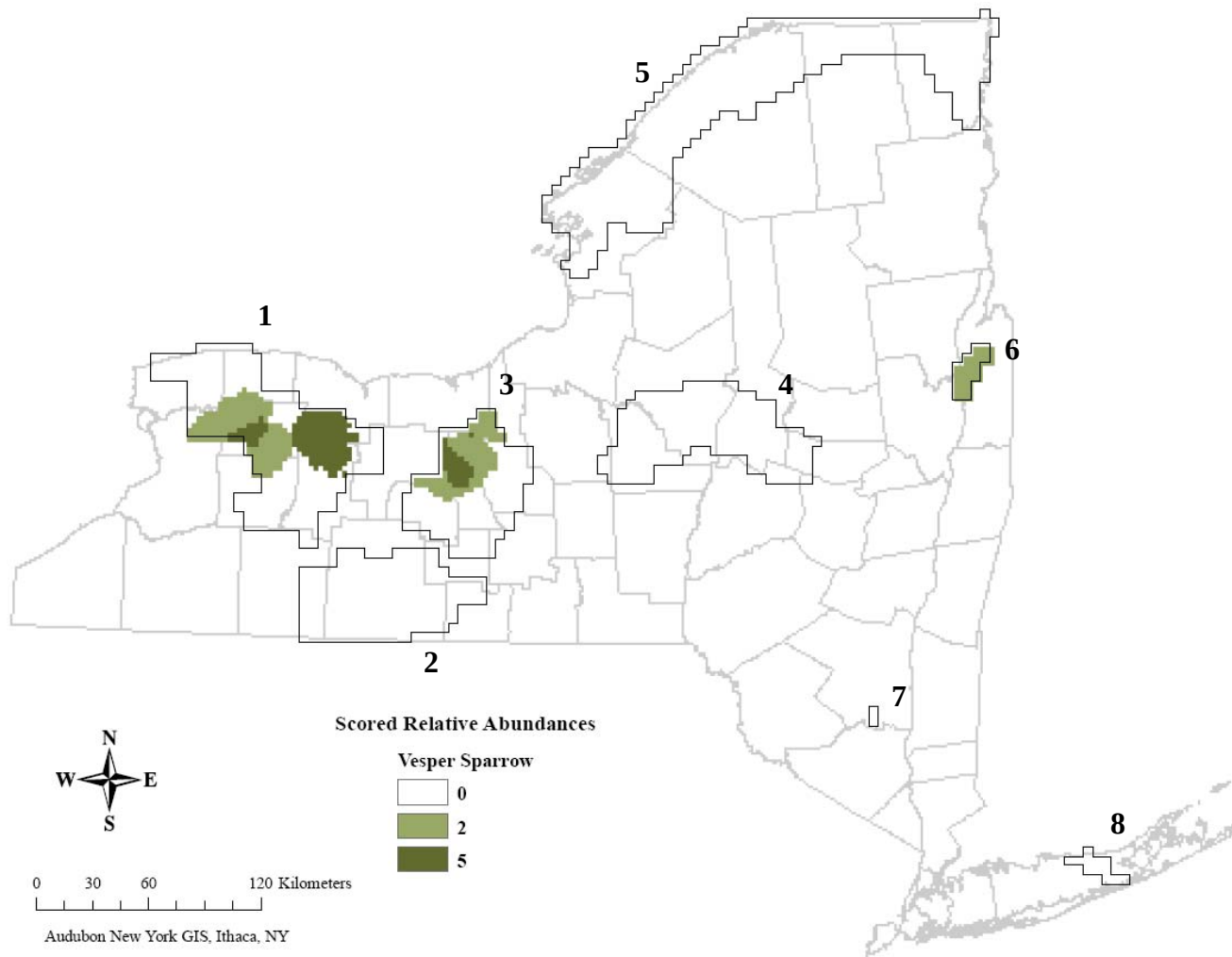


Figure 42. Ranked and scored estimates of Vesper Sparrow relative abundances interpolated across the Focus Areas using kriging.

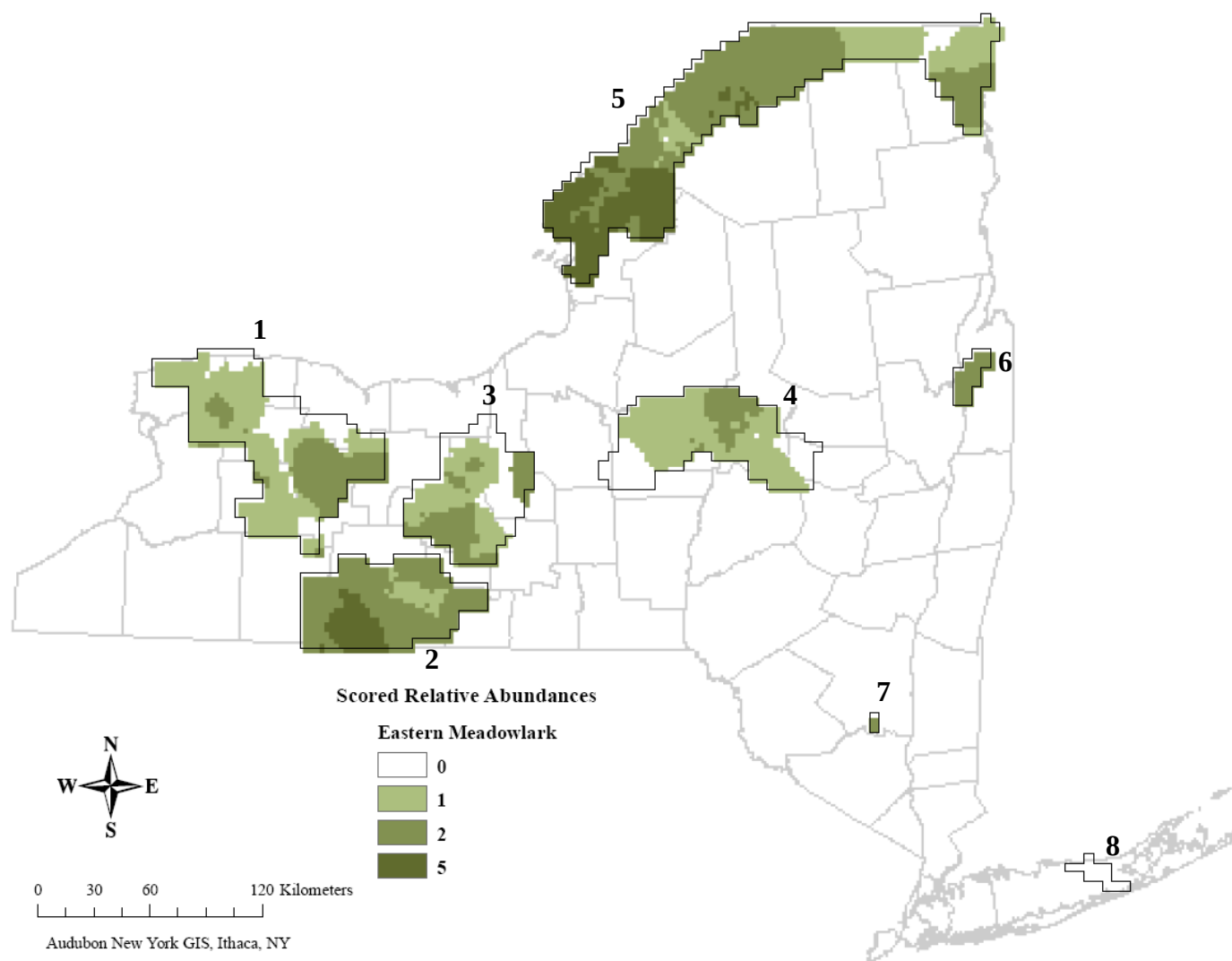


Figure 43. Ranked and scored estimates of Eastern Meadowlark relative abundances interpolated across the Focus Areas using kriging.

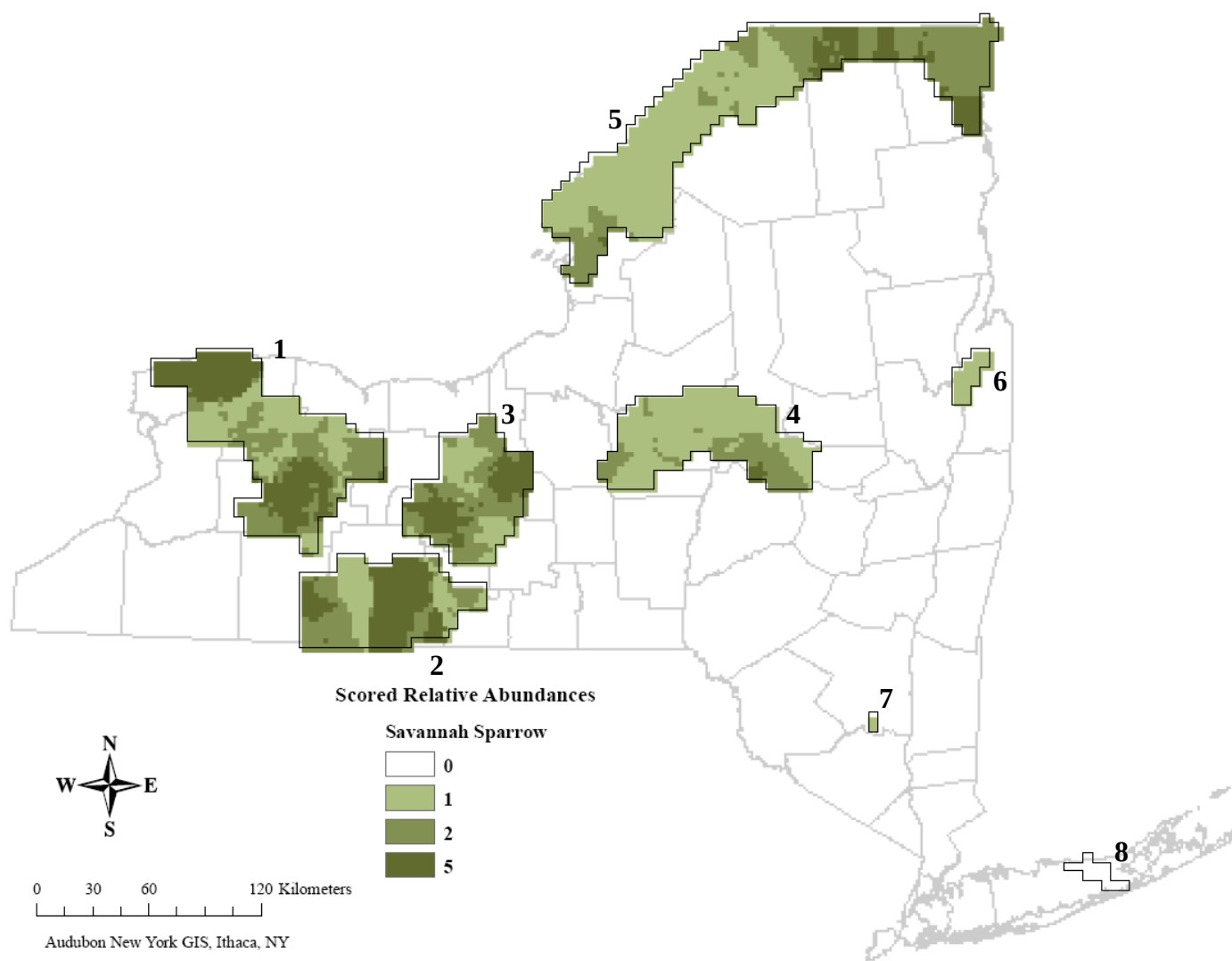


Figure 44. Ranked and scored estimates of Savannah Sparrow relative abundances interpolated across the Focus Areas using kriging.

Appendix F – Maps and keys of publicly-owned lands within the Grassland Focus Areas.

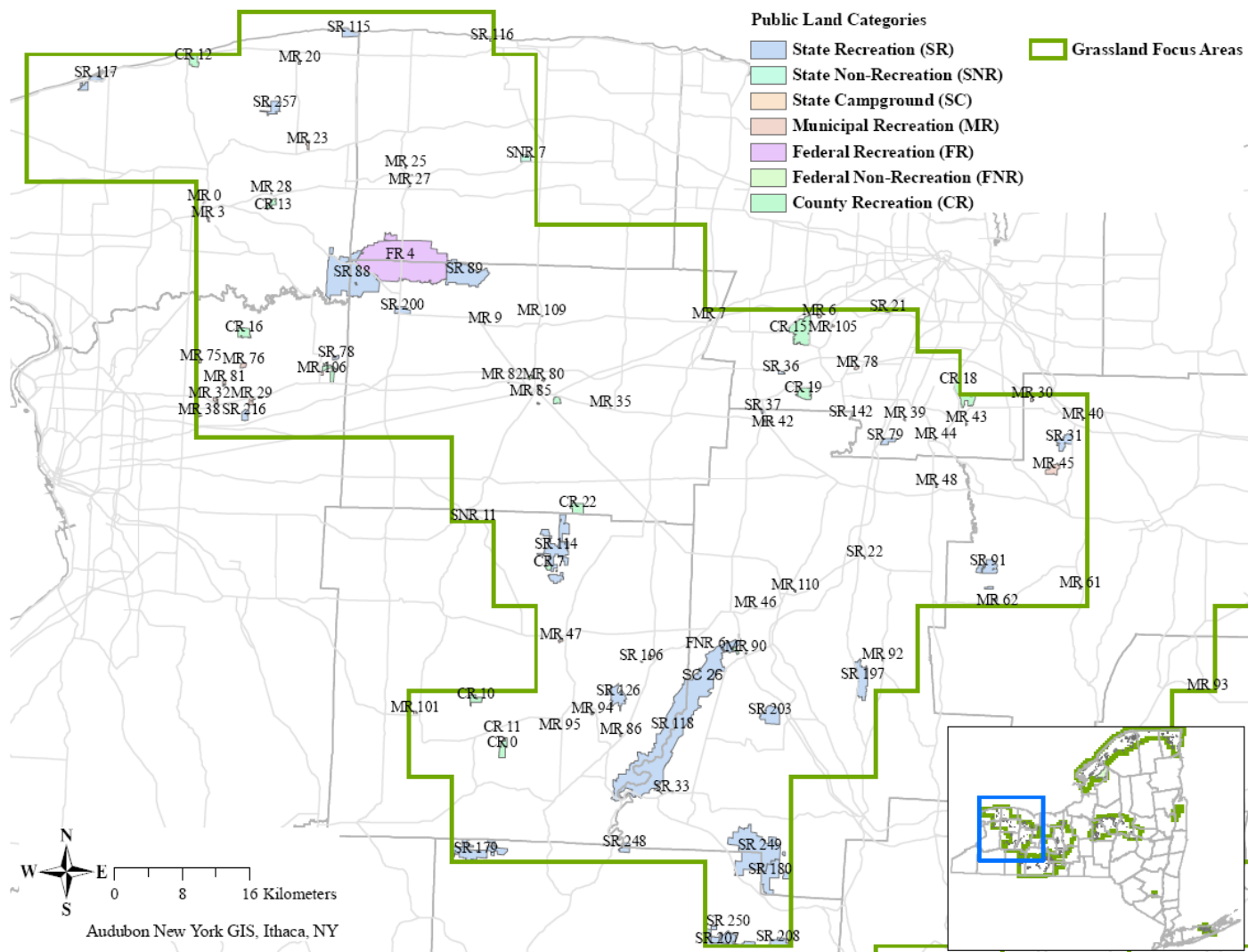


Figure 45. Public lands within focus area 1 (key in Table 12; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 14. Key for map of public lands within focus area 1.

Key	Site Name	Key	Site Name	Key	Site Name
SNR 7	Albion State Correctional Facility	MR 3	Joseph E Kibler Park	MR 80	MacArthur Park
SNR 11	Attica State Correctional Facility	MR 6	Chili Heights Nature Trail	MR 81	Town Place Park
SR 21-22	State Boat Launch	MR 7	Hickory Park	MR 82	Kiwanis Mini Park
SR 31	Ganondagan State Historic Site	MR 9	Elroy Parkins Memorial Town Park	MR 84	Austin Park
SR 33	Genesee Valley Canal Historic Site	MR 20	Somerset Town Park	MR 85	Williams Park
SR 36	Cedar Springs State Fish Hatchery	MR 21	Calvin E Krueger Park	MR 86	Castile Village Park
SR 37	Caledonia State Fish Hatchery	MR 23	Hartland Town Park	MR 89	Centennial Park
SR 78	Onondaga Escarpment Unique Area	MR 25	Gulf Street Park	MR 90	Francis Bellamy Memorial Park
SR 79	Oak Openings State Unique Area	MR 26	State Street Park	MR 91	Lake Street Park
SR 88	Tonawanda State WMA	MR 27	John E Butts Memorial Park	MR 92	Ricky Greene Memorial Park
SR 89	Oak Orchard State WMA	MR 28	Royalton Veterans Park	MR 94	Silver Springs Municipal Park
SR 91	Honeoye Creek State WMA	MR 29	Clarence Town Park	MR 95	Gainesville Village Park
SR 114	Carlton Hill State Multiple Use Area	MR 30	Fishers Park	MR 101	Veterans Park
SR 115	Golden Hill State Park	MR 31	Parker Commons	MR 105	Town Park
SR 116	Lakeside Beach State Park	MR 32	Thompson Road Park	MR 106	Town Park
SR 117	Wilson Tuscarora State Park	MR 33	Kibbe Park	MR 109	Veterans Memorial Park
SR 118	Letchworth State Park	MR 35	Emery Park	MR 110	Highland Park
SR 126	Silver Lake State Park (undeveloped)	MR 38	Harris Hill Park	FR 4	Iroquois National Wildlife Refuge
SR 142	Genesee Valley Greenway State Trail	MR 39	Stonybrook Park	FNR 6	Reservation (US Army Corps of Engineers)
SR 179-181	State Reforestation Area	MR 40	Harlan Fisher Park	FNR 18	VA Medical Center
SR 196	Silver Lake Outlet State WMA	MR 41	Tenant Park	CR 0, 7, 10-11	County Forest
SR 197	Conesus Inlet State WMA	MR 42	Washburn Park	CR 12	Krull County Park
SR 200	John White Memorial Game Farm	MR 43	Semmel Road Sports Facility	CR 13	Royalton Ravine County Park
SR 203	State Reforestation Area	MR 44	Monroe Street Village Park	CR 14	Genesee Valley County Park
SR 206-208	State Reforestation Area	MR 45	Boughton Park	CR 15	Black Creek County Park
SR 216	Tillman Road Swamp State WMA	MR 46	Boyd Parker Park	CR 16	Beeman Creek County Park
SR 248	Mudville State WMA	MR 47	Warsaw Village Park	CR 17	Akron Falls County Park
SR 249	Rattlesnake Hill State WMA	MR 48	Mark Tubbs Memorial Park	CR 18	Mendon Ponds County Park
SR 250	Keaney Swamp State WMA	MR 51	Attica Memorial Park	CR 19	Oatka Creek County Park
SR 257	Hartland Swamp State Wetlands	MR 61	Levi Corser Memorial Park	CR 22	Genesee County Park and Forest
SC 19	Golden Hill SPC	MR 62	Sandy Bottom Park	CR 23	Livingston County Park
SC 26	Letchworth SPC	MR 75	Meadowlakes Park	CR 29	DeWitt County Recreational Facility
MR 0	Dolan Park	MR 76	Clarence Soccer Center		
MR 1	Upton Park	MR 78	Riverbend Park		

WMA stands for Wildlife Management Area; SPC stands for State Park Campground.

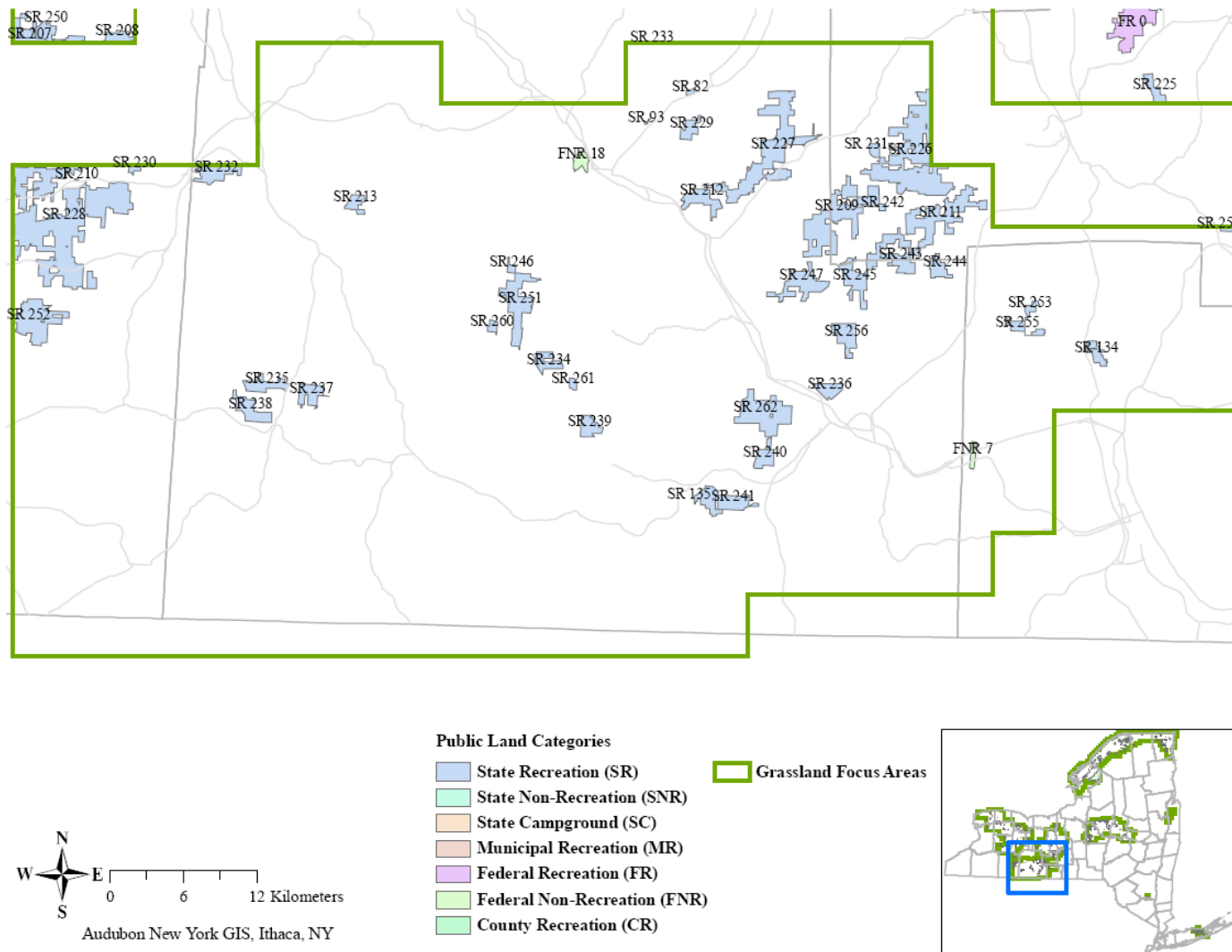


Figure 46. Public lands within focus area 2 (key in Table 13; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 15. Key for map of public lands within focus area 2.

Key	Site Name
SR 82	State Wetland
SR 93	Bath State Fish Hatchery
SR 134	Mark Twain State Park
SR 135	Pinnacle State Park
SR 209-213	State Reforestation Area
SR 226-247	State Reforestation Area
SR 251-256	State Reforestation Area
SR 259	Connecticut Hill State WMA
SR 260	West Cameron State WMA
SR 261	Rathbone State WMA
SR 262	Erwin State WMA
FR 2	Almond Lake (US Army Corps of Engineers)
FNR 7	Big Flats Plant Material Center (US Dept of Agriculture)
FNR 16	Bath National Cemetery
FNR 18	VA Medical Center
WMA stands for Wildlife Management Area	

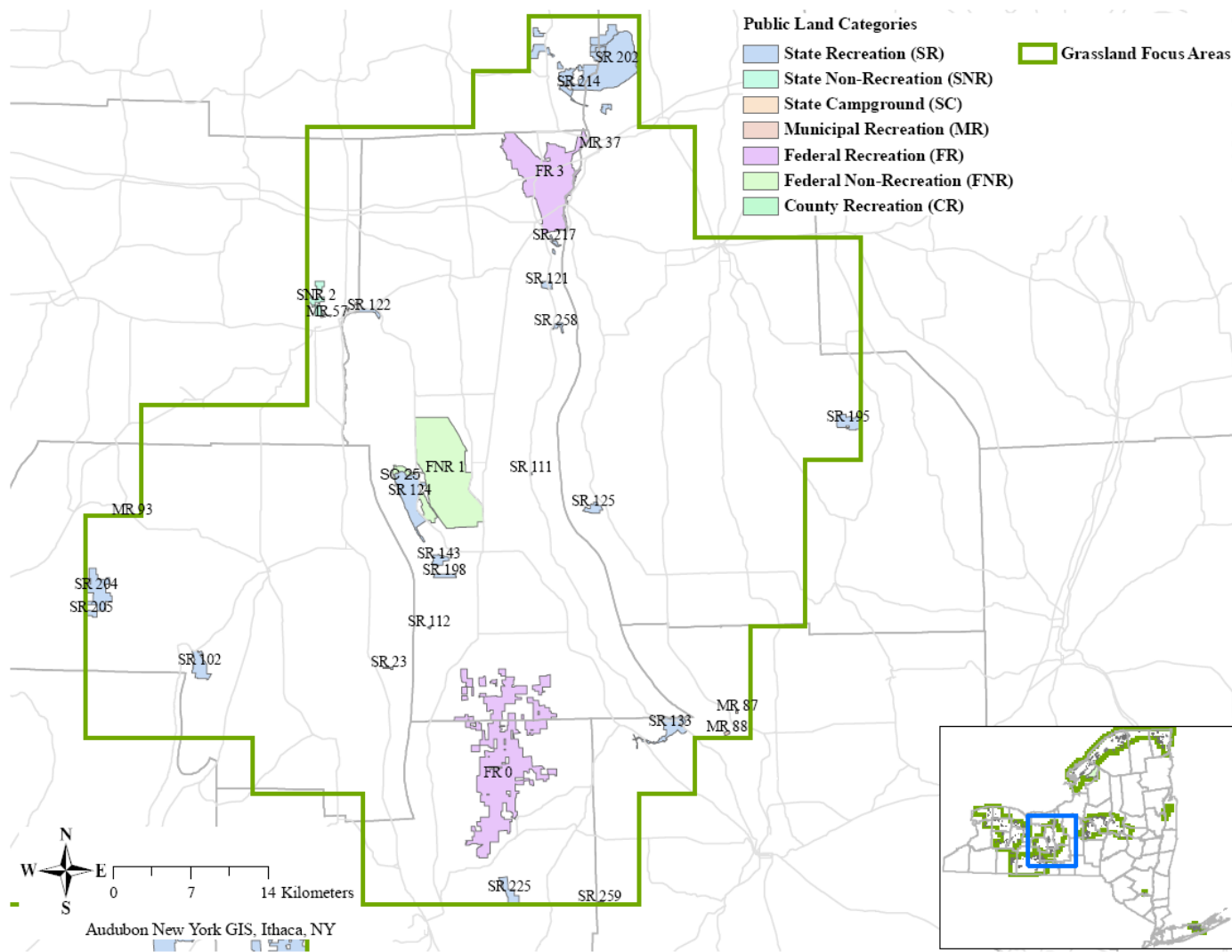


Figure 47. Public lands within focus area 3 (key in Table 14; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 16. Key for map of public lands within focus area 3.

Key	Site Name	Key	Site Name
SNR 2	State Agricultural Experiment Station	SR 259	Connecticut Hill State WMA
SR 23	State Boat Launch	SC 23	Cayuga Lake SPC
SR 102	Keuka Lake State Park	SC 25	Sampson SPC
SR 111	Deans Cove State Marine Park	SC 27	Keuka Lake SPC
SR 112	Lodi Point State Marine Park	SC 28	Taughannock Falls SPC
SR 121	Cayuga Lake State Park	MR 37	Montezuma Memorial Park
SR 122	Seneca Lake State Park	MR 52	Charters Playground
SR 124	Sampson State Park	MR 53	Gulvin Park
SR 125	Long Point State Park	MR 54	Brook Street Park
SR 133	Taughannock Falls State Park	MR 55	Mc Donough Park
SR 143	Bonavista State Golf Course	MR 56	Ridgewood Park
SR 195	State Reforestation Area	MR 57	Lakefront Park
SR 198	Willard State WMA	MR 87	Ludlowville Park
SR 202	Howland Island State WMA	MR 88	Myers Park
SR 204-205	State Reforestation Area	MR 93	Potter Town Park
SR 214	Northern Montezuma Wetlands State WMA	FR 0	Finger Lakes National Forest
SR 217	Cayuga Lake State WMA	FR 3	Montezuma National Wildlife Refuge
SR 225	State Reforestation Area	FNR 1	Seneca Army Depot Activity
SR 258	Canoga Marsh State Wetlands		

WMA stands for Wildlife Management Area; SPC stands for State Park Campground.

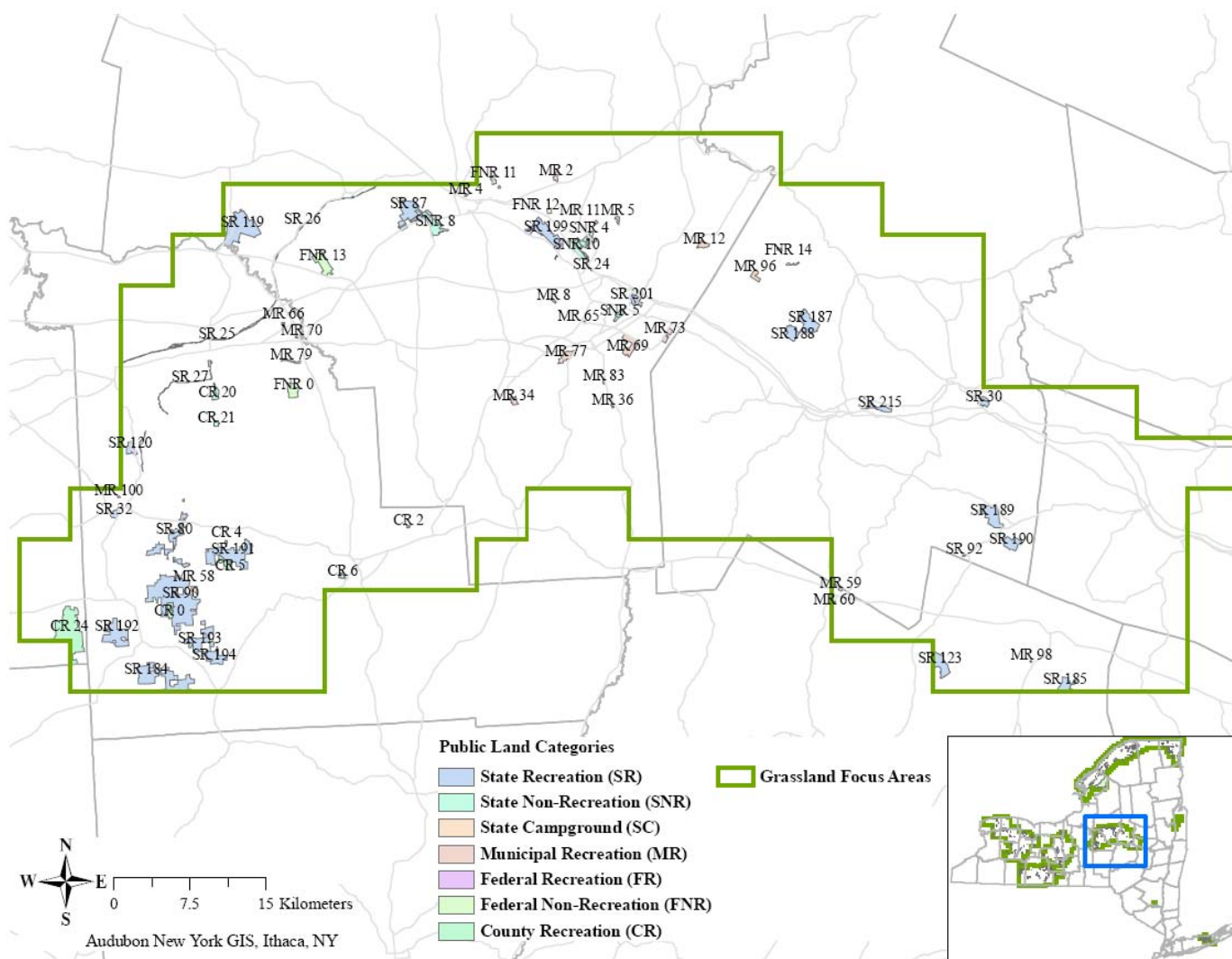


Figure 48. Public lands within focus area 4 (key in Table 15; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 17. Key for map of public lands within focus area 4.

Key	Site Name	Key	Site Name
SNR 4	Central New York State Psychiatric Center	MR 34	Kirkland Town Park
SNR 5	Mohawk Valley State Psychiatric Center	MR 36	Donovan Memorial Park
SNR 8	Oneida State Correctional Facility	MR 49	Lakeland Park
SNR 9	Midstate State Correctional Facility	MR 50	Gypsy Bay Park
SNR 10	Marcy State Correctional Facility	MR 58	Tuscarora Nature Park
SR 24	Lock 20 State Canal Park	MR 59	John D Carey Park
SR 25	Erie Canal State Park	MR 60	Richfield Springs Municipal Park
SR 26	Old Erie Canal State Park	MR 63	Veterans Memorial Playfield
SR 27	Canastota Cazenovia State Trailway	MR 64	Sconondoa Playground
SR 29	Oriskany Battlefield State Historic Site	MR 65	Pietryka Park
SR 30	Herkimer Home State Historic Site	MR 66	Harmon Field
SR 32	Lorenzo State Historic Site	MR 67	F T Proctor Park
SR 80	Nelson Swamp State Unique Area	MR 68	Maxwell Field
SR 87	Rome State WMA	MR 69	Roscoe Conkling Park
SR 90	Tioughnioga State WMA	MR 70	Du Ross Conservancy
SR 92	Van Hornesville State Fish Hatchery	MR 71-73	T R Proctor Park
SR 119	Verona Beach State Park	MR 74	Oneida Castle Village Park
SR 120	Chittenango Falls State Park	MR 77	Sherrill Brook Park
SR 123	Glimmerglass State Park	MR 79	Mount Hope Park
SR 184-194	State Reforestation Area	MR 83	Washington Mills Athletic Park
SR 199	Oriskany Flats State WMA	MR 96	Schuyler Town Park
SR 201	Utica Marsh State WMA	MR 98	Village Park
SR 215	Lock 18 State WMA	MR 100	Lakeside Park
SC 21	Verona Beach SPC	MR 108	Allen Park
SC 22	Chittenango Falls SPC	FR 1	Fort Stanwix National Monument
SC 24	Glimmerglass SPC	FNR 0	USAF Stockbridge Test Annex
MR 2	Floyd Town Park	FNR 11	USAF Rome Research Site (Laboratory)

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MR 4	Pinti Field	FNR 12	USA Floyd Test Site
MR 5	Toby Road Park	FNR 13	USAF Verona Test Site
MR 8	Whitestown Town Park	FNR 14	USAF Newport Test Annex
MR 10	Frank J Robak Park	CR 0, 2-6, 8-9	County Forest
MR 11	Link Park	CR 20	Oxbow County Park
MR 12	Wilderness Park	CR 21	Nichols Pond County Park
MR 13	Little League Park	CR 24	Highland County Forest

WMA stands for Wildlife Management Area; SPC stands for State Park Campground.

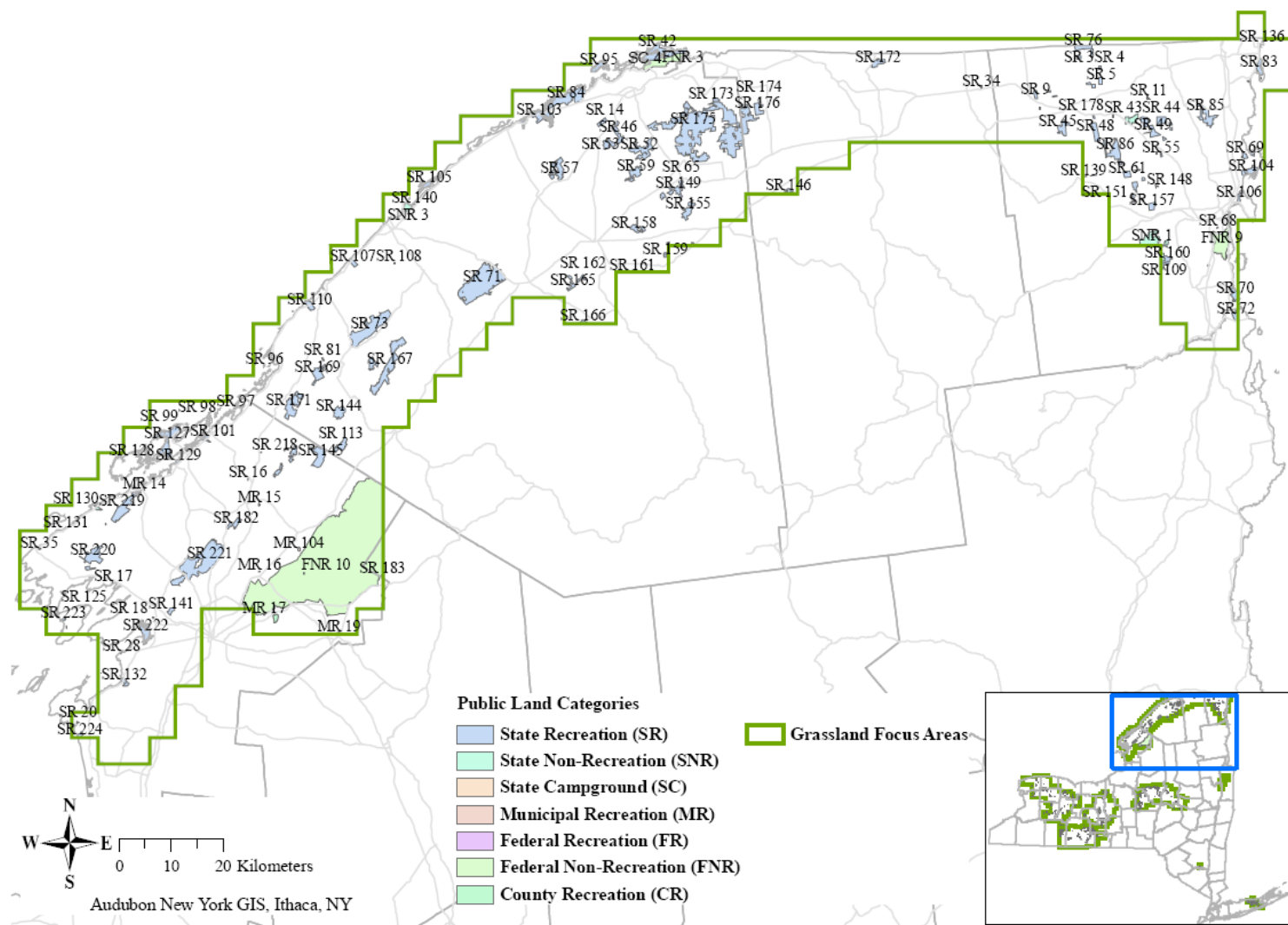


Figure 49. Public lands within focus area 5 (key in Table 16; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 18. Key for map of public lands within focus area 5.

Key	Site Name	Key	Site Name	Key	Site Name
SNR 1	State Land (Restricted)	SR 100	Dewolf Point State Park	SC 1	Burnham Point SPC
SNR 3	St Lawrence State Psychiatric Center	SR 101	Keewaydin State Park	SC 2	Long Point SPC
SNR 6	Cape Vincent State Correctional Facility	SR 103	Coles Creek State Park	SC 3	Westcott Beach SPC
SR 1-14	State Forest Preserve	SR 104	Point Au Roche State Park	SC 4	Robert Moses SPC
SR 15-20	State Boat Launch	SR 105	Galop Island State Park	SC 5	Coles Creek SPC
SR 28	Sackets Harbor Battlefield Historic Site	SR 106	Cumberland Bay State Park	SC 6	Cumberland Bay SPC
SR 34	Chateaugay State Fish Hatchery	SR 107	St Lawrence State Park	SC 7	Eel Weir SPC
SR 35	Cape Vincent Fisheries Research Station	SR 108	Eel Weir State Park	SC 8	Macomb Reservation SPC
SR 42	Robert Moses State Park	SR 109	Macomb Reservation State Park	SC 9	Ausable Point SPC
SR 43-65	State Reforestation Area	SR 110	Jacques Cartier State Park	SC 10	Jacques Cartier SPC
SR 68	Imperial Dam Fish Ladder (State)	SR 113	Yellow Lake State Multiple Use Area	SC 11	Cedar Island SPC
SR 69	Montys Bay State WMA	SR 125	Long Point State Park	SC 12	Kring Point SPC
SR 70	Ausable Marsh State WMA	SR 127	Wellesley Island State Park	SC 13	Mary Island SPC
SR 71	Upper and Lower Lakes State WMA	SR 128	Canoe and Picnic Point State Park	SC 14	Dewolf Point SPC
SR 72	Wickham Marsh State WMA	SR 129	Grass Point St Park	SC 15	Keewaydin SPC
SR 73	Fish Creek Marsh State WMA	SR 130	Cedar Point State Park	SC 16	Wellesley Island SPC
SR 74	Cranberry Creek State WMA	SR 131	Burnham Point State Park	SC 17	Canoe and Picnic Point SPC
SR 75	Collins Landing State WMA	SR 132	Westcott Beach State Park	SC 18	Grass Point St Park Cmpgrd
SR 76	The Gulf State Unique Area	SR 136-141	State Land	MR 14	Gordon D Cerow Recreation Park
SR 77	Gull Island State Unique Area	SR 144-178	State Reforestation Area	MR 15	Santaway Village Park
SR 81	State Wetland	SR 178	State Reforestation Area	MR 16	Jack Williams Community Park
SR 83	Kings Bay State WMA	SR 182-183	State Reforestation Area	MR 17	Maple Street Park
SR 84	Wilson Hill State WMA	SR 218	Indian River State WMA	MR 18	Dexter Memorial Field
SR 85	Lake Alice State WMA	SR 219	French Creek State WMA	MR 19	Carthage Recreation Park
SR 86	Lewis Preservation State WMA	SR 220	Ashland Flats State WMA	MR 104	Town Park
SR 95	Croil Island State Park	SR 221	Perch River State WMA	FNR 3	US DOT St Lawrence Seaway

Continued on next page

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SR 96 Cedar Island State Park

SR 97 Kring Point State Park

SR 98 Mary Island State Park

SR 99 Waterson Point State Park

SR 222 Dexter Marsh State WMA

SR 223 Point Peninsula State WMA

SR 224 Black Pond State WMA

SC 0 Cedar Point SPC

FNR 5 US Coast Guard Station

FNR 9 Plattsburgh USAF Base (Closed)

FNR 10 Fort Drum (US Army)

CR 0-1 County Forest

WMA stands for Wildlife Management Area; SPC stands for State Park Campground.

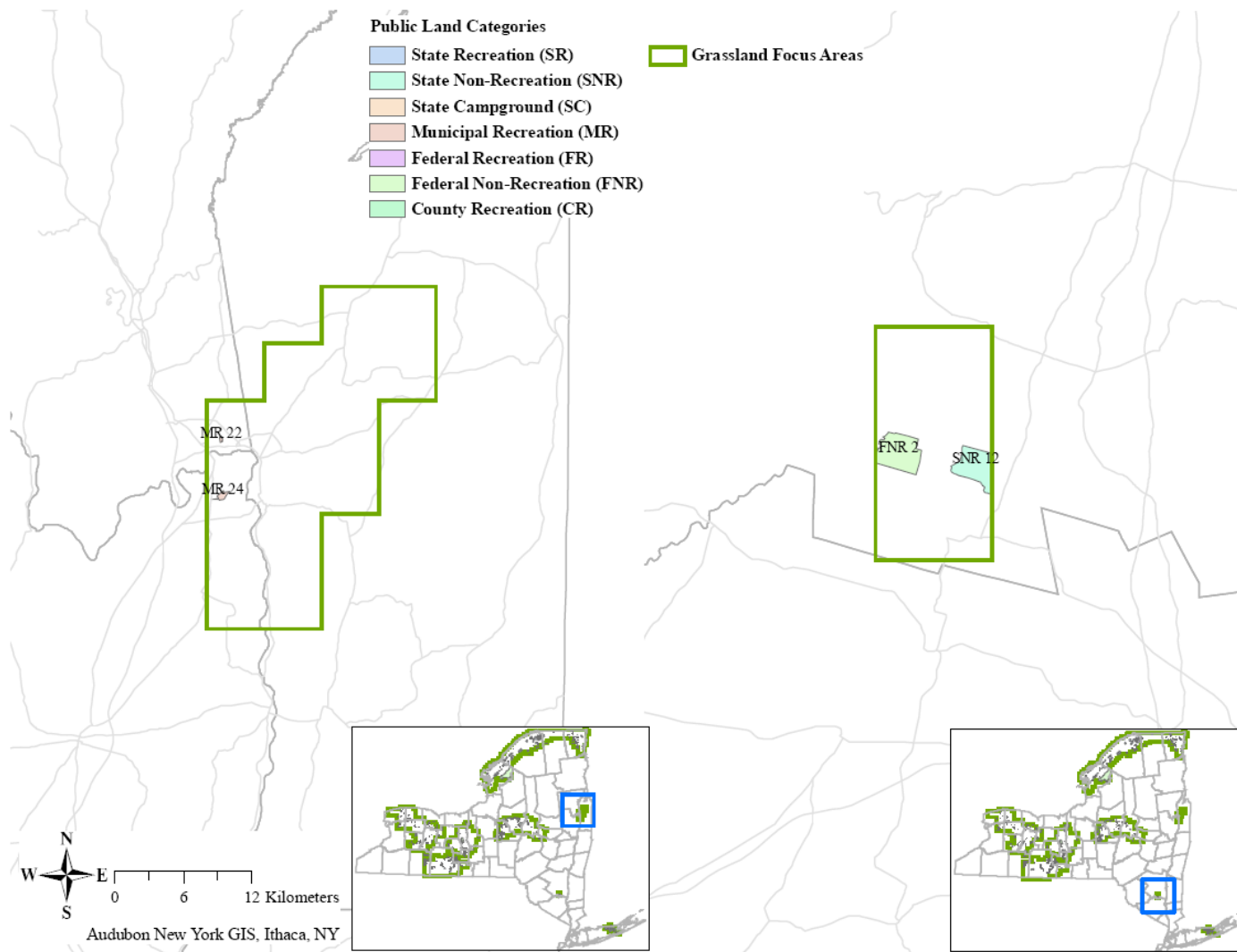


Figure 50. Public lands within focus areas 6 and 7 (key in Table 17; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 19. Key for map of public lands within focus areas 6 and 7.

<u>Focus Area 7</u>		<u>Focus Area 6</u>	
Key	Site Name	Key	Site Name
SNR 12	Wallkill State Correctional Facility	MR 22	East Field Park
FNR 2	Ganiff Training Complex (US Army)	MR 24	Town Of Moreau Recreation Park

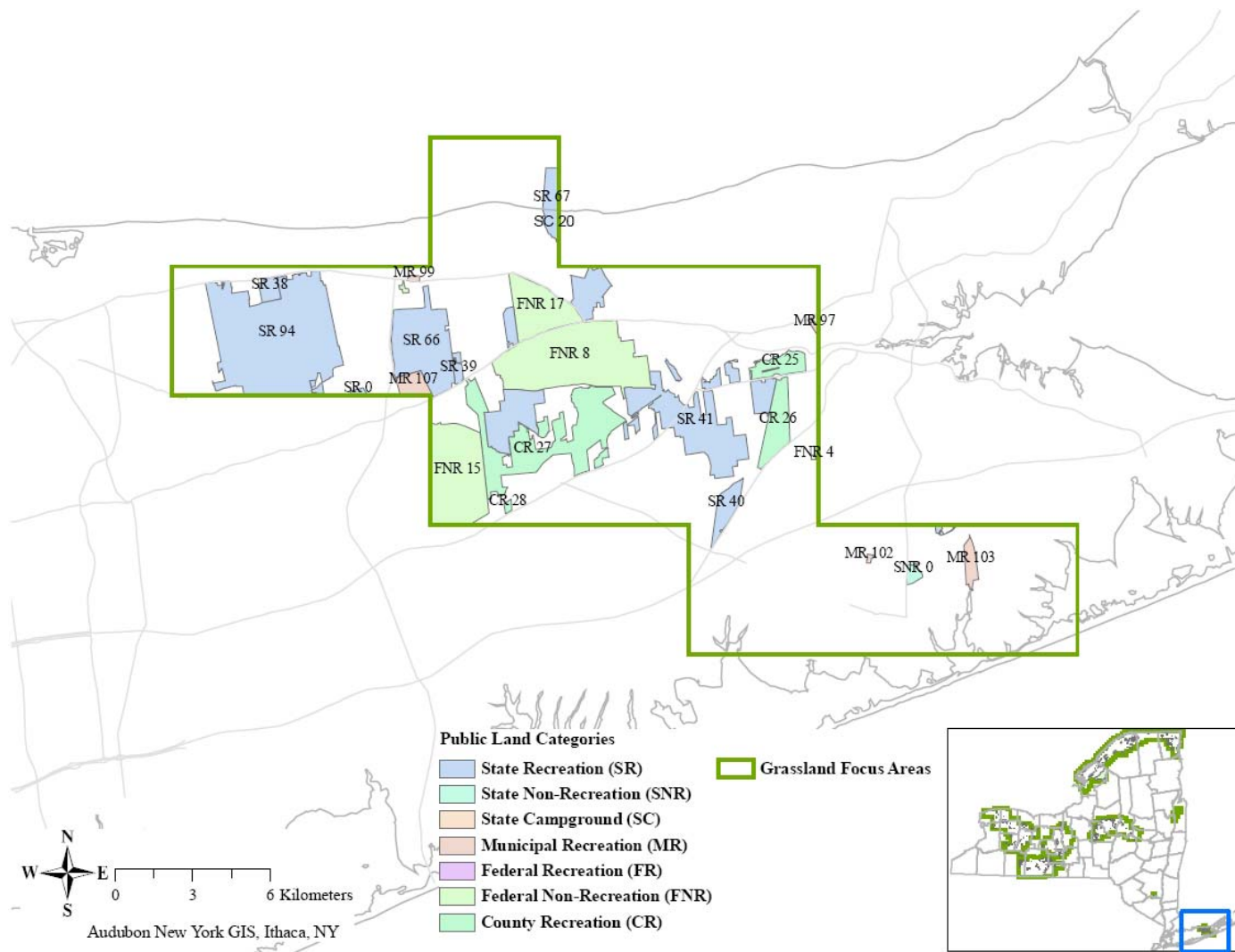


Figure 51. Public lands within focus area 8 (key in Table 18; from NYS Accident Location Information System-Public Land Boundaries 2006).

Table 20. Key for map of public lands within focus area 8

Key	Site Name
SNR 0	New York Air National Guard
SC 20	Wildwood SPC
SR 0	Middle Island State Environmental Education Center
SR 38	Rocky Point State Pine Barrens Preserve
SR 39	State Pine Barrens Preserve
SR 40	Manorville State Pine Barrens Preserve
SR 41	Long Island State Pine Barrens Preserve
SR 66	Brookhaven State Park (undeveloped)
SR 67	Wildwood State Park
SR 94	Rocky Point State Natural Resource Management Area
MR 97	Stotzky Memorial Park
MR 99	Town Recreational Center
MR 102	Hampton West Park
MR 103	Quogue Wildlife Refuge
MR 107	Firemens Memorial Park
FNR 4	US Dept Of Transportation (FAA)
FNR 8	Naval Weapons Industrial Reserve Plant
FNR 15	US Reservation (Brookhaven National Laboratory)
FNR 17	Calverton National Cemetery
CR 25	Peconic Bog County Park
CR 26	Peconic Hills County Park
CR 27	Robert Cushman Murphy County Park
CR 28	RC Murphy County Park
SC 20	Wildwood SPC
SPC stands for State Park Campground.	

Appendix G – Land trusts operating locally, statewide, and nationally in New York (list maintained by the Land Trust Alliance at www.lta.org).

Land Trust Alliance Member Land Trusts Operating Locally

Name	Main Office Location
Adirondack Land Trust/Nature Conservancy *S&P	Keene Valley, NY
Agricultural Stewardship Association *S&P	Greenwich, NY
Avalonia Land Conservancy *S&P	Old Mystic, CT
Bergen Swamp Preservation Society *S&P	Bergen, NY
Bronx Land Trust *S&P	Bronx, NY
Brooklyn Queens Land Trust *S&P	Brooklyn, NY
Cape Vincent Village Green, Inc. *S&P	Cape Vincent, NY
Cazenovia Preservation Foundation *S&P	Cazenovia, NY
Chautauqua Watershed Conservancy *S&P	Jamestown, NY
Chenango Land Trust *S&P	Norwich, NY
Columbia Land Conservancy *S&P	Chatham, NY
Cragsmoor Conservancy, Inc. *S&P	Cragsmoor, NY
Delaware Highlands Conservancy *S&P	Hawley, PA
Dutchess Land Conservancy *S&P	Millbrook, NY
Eddy Foundation *S&P	Essex, NY
Esopus Creek Conservancy *S&P	Saugerties, NY
Finger Lakes Land Trust *S&P	Ithaca, NY
Friends of the Outlet *S&P	Dresden, NY
Genesee Land Trust *S&P	Rochester, NY
Genesee Valley Conservancy *S&P	Geneseo, NY
Greene Land Trust *S&P	Cairo, NY
Harlem Valley Rail Trail *S&P	Millerton, NY
Heritage Conservancy *S&P	Doylestown, PA
Hudson Highlands Land Trust *S&P	Garrison, NY
Indian River Lakes Conservancy *S&P	Redwood, NY
Keep Conservation Foundation *S&P	New York, NY
Lake Champlain Land Trust *S&P	Burlington, VT
Lake George Land Conservancy *S&P	Bolton Landing, NY
Manhattan Land Trust *S&P	New York, NY
Mendon Foundation, Inc. *S&P	Mendon, NY
Mianus River Gorge Preserve, Inc. *S&P	Bedford, NY
Mohawk Hudson Land Conservancy *S&P	Slingerlands, NY
Mohonk Preserve *S&P	New Paltz, NY
Mount Sinai Heritage Trust, Inc. *S&P	Mount Sinai, NY
Nassau Land Trust *S&P	East Norwich, NY
Natural Lands Trust *S&P	Media, PA
North Elba Land Conservancy *S&P	Lake Placid, NY
North Salem Open Land Foundation *S&P	North Salem, NY
North Shore Land Alliance *S&P	Old Westbury, NY

Oblong Land Conservancy, Inc.	*S&P	Pawling, NY
Ontario Bays Initiative	*S&P	Chaumont, NY
Open Space Institute	*S&P	New York, NY
Orange County Land Trust	*S&P	Middletown, NY
Otsego Land Trust, Inc.	*S&P	Cooperstown, NY
Peconic Land Trust	*S&P	Southampton, NY
Placid Lake Foundation	*S&P	Lake Placid, NY
Post-Morrow Foundation	*S&P	Brookhaven, NY
Pound Ridge Land Conservancy	*S&P	Pound Ridge, NY
Putnam County Land Trust	*S&P	Brewster, NY
Queensbury Land Conservancy	*S&P	Queensbury, NY
Rensselaer-Taconic Land Conservancy	*S&P	Troy, NY
Rev. Linnette C. Williamson Memorial Park Association	*S&P	New York, NY
Rondout-Esopus Land Conservancy	*S&P	High Falls, NY
Saratoga P.L.A.N.	*S&P	Saratoga Springs, NY
Save the County Land Trust	*S&P	Syracuse, NY
Scenic Hudson, Inc.	*S&P	Poughkeepsie, NY
Schodack Area Land Trust	*S&P	East Schodack, NY
Schoharie Land Trust, Inc.	*S&P	Cobleskill, NY
Serpentine Art and Nature Commons, Inc.	*S&P	Staten Island, NY
Shawangunk Conservancy	*S&P	Accord, NY
Somers Land Trust	*S&P	Somers, NY
Southern Madison Heritage Trust	*S&P	Hamilton, NY
St. Lawrence Land Trust	*S&P	Canton, NY
Teatown Lake Reservation, Inc.	*S&P	Ossining, NY
The Catskill Center for Conservation and Development	*S&P	Arkville, NY
The Trust for Public Land, Mid-Atlantic Regional Office	*S&P	New York, NY
Thousand Islands Land Trust	*S&P	Clayton, NY
Three Village Community Trust, Inc.	*S&P	Setauket, NY
Tug Hill Tomorrow Land Trust	*S&P	Watertown, NY
Wallkill Valley Land Trust, Inc.	*S&P	New Paltz, NY
Westchester Land Trust	*S&P	Bedford Hills, NY
Western New York Land Conservancy	*S&P	East Aurora, NY
Williamstown Rural Lands Foundation	*S&P	Williamstown, MA
Wilton Wildlife Preserve & Park	*S&P	Gansevoort, NY
Winnakee Land Trust	*S&P	Rhinebeck, NY
Woodstock Land Conservancy	*S&P	Woodstock, NY
Yorktown Land Trust	*S&P	Yorktown Heights, NY

Land Trust Alliance Member Land Trusts Operating Statewide

North American Land Trust	*S&P	Chadds Ford, PA
Northeast Wilderness Trust	*S&P	Boston, MA
The Nature Conservancy, New York State Office	*S&P	Albany, NY

Land Trust Alliance Member Land Trusts Operate Nationally

[American Farmland Trust](#) *S&P

[American Land Conservancy](#) *S&P

[The Conservation Fund](#)

[The Great Outdoors Conservancy](#) *S&P

[The Humane Society of the United States Wildlife Land Trust](#) *S&P

[National Park Trust](#) *S&P

[The Nature Conservancy](#) *S&P

[Trust for Public Land](#) *S&P

[Wilderness Land Trust](#) *S&P

*S&P indicates adoption of [Land Trust Standards & Practices](#), guidelines for responsible and ethical operation of a land trust.

Attachment F

New York  State

 State Agencies

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Best Management Practices for Grassland Birds

These Best management practices (BMPs) should be used to guide habitat management on grassland habitat or habitat to be converted into grassland. The management goal of these BMPs is to maintain



the open, grassy conditions necessary for successful breeding by grassland birds and to avoid disturbance to nesting birds. Techniques to be used may include seeding, mowing, and removal of trees and shrubs. Typically, land should be managed for a minimum of 5 years to begin showing benefits for grassland birds.

Although developed for the Landowner Incentive Program (LIP) for Grassland Protection and Management, these BMPs can be applied to any sizable grassland to benefit grassland birds. These BMPs will form the basis for specific 5-year Site Management Plans for landowners selected to receive technical and financial assistance through LIP.

Target Bird Species

The management recommendations in these BMPs are aimed towards grassland birds. Target birds are those listed as "probably" or "confirmed" breeding in the 2005 [Breeding Bird Atlas](#) (BBA) Block where the subject field is located. Birds registered in BBA blocks adjacent to the block where the field is located could colonize the subject field once the habitat becomes suitable for them. View the list of ["at-risk" grassland bird species](#) that are a high priority for protection and management.

Timing

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Bureau of Wildlife
625 Broadway
Albany, NY 12233-4754
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This Page Covers



All of
New York State

1. Nesting Restrictions: Grasslands should not be disturbed by mowing, planting, harvesting, driving, or by any other mechanized means from 23 April to 15 August, inclusive (the nesting season) of every contract year.
2. Wintering Restrictions: Excessive disturbance such as frequent high speed snowmobile, ATV, or motorized vehicle operation or loud noises such as fireworks should be avoided from 1 November to 1 March, inclusive for the protection of wintering raptors.
3. Mowing window: All mowing must be done between 16 August and 1 October.

Preliminary Site Management

1. Between 16 August and 1 November of the first year of management, reduce fragmentation of the grassland by eliminating hedgerows, shrubs, and trees within the boundaries of the LIP field.
2. Between 16 August and 1 November and to the extent possible, eliminate woody vegetation, especially hedgerows within and bordering the field. Hedgerows split up habitat and function as predator corridors for coyote, foxes, cats, raccoons, etc; thereby degrading the overall quality of the site for breeding.

Management Schedule

General: The landowner or land manager should mow as early within the mowing window as circumstances and conditions allow to prevent the maturation and release of seeds from forbs, especially the species listed below. At least 1/3 of mowed vegetation should be chopped up and left on site after each mowing. Thatch will provide nesting habitat for birds as well as attracting moles and voles which are prey for raptors and owls.

Invasive or Undesirable Species: The following species, if present, may require spot-mowing after August 15th of any year to control their encroachment into the field: spotted or brown knapweed, pale swallow-wort, burdock, or goldenrods.

Years One through Five:

1. Conduct Preliminary Site Management as described above.
2. Divide the field into 1/3s (approximately) if total acreage is 30 acres or more, or into 1/2s if field is less than 30 acres. Mow the first 1/2 or 1/3 of the grassland to a height no shorter than 6 inches (8 inches is preferred). Rotate the portion mown every year.

Additional Recommendations

Prevent disturbance of nesting birds by feral or outdoor cats,
dogs, fireworks, recreational vehicles or ATVs, etc.

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Attachment G

PLANT MATERIALS TECHNICAL NOTE

**Table 1. Seed Mixtures and Soil Suitability Recommendations for Wildlife
(Introduced Species) ¹**

Seed Mixtures	Drainage Class				
	EWD	WD	MWD	SPD	PD
Orchardgrass 5 lbs/ac and Hard Fescue 6 lbs/ac plus Ladino Clover (upright improved varieties) 2 lbs/ac and Red Clover 2 lbs/ac or 3 lbs/ac Birdsfoot trefoil (upright varieties i.e. Pardee, Norcen or viking)		X	X		
Timothy 3 lbs/ac and Orchardgrass 4 lbs/ac and Bromegrass 3 lbs/ac plus Ladino Clover (upright improved varieties) 2 lbs/ac and Red Clover 2 lbs/ac or 3 lbs/ac Birdsfoot trefoil (upright varieties i.e. Pardee Norcen or viking)		X	X	X	
Timothy 3 lbs/ac and Orchardgrass 4 lbs/ac and Red top .5 lb/ac plus Ladino Clover (upright improved varieties) 2 lbs/ac and Red Clover 2 lbs/ac or 3 lbs/ac Birdsfoot trefoil (upright varieties i.e. Pardee) Norcen or viking)		X	X	X	X
Timothy 5 lbs/ac and Orchardgrass 5 lbs/ac plus Ladino Clover (upright improved varieties) 2 lbs/ac and Red Clover 2 lbs/ac or 3 lbs/ac Birdsfoot trefoil (upright varieties i.e. Pardee Norcen or viking)		X	X	X	

¹ Use early varieties of the grasses when available to facilitate earlier stem elongation providing earlier cover.
These seeding recommendations are for wildlife purposes and not for critical area and highly erodible areas.

**Table 2. Seed Mixtures and Soil Suitability Recommendations for Wildlife
(Native Warm Season Grass Species) ¹**

Grass seeding rates are PURE LIVE SEED ². These seeding rates ASSUME drilling seed and proper weed control. If a drill is NOT used, increase total grass seeding rate by 20%.

Seed Mixtures	Drainage Class				
	EWD	WD	MWD	SPD	PD
Switchgrass 2 lbs/ac and ³ Deertongue 4 lbs/ac and Eastern gamagrass 5 lbs/ac optional *Native Forbs		X	X	X	X
Big bluestem 2 lbs/ac and Indiangrass 3 lbs/ac and Little bluestem 3 lbs/ac and Deertongue 2 lbs/ac optional *Native Forbs	X	X			
Big bluestem 4 lbs/ac and Indiangrass 4 lbs/ac and Switchgrass 2 lbs/ac optional *Native Forbs	X	X	X	X	
Big bluestem 3 lbs/ac and Indiangrass 3 lbs/ac and Deertongue 3 lbs/ac and Switchgrass 2 lbs/ac optional *Native Forbs		X	X	X	X

* Utilizing 5 species from the list. Rates based on seed size and weight and cost consideration.

¹ These seeding recommendations are for wildlife purposes and not for critical area and highly erodible areas

² Native warm season grass should be seeded at the pure live seed (PLS) rate.

PLS = (% purity * % Germ.)/100

Bulk seed = 100/%PLS

96% Purity x 80% Germination/100 = 76.8% PLS

100/76.8% = 1.3 bulk lbs to seed 1 lb PLS

Prices may be based on bulk seed. Take this into consideration when ordering seed. Seeds per lb can vary by year and seed

³ This mix will not require the use of a native grass drill. If seeding conventionally, seed gamagrass 1-1 1/2" deep in grain box. Seed the remaining grass in legume box, pull tubes to allow surface seeding. Cultipack after drilling. The rest of the mixes will require a native grass drill.

EWD = Excessively Well Drained; WD = Well Drained; MWD = Moderately Well Drained;

SPD = Somewhat Poorly Drained; PD = Poorly Drained

Table 3. Seed Mixtures and Soil Suitability Recommendations for Wildlife
(Native Warm and Cool Season Grass Species) ¹

Grass seeding rates are PURE LIVE SEED ². These seeding rates ASSUME No-Till Seeding. If a No-Till Drill is NOT used, increase Total grass seeding rate by 2 lbs. proportional based on existing seeding ratio.

Seed Mixtures ³	Drainage Class				
	EWD	WD	MWD	SPD	PD
Indiangrass 2 lbs/ac and Switchgrass 1 lb/ac and Little bluestem 3 lbs/ac and Canada wildrye 5 lbs/ac optional *Native Forbs	X	X			
Big bluestem 4 lbs/ac and Indiangrass 2 lbs/ac and Switchgrass 1 lb/ac and Canada wildrye 5 lbs/ac optional *Native Forbs		X	X		
Big bluestem 4 lbs/ac and Eastern gamagrass 2 lbs/ac and Switchgrass 1 lb/ac and Virginia wildrye 4 lbs/ac and Deertongue 1 lb/ac optional *Native Forbs			X	X	
Fowl bluegrass 1/2 lb/ac and Fringed brome grass 4 lbs/ac and Riverbank wildrye 4 lbs/ac and Virginia wildrye 4 lbs/ac and Switchgrass 1/2 lb/ac optional *Native Forbs		X	X	X	X
Fringed brome grass 4 lbs/ac and Canada wildrye 6 lbs/ac and Switchgrass 1 lbs/ac and Deertongue 2 lbs/ac optional *Native Forbs		X	X	X	

* Utilizing five species from the list. Rates based on seed size and weight and cost consideration.

¹ These seeding recommendations are for wildlife purposes and not for critical area and highly erodible areas.

² PLS = (% purity * % Germ.)/100

Bulk seed = 100/%PLS

96% Purity x 80% Germination/100 = 76.8% PLS

100/76.8% = 1.3 bulk lbs to seed 1 lb PLS

Prices may be based on bulk seed. Take this into consideration when ordering seed. Seeds per lb can vary by year and seed

³ Low rates of switchgrass, deertongue, and fowl bluegrass will require monitoring of seedbox to maintain seed over seed drop opening.

EWD = Excessively Well Drained; WD = Well Drained; MWD = Moderately Well Drained;

SPD = Somewhat Poorly Drained; PD = Poorly Drained

Table 4. Seed Mixtures and Soil Suitability Recommendations for Wildlife
(Native Cool Season Grass Species) ¹

Grass seeding rates are PURE LIVE SEED ². These seeding rates ASSUME No-Till Seeding. If a No-Till Drill is NOT used, increase Total grass seeding rate by 2 lbs. proportional based on existing seeding ratio.

Seed Mixtures	Drainage Class				
	EWD	WD	MWD	SPD	PD
Canada wildrye 5 lbs/ac and Riverbank wildrye 3 lbs/ac and and Bottlebrush 2 lbs/ac optional *Native Forbs		X	X	X	
Canada wildrye 4 lbs/ac and Virginia wildrye 4 lbs/ac and Riverbank wildrye 4 lbs/ac and Fringed brome grass 4 lbs/ac and optional *Native Forbs		X	X	X	
Riverbank wildrye 4 lbs/ac and Virginia wildrye 4 lbs/ac and Fringed brome grass 6 lbs/ac and and Fowl bluegrass 1/2 lb/ac ³ optional *Native Forbs				X	X

* Utilizing five species from the list. Rates based on seed size and weight and cost consideration.

¹ These seeding recommendations are for wildlife purposes and not for critical area and highly erodible areas.

² PLS = (% purity * % Germ.)/100

Bulk seed = 100/%PLS

96% Purity x 80% Germination/100 = 76.8% PLS

100/76.8% = 1.3 bulk lbs to seed 1 lb PLS

Prices may be based on bulk seed. Take this into consideration when ordering seed. Seeds per lb can vary by year and seed

³ Fowl bluegrass can be too competitive at high seeding rates, at low rates need to check seed box to assure flowing into seed drop opening, or divide seed into smaller units and place with the other seeds at appropriate intervals.

EWD = Excessively Well Drained; WD = Well Drained; MWD = Moderately Well Drained;

SPD = Somewhat Poorly Drained; PD = Poorly Drained

NATIVE FORBES LIST¹

Common Name	Latin Name	wetland indicator	note: .0625 lb = 1 oz		seeds/ft ²	soil adaptation
			lb/ac	seeds/lb		
butterfly milkweed ³	<i>Asclepias tuberosa</i>	upland	0.0625	50,000	0.07	MWD-ED
New England aster	<i>Aster novae-angliae</i>	facw-	0.0625	1,216,000	1.74	PD-WD
long leaved aster	<i>Aster umbellatus</i>	facw	0.0313	1,072,000	0.77	PD-WD
white heath aster	<i>Aster ericoides</i>	facu	0.0156	3,200,000	1.15	MWD-ED
blue false indigo ²	<i>Baptisia australis</i>	facu	0.0625	63,140	0.09	MWD-ED
partridgepea (annual)	<i>Chamaecrista fasciculata</i>	facu	1.0000	65,000	1.49	MWD-ED
sunflower heliopsis, (ox-eye sunflower)	<i>Heliopsis helianthoides</i>	upland	0.5000	126,000	1.45	MWD-ED
purple coneflower ²	<i>Echinacea purpurea</i>	upland	0.5000	97,000	1.11	MWD-WD
Joe pyeweed ³	<i>Eupatorium maculatum</i>	facw	0.0313	2,000,000	1.43	PD-MWD
roundhead lespezeza	<i>Lespedeza capitata</i>	facu-	0.0625	275,000	0.39	MWD-ED
spiked gayfeather ²	<i>Liatris spicata</i>	facu+	0.1250	162,000	0.46	SPD-WD
perennial lupine	<i>Lupinus perennis</i>	facu	0.5000	18,800	0.22	MWD-ED
wild bergamot ³	<i>Monarda fistulosa</i>	upland	0.0313	1,418,000	1.02	SPD-MWD
grey headed coneflower ²	<i>Ratibida pinnata</i>	upland	0.1250	410,000	1.18	MWD-ED
blackeyed susan	<i>Rudbeckia hirta</i>	facu-	0.0625	1,750,000	2.51	SPD-WD
Canada golden rod	<i>Solidago canadensis/altissima</i>	facu	0.0156	4,600,000	1.65	SPD-ED
grass leaved golden rod	<i>Euthamia graminifolia</i>	fac	0.0313	5,600,000	4.02	SPD-MWD
boneset	<i>Eupatorium perfoliatum</i>	facw+	0.0313	2,880,000	2.07	PD-MWD
blue vervain ³	<i>Verbena hastata</i>	facw+	0.0625	1,544,000	2.22	PD-MWD
white vervain	<i>Verbena urticifolia</i>	facu	0.0625	1,000,000	1.43	SPD-WD
showy tick trefoil	<i>desmodium canadense</i>	fac	0.2500	72,000	0.41	SPD-WD
golden alexanders	<i>zizia aurea</i>	fac	0.2500	184,000	1.06	SPD-WD
giant sunflower	<i>Helianthus giganteus</i>	facw	0.0313	160,000	0.11	PD-MWD

¹ Due to the ability of some of these and other plants to colonize the plantings and the cost of the seed, the amount of seed planted is light. If some of these species are in adjacent areas, it would be beneficial to select other species to increase species diversity. Any species could be increased to 1 seed/ft², taking cost into consideration, which changes yearly.

² These species are predominantly native to the Midwest and have been found to occur in New York.

³ These species will benefit from stratification or may need to go through a winter to obtain full germination.

Introduction

Too often we hear that communities cannot afford to “grow smart” by conserving open space. But accumulating evidence indicates that open space conservation is not an expense but an investment that produces important economic benefits. Some of this evidence comes from academic studies and economic analysis. Other evidence is from the firsthand experience of community leaders and government officials who have found that open space protection does not “cost” but “pays.”

This casebook presents data and examples that can help leaders and concerned citizens make the economic case for parks and open space conservation. Some communities protect open space as a way to guide growth and avert the costs of urban and suburban sprawl. In others, new parks have invigorated downtown businesses and neighborhood economies.

Some communities work to conserve economically important landscapes, such as watersheds and farmland, or they preserve open space as a way to attract tourists and new business. And many communities are learning that conserved open space contributes to the quality of life and community character that supports economic well-being.

Too many community leaders feel they must choose between economic growth and open space protection. But no such choice is necessary. Open space protection is good for a community’s health, stability, beauty, and quality of life. It is also good for the bottom line.

By
Will Rogers
President
Trust for Public Land



PHIL SCHERMEISTER
TPL President Will Rogers.

Opposite: Chattanooga Riverwalk,
Chattanooga, Tennessee.

BILLY WEEKS

Growing Smart

Open space preservation

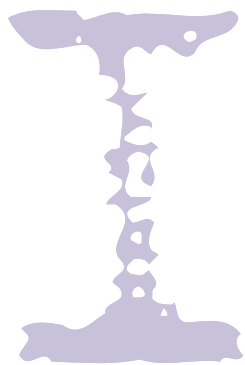
**helps communities grow smart,
preventing the higher costs of unplanned development.**

In the future, livable communities will be the basis for our competitiveness and economic strength. Our efforts to make communities more livable today must emphasize the right kind of growth—sustainable growth. Promoting a better quality of life for our families need never come at the expense of economic growth. Indeed, in the 21st century it can and must be an engine for economic growth.

—Vice President Al Gore



Slavic Village was designed to offer affordable housing and a public park. The development also has brought economic renewal to its Cleveland, Ohio, neighborhood.



In many ways the 1990s were a great decade for Austin, Texas. Attracted by oak-covered hillsides and a relaxed, almost small-town, atmosphere, more than 800 high-tech companies have moved to the Austin region in recent years, swelling the local tax base. *Newsweek* recently dubbed Austin “the utopian workplace of the future,” and *Fortune* has designated it the nation’s new number-one business city.

However, this growth has not come without cost. Destructive urban sprawl has become a headline issue in Austin, where the population swelled from 400,000 to 600,000 in the last decade and where many residents fear that Austin’s success carries the seeds of its own doom. A million people now live in the Austin metro area. Roads are clogged with traffic, air quality is in decline, sprawling development threatens drinking water, and the oak-dotted hillsides are disappearing beneath houses and shopping centers. In 1998, the Sierra Club ranked Austin the second most sprawl-threatened midsize city in America.¹

But even if Austin is one of the nation’s most sprawl-threatened cities, it has also begun to mount an admirable defense. A 1998 Chamber of Commerce report recognized Austin’s environment as an important economic asset worth protecting, and the city council has launched a smart growth initiative in an attempt to save the goose that lays the golden egg. The initiative includes regulatory changes in an attempt to encourage denser development patterns. It also includes efforts to protect open space. Over the last decade, Austin voters have approved over \$130 million in local bonds to help create parks and greenways and protect critical watershed lands.

Some of this money is going to the purchase of open space that will attract new residents to a 5,000-acre “desired development zone,” says real estate developer and Austin City Councilmember Beverly Griffith. “We’re identifying and setting aside the most sensitive, the most beautiful, the most threatened lands in terms of water quality, so the desired development zone will have a spine of natural beauty down the middle of it, and that will attract folks to live and work there.”

“Planning for housing, open space, and recreation is what’s going to enrich the desired development zone,” Griffith says. “People will be able to work and live in the same area.” ►



ERIC SWANSON

Town Lake, Austin, Texas, is one of many greenspaces that makes the city an attractive place to live and work.

*Planning for housing, open space,
and recreation is what’s going
to enrich the desired development zone.
People will be able to work and live in
the same area.*

—BEVERLY GRIFFITH
City Councilmember, Austin, TX



ERIC BEGGS

Beverly Griffith.

Ask William Moorish

“Before increasing the density of a community we like to increase the intensity of nature,” says William Moorish, director of the Design Center for American Urban Landscape at the University of Minnesota. Moorish cites an example from the Lake Phalen neighborhood of St. Paul, Minnesota, where a 1950s shopping center is being torn down to uncover a lake and wetland. Plans call for restoring the wetland as the centerpiece of a mixed-use neighborhood already served by infrastructure and mass transit.

Open space makes higher-density living more attractive, Moorish contends. Every community should provide infrastructure to its residents, and Moorish would expand the definition of infrastructure to include open space and a quality environment. Currently, the design of much urban infrastructure—roads, bridges, power lines, airports, water treatment plants—strips the richness of nature from communities. By preserving open space we fashion a richer, greener, more complex infrastructure that makes cities more appealing places to live. This, in turn, will reduce the pressure to bulldoze economically valuable farmland and natural areas on the urban fringe.

Many community leaders expect that the taxes generated by growth will pay for the increased costs of sprawl, but in many instances this is not the case.

► Smart Growth and Open Space

Austin is not alone in its efforts to protect open space as a way of supporting local economies and guiding growth into more densely settled, multiuse, pedestrian-friendly neighborhoods. Open space conservation is essential to any smart growth plan. The most successful higher-density neighborhoods—those most attractive to homebuyers—offer easy access to parks, playgrounds, trails, greenways and natural open space.

To truly grow smart a community must decide what lands to protect for recreation, community character, the conservation of natural resources, and open space. This decision helps shape growth and define where compact development should occur.

Many Americans believe that smart growth communities are more livable than are sprawling suburban neighborhoods. But accumulating evidence also suggests that smarter, denser growth is simply the most economical way for communities to grow. This is one reason that the American Planning Association, the U.S. Conference of Mayors, the National Association of Counties, and many business leaders are getting behind the smart growth movement.

Can conservation lower property taxes?

Does land conservation force a rise in local property taxes by removing land from the tax rolls?

The answer may be yes and no, according to a pair of 1998 studies by the Trust for Public Land. The studies examined the relationship between land conservation and property taxes in Massachusetts.

In fact, the study found, in the short term property taxes did rise after a land conservation project.

But in the long term, Massachusetts towns that had protected the most land enjoyed, on average, the lowest property tax

rates—perhaps because they had less development, which requires roads, schools, sewer and water infrastructure, and other services.

Every community is different, the report cautions; decisions about conservation must be informed by a careful analysis of tax consequences and broader community goals:

“The challenge when evaluating future investments is to strike a balance between what improves a community, what residents can afford and what is fair. Planning for both conservation and development is an important part of achieving that goal.”²

Increased density saves in infrastructure costs and contains sprawl.



LARRY ORMAN

The Costs of Sprawl Outpace Tax Revenues

Sprawl development not only consumes more land than high-density development, it requires more tax-supported infrastructure such as roads and sewer lines. Police and fire services and schools also must be distributed over a wider area.

One study found that New Jersey communities would save \$1.3 billion in infrastructure costs over 20 years by avoiding unplanned sprawl development.³

Another predicted that even a modest implementation of higher-density development would save the state of South Carolina \$2.7 billion in infrastructure costs over 20 years.⁴ And a third found that increasing housing density from 1.8 units per acre to 5 units per acre in the Minneapolis/St. Paul area would slash \$3 billion in capital infrastructure costs over 20 years.⁵

Many community leaders expect that the taxes generated by growth will pay for the increased costs of sprawl, but in many instances this is not the case.

- In the island community of Nantucket, Massachusetts, each housing unit was found to cost taxpayers an average of \$265 a year more than the unit contributed in taxes. “Simply stated, new dwellings do not carry their own weight on the tax rolls,” a town report concluded.⁶
- And in Loudoun County, Virginia—the fastest growing county in the Washington, D.C. area—costs to service 1,000 new development units exceeded their tax contribution by as much as \$2.3 million.⁷
- Studies in DuPage County, Illinois, and Morris County, New Jersey, suggest that even commercial development may fail to pay its own way. In addition to making its own demands on community resources, commercial development can attract costly residential sprawl.⁸

But do people want to live in clustered housing?

Many communities are saving money and land by encouraging—or even mandating—clustered housing.

In a typical clustered development, homes are built closer together on smaller lots and surrounded by protected open space or conservation land.

Clustered housing is cheaper for a community to service than houses on larger lots, largely because it consumes less land and requires shorter roads, shorter utility lines and less infrastructure of other types.

But do people really want to live in clustered housing?

A 1990 study attempted to answer this question for two communities in New England, where sprawl is rapidly overwhelming the original clustered development pattern of houses gathered around a village green and surrounded by farms, forests, and other open space.

Researchers used the rate of real estate appreciation as a measure of consumer demand for homes in two clustered developments in Concord and Amherst, Massachusetts. In both communities the average clustered home appreciated faster than comparable homes on conventional lots.

Clustered housing can allow a community to meet its land protection goals without endangering property values or the tax base while allowing construction of the same number of units, the report suggests.

“The home-buyer, speaking . . . through the marketplace, appears to have demonstrated a greater desire for a home with access . . . to permanently protected land, than for one located on a bigger lot, but without the open-space amenity.”⁹

Ask Luther Propst and Chris Monson



DOMINIC OLDERSHAW

Luther Propst.

In eastern Pima County, Arizona, on the outskirts of rapidly growing Tucson, developers once wanted to build a 21,000-unit resort and residential community on the 6,000-acre Rocking K Ranch adja-

cent to Saguaro National Park.

But the project was scaled back to 6,500 clustered units after opposition from the National Park Service and local environmentalists threatened to derail the development. As part of the agreement that allowed the development to proceed, the most biologically important land was set aside as open space. Two thousand acres has been sold to the National Park Service.

The rest of the property will be managed with input from Rincon Institute, a community stewardship organization supported by homeowners and businesses in the new development and visitors to the resort. The Institute conducts long-term environmental research, helps protect neighboring natural areas and conducts environmental education programs.

"Initially the developers were skeptical, but they now see that a legitimate commitment to conservation is good for marketing," says Luther Propst, director of the Sonoran Institute, which helped negotiate the arrangement.

The developer agrees. "People will pay a premium for an environmentally well-thought-out community," says Chris Monson, president of the Rocking K Development Corporation. "Sometimes less is more, so we increased densities, clustered housing, and preserved open space. We think this makes our development look attractive. It also makes the units easier to sell."

Loudoun County, Virginia, near Washington D.C., is under intense development pressure.



JEANNIE COUCH

► The Benefits of Land Conservation

Instead of costing money, conserving open space as a smart growth strategy can save communities money:

- Bowdoinham, Maine, chose to purchase development rights on a 307-acre dairy farm when research indicated that the costs of supporting the development would not be met by anticipated property revenues. "Undeveloped land is the best tax break a town has," concluded selectman George Christopher.¹⁰
- A study in Woodbridge, Connecticut, revealed that taxpayers would be better off buying a 292-acre tract than permitting it to be developed. "This town cannot afford *not* to buy land," wrote Robert Gregg, president of the Woodbridge Land Trust.¹¹

"Land conservation is often less expensive for local governments than suburban style development," writes planner Holly L. Thomas. "The old adage that cows do not send their children to school expresses a documented fact—that farms and other types of open land, far from being a drain on local taxes, actually subsidize local government by generating far more in property taxes than they demand in services."¹²

For this reason, even groups that usually oppose taxation have come to recognize that new taxes to acquire open space may save taxpayers money in the long run. "People are . . . beginning to realize that development is a tax liability for towns, not an asset, because you have to build schools and hire more police officers. And that makes property taxes go up," Sam Perilli, state chairman of United Taxpayers of New Jersey, an antitax group, told the *New York Times*.¹³ ►

Keep on ranchin'

Along the Front Range of the Colorado Rockies, communities from Fort Collins in the north to Pueblo in the south are racing to preserve the wide open spaces and quality of life that have attracted millions of new residents.

"A lot of employers move here for the climate, access to the mountains, the open space, and other quality of life issues," says Will Shafroth of Great Outdoors Colorado (GOCO), which funds open space projects using state lottery revenues. "But if we continue to develop and become a solid city between Fort Collins and Pueblo, we lose the very reason businesses come here to begin with. They're going to move off and find the next place, as they have in California and Florida and Texas and other places that have grown rapidly."

Larimer County, at the northern end of the Front Range, is typical. The county, which has been growing at 3.5 percent per year for the past 25 years, lost nearly 35,000 acres of farm and ranch land to development between 1987 and 1992.

"There is strong concern that we not

allow our communities to grow together into one indistinguishable urban mass," says Tom Keith, chair of Larimer County's Open Lands Advisory Board, which was appointed by county commissioners to guide a new Open Lands Program.

Larimer County has taken several approaches to preserving its quality of life. In the early 1990s a committee appointed by the county recommended clustered rather than dispersed development on rural lands, and while the approach was not mandatory, 20 clustered projects were under way by 1997.

In 1995 Larimer County voters passed an eight-year, $\frac{1}{4}$ cent "Help Preserve Open Spaces" sales tax, which has brought in nearly \$18 million to date. The money will be used for the purchase of land or development rights to keep open lands open and to keep farms and ranches in agricultural use. Other support for the program has come from GOCO.

As of 1998, Larimer County had protected 7,000 acres of the open space on which its quality of life and prosperity depend.¹⁴



BILL GRAY

In Steamboat Springs, Colorado, TPL helped create an open space plan and supported a successful tax measure to protect working ranches.



AP/WORLD WIDE PHOTOS

Sprawl development has led to traffic problems in Atlanta, Georgia.

There is no greater risk to land values than unrestrained development.

—REAL ESTATE RESEARCH CORPORATION

New Jersey shows the way

- Number of open space bond acts approved by New Jersey voters, 1961-1995: **9**
- Funds for New Jersey's Green Acres land acquisition program generated by these bond acts: **\$1.4 billion**
- Expected additional amount of state open space funding approved by New Jersey voters, November 1998: **\$1 billion**
- Amount of open space these latest funds will help protect: **1 million acres**
- Approximate proportion of New Jersey's remaining developable open space this acreage represents: **50 percent**
- Number of New Jersey counties that passed open space funding measures in November 1998: **6**
- Of 21 New Jersey counties, the number that now have a dedicated source of open space funding: **16**
- Rank of New Jersey among states in population density: **1** ¹⁷

► Livable Communities: A Long-term Investment

In the long term, economic advantage will go to communities that are able to guide growth through land conservation and other smart growth measures. In some instances a community's bond rating may actually rise after it has shown it can control growth by purchasing open space.¹⁵

One 1998 real estate industry analysis predicts that over the next 25 years, real estate values will rise fastest in the smart communities that incorporate the traditional characteristics of successful cities: a concentration of amenities, an integration of residential and commercial districts, and a "pedestrian-friendly configuration."

But many low-density suburban communities will suffer lower land values because of poor planning, increasing traffic, deteriorating housing stock, and loss of exclusivity, the report predicts, concluding that "there is no greater risk to land values than unrestrained development."¹⁶ ■

Attracting Investment

Parks and open space

**create a high quality of life
that attracts tax-paying businesses
and residents to communities.**



SUSAN LAPIDES

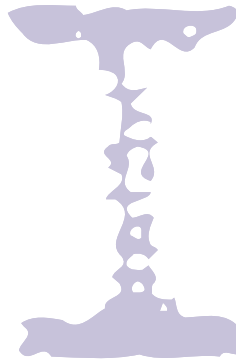
Providence, Rhode
Island, plans a system
of trails and greenways
to bring growth and
investment to the city.

Open space pays . . .

In 1967, Boulder, Colorado, became the first U.S. city to pass a dedicated sales tax to fund the preservation of open space. Today Boulder enjoys an open space treasury of more than 40,000 acres, much of it in a ring of greenbelts that offer uncluttered views of the city's signature Rocky Mountain backdrop.¹⁹

As early as the 1970s, it was already clear that Boulder residents would pay a premium to live near these open spaces, with their trails and stream corridors, and that the resulting increase in taxes would more than pay for open space protection. In one neighborhood, total property values increased by \$5.4 million after the greenbelt was built, generating \$500,000 per year in additional property taxes—enough to recoup the greenway's \$1.5 million purchase price in only three years.²⁰

Boulder's experience confirms what many communities have discovered: open space conservation is a one-time investment that can boost property values and swell tax coffers long after the land is paid for. And in survey after survey home buyers identify nearby open space and trails as among the top features in choosing a home.²¹



In the early 1980s, Chattanooga, Tennessee, was suffering a deep economic recession. Eighteen thousand manufacturing jobs had been lost due to factory closure and relocation. Surviving factories, burdened with outdated equipment, pumped out a smog so thick that residents sometimes drove with their lights on in the middle of the day.

Faced with rising unemployment and crime, polluted air, and a deteriorating quality of life, middle-class residents began to leave the city, taking with them the tax base that had supported police, sanitation, road repair, and other municipal services. Departing residents explained that they were moving to the cleaner, greener, and safer suburbs. To lure them back, local government, businesses, and community groups decided to improve Chattanooga's quality of life by cleaning the air, acquiring open space, and constructing parks and trails.

Largely as a result of these efforts, Chattanooga today is alive with economic activity. Where once there were rusting factories, there are now green open spaces surrounded by a bustling commercial and residential district. Where the Tennessee River sweeps through the city, abandoned warehouses have given way to an eight-mile greenway, the centerpiece of a planned, 75-mile network of greenways and trails. A former automobile bridge across the river has been dedicated to pedestrian use, sparking economic revival on both sides of the river. Downtown, an IMAX theater now caters to Chattanooga residents and tourists, and a new Tennessee RiverPark surrounds the new Tennessee Aquarium, which has injected an estimated \$500 million into the local economy since opening in 1992.

In all, the environmentally progressive redevelopment of Chattanooga's downtown riverfront involved \$356 million in public and private investment. In the eight years between 1988 and 1996 the number of businesses and full-time jobs in the district more than doubled, and assessed property values went up over \$11 million, an increase of 127.5 percent. Over the same period, the annual combined city and county property tax revenues went up \$592,000, an increase of 99 percent.¹⁸

"We certainly have had a revival, and the city takes pride in the fact that we have received a lot of attention for this turn-



BILLY WEEKS

Chattanooga, Tennessee, is fueling an economic revival with parks and greenways. This pedestrian-only bridge crosses the Tennessee River.



BILLY WEEKS

David Crockett.

Making the city more pedestrian-friendly is really what's bringing it back to life.

—DAVID CROCKETT
Chairman, Chattanooga City Council

around,” says David Crockett, chairman of the Chattanooga City Council and president of the Chattanooga Institute, which focuses on new ways of building communities. “There is a feeling not that we’ve arrived, but that we are on the right path—and ‘path’ is a good word for it,” Crockett says, “since our progress is closely linked to paths. People may point to some rightly celebrated projects, like the aquarium or the IMAX theater, but making the city more pedestrian-friendly is really what’s bringing it back to life.”

Ten years ago, Crockett found himself arguing for the importance of parks and open space to the city’s economic future. “People asked why we should spend money on walking paths and parks when we have schools that need money and roads to fix and we need to create more jobs. But now we have moved beyond thinking of those as tradeoffs. It is understood that we invest in all of those things. There is consensus that we will continue to add more parks, open space, and walking areas to the city.” ▶

Give me land, lots of land

- Corporate CEOs say quality of life for employees is the third-most important factor in locating a business, behind only access to domestic markets and availability of skilled labor.²⁹
- Owners of small companies ranked recreation/parks/open space as the highest priority in choosing a new location for their business.³⁰
- Seventy firms that moved to or expanded within Arizona chose the state for its “outdoor lifestyle and recreation opportunities.”³¹

...and pays

- **SALEM, OR:** Land adjacent to a greenbelt was found to be worth about \$1,200 an acre more than land only 1,000 feet away.²²
- **OAKLAND, CA:** A three-mile greenbelt around Lake Merritt, near the city center, was found to add \$41 million to surrounding property values.²³
- **FRONT ROYAL, VA:** A developer who donated a 50-foot-wide, seven-mile-long easement along a popular trail sold all 50 parcels bordering the trail in only four months.²⁴
- **SEATTLE, WA:** Homes bordering the 12-mile Burke Gilman trail sold for 6 percent more than other houses of comparable size.²⁵
- **DENVER, CO:** Between 1980 and 1990, the percentage of Denver residents who said they would pay more to live near a greenbelt or park rose from 16 percent to 48 percent.²⁶
- **DAYTON, OH:** Five percent of the selling price of homes near the Cox Arboretum and park was attributable to the proximity of that open space.²⁷



WILLIAM POOLE

- **SAN FRANCISCO, CA:** Golden Gate Park increases the value of nearby property by an amount of from \$500 million to \$1 billion, in the process generating \$5-\$10 million in annual property taxes.²⁸

Golden Gate Park,
San Francisco,
California.

Ask Bank of America

In 1996 the Bank of America released “Beyond Sprawl: New Patterns of Growth to Fit the New California,” a report about the effects of sprawl on California’s economy. B of A had sponsored the report in partnership with the California Resources Agency, the Greenbelt Alliance, and the Low Income Housing Fund, but it was the involvement of the state’s largest bank that lent the report particular credibility with businesspeople.

“Unchecked sprawl has shifted from an engine of California’s growth to a force that threatens to inhibit growth and degrade the quality of our life,” the report concluded. Among other costs, the report singled out the loss of farmland, the expense of supporting highways and other infrastructure in far-flung suburbs, and damage to the environment due to development pressure on remaining open land.³⁴

In 1998 a report by the Center for the Continuing Study of the California Economy confirmed the Bank of America findings. “Land Use and the California Economy: Principle for Prosperity and Quality of Life” highlighted planned growth, open space preservation and higher-density development as ways of preserving quality of life to attract businesses and workers. “A high quality of life is not just an amenity for California residents,” the report states. “It is increasingly a key determinant in attracting workers in California’s leading industries.”³⁵

Critics warned that Portland, Oregon’s urban growth boundary would stifle the economy. But the opposite has occurred.



PHOTO: PHIL SCHERMEISTER

► Quality of Life: The New Engine of Economic Growth

The revival of Chattanooga illustrates the new role of parks, open space, and quality of life in attracting residents, businesses, and economic activity to communities. The riverfront location that once drew factories to the city now makes its economic contribution by attracting tourists and new residents.

As the nation moves toward a mixed economy based on services, light industry, consumer goods, and new technologies, businesses and their employees are no longer tied to traditional industrial centers. Today, businesses are free to shop for an appealing location, and they clearly prefer communities with a high quality of life, including an abundance of open space, nearby recreation, and pedestrian-friendly neighborhoods.

Consider the case of Portland, Oregon, which in 1980 established an urban growth boundary that strictly limited development at the city’s fringe. Critics warned that the boundary would stifle development and damage the region’s economy. But instead, the number of jobs in the metropolitan area has increased by 57 percent. High-tech companies and industries sprang up inside the urban boundary. Hewlett-Packard, Intel, and Hyundai were among those companies attracted by forests, orchards, and creeks on the outskirts of a livable urban area. According to the *New York Times*, employers wanted to attract “educated workers who were as interested in the quality of life as a paycheck.”

“This is where we are headed worldwide,” maintained an Intel spokesman. “Companies that can locate anywhere they want will go where they can attract good people in good places.”³²

Open Space for Quality of Life

Across the nation, parks and protected open space are increasingly recognized as vital to the quality of life that fuels economic health. For a 1995 poll, researchers from the Regional Plan Association and the Quinnipac College Polling Institute queried nearly 2,000 people from around the country about quality of life. The major elements cited as crucial for a satisfactory quality of life were low crime with safe streets and access to greenery and open space.³³

Maintaining a clear edge between town and country is the most simple and critical step counties and cities can take to retain the rural character that has been the source of our wealth.

—SIERRA BUSINESS COUNCIL

Real estate industry analysts confirm quality of life as a determining factor in real estate values and economic vitality. One 1998 industry report calls livability “a litmus test for determining the strength of the real estate investment market . . . If people want to live in a place, companies, stores, hotels, and apartments will follow.”³⁶

A 1996 report by Arthur Andersen consulting company found that mid- and high-level executives increasingly choose to work in locations that offer a high quality of life outside the workplace. Availability of quality education is of prime importance, Andersen reports. But not far behind comes recreation, along with cultural institutions and a safe environment. Proximity to open space is seen as an important benefit.³⁷

A survey of businesses in California’s Sierra Nevada Mountains cited nearby wildlands, open landscapes, and small-town charm as among the significant advantages of doing business there. “The quality of life in this region drives our economic engine,” says Tracy Grubbs, director of special projects for the 450-member Sierra Business Council. The council’s 1997 report concluded that “as the Sierra Nevada’s population grows, maintaining a clear edge between town and country is the most simple and critical step counties and cities can take to retain the rural character that has been the source of our wealth.”³⁸

“There are businesses that have decided to locate in communities because of the presence of a greenways system,” says Chuck Flink, president of Greenways, Inc., which helps communities plan these long, skinny parks. Flink points to Reichold Chemical Company, which brought 500 jobs to Research Triangle Park in Raleigh-Durham, North Carolina, and to Caterpillar, Inc., which located in Morgantown, North Carolina, after a 20-city search. “Both companies cited the presence of greenways as decisive factors in the location decision,” Flink says.

Nationwide, easy access to parks and open space has become a new measure of community wealth—an important way to attract businesses and residents by guaranteeing both quality of life and economic health. ■



The Sierra Business Council's Tracy Grubbs.



SEAN ARBABI

The Sierra village of Downieville, California is a popular tourist destination.

Voters say, just buy it!

More and more state, county, and municipal voters are deciding that the surest—and often the fairest—way to protect open space is to just buy it. Purchasing land or development rights as a way of guiding growth avoids expensive regulatory and legal battles while reimbursing landowners for the economic and other benefits the open space will bring the community.

In November 1998, voters nationwide faced 240 state and local ballot measures concerning land conservation, parks, and smarter growth—and approved 72 percent of them. Many of these were funding measures that will trigger, directly or indirectly, more than \$7.5 billion in state and local funding for land acquisition, easement purchase, park improvements, and protection of historic resources.

Such successes show that voters are coming to understand that conservation and open space are investments, not costs. Recent ballot measures seeking funds for conservation and open space have received the highest rates of approval among ballot measures seeking approval for new capital expenditures.³⁹

Revitalizing Cities

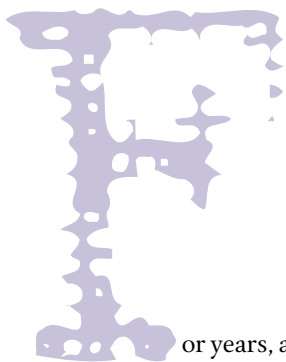
Urban parks, gardens, and recreational open space

**stimulate commercial growth and
promote inner-city revitalization.**



SUSAN LAPIDES

The Park at Post Office Square, on land formerly used for a parking garage, has become a magnet for new business investment in downtown Boston, Massachusetts. The garage is now underground.



For years, a two-acre parcel in the midst of Boston's financial district was occupied by an unsightly, 500,000-square-foot concrete parking garage. But in the early 1980s, at the urging of surrounding businesses, the city joined a unique public-private partnership to demolish the structure and create a privately funded underground garage covered by a graceful park. Today, the Park at Post Office Square features a spreading lawn, polished granite walls, teak benches, a 143-foot formal garden, a walk-through sculpture fountain, and a café. Each day as many as 2,000 people stream up the escalators from the garage to jobs in the surrounding high-rises.

"Post Office Square Park has changed Boston forever," wrote *Boston Globe* architecture critic Robert Campbell. "The business district used to be an unfathomable maze of street and building without a center. The park provides that center, and all around it, as if by magic or magnetism, the whole downtown suddenly seems gathered in an orderly array. It's as if the buildings were pulling up to the park like campers around a bonfire."

This rare open space in Boston's crowded financial district has boosted the value of surrounding properties while providing an elegant green focus to a crowded commercial area. The city receives \$1 million a year for its ownership interest in the garage, and \$1 million in annual taxes. After the construction debt is paid, ownership of the garage and park will revert to the city.⁴⁰

"The garage that formerly filled that block was really a negative," says architect and city planner Alex Garvin, who has written extensively on the role of open space in urban economies. "It simply wasn't attractive for a business to be located opposite a multistory parking structure." But with the parking relocated below ground and the park created on top, all that changed, particularly given that the park is not just decorative space but has become a popular gathering spot. "There's a café there," Garvin says. "You can sit in the park. It has become an attractive place where people want to be. And now that people want to be in the park, businesses want to be across the street from it and the value of that property goes up."

Ask Michael Groman

"The creation of quality open space in the neighborhood translates into a quality neighborhood," argues Michael Groman, manager of the Philadelphia Green Program of the Pennsylvania Horticultural Society.

Recently, Groman's department has been taking a novel approach to neighborhood stabilization in Philadelphia's New Kensington neighborhood, where more than a thousand littered vacant lots were damaging property values and scaring away potential investors. Improper management of these properties was costing the community dearly, Groman says. "The idea was to try to reduce the drag that these vacant lots have on the community."

Working with the New Kensington Community Development Corporation (NKCDC), Groman helped launch programs to improve the visual appeal of the properties and transfer some of them to adjacent homeowners for a nominal sum. "Greening and managing vacant land is a primary component in community development work," Groman maintains. "Managing open space is not a luxury but rather a definite need."

It's as if the buildings were pulling up to the park like campers around a bonfire.

—ROBERT CAMPBELL
Boston Globe architecture critic
on the Park at Post Office Square

Bryant Park in midtown Manhattan is credited with increasing occupancy rates and property values in the surrounding neighborhood.



BRYANT PARK RESTORATION CORPORATION



BRYANT PARK RESTORATION CORPORATION

Dan Biederman is cofounder of the Bryant Park Restoration Corporation.

► A similar story comes from New York City, where nine-acre Bryant Park, beside the New York Public Library, was neglected and run-down until the late 1970s. Today, after a five-year, \$9 million renovation, the park boasts attractive lawns, flower gardens, news and coffee kiosks, pagodas, a thriving restaurant, and hundreds of moveable chairs under a canopy of trees. On some days, more than 4,000 office workers and tourists visit this green oasis in the heart of Manhattan, and more than 10,000 people come for special events.⁴¹

The park, supported by city funds and by contributions from surrounding businesses, has spurred a rejuvenation of commercial activity along Sixth Avenue. Rents in the area are climbing and office space is hard to come by. In the next five-to-seven years, revenues from park concessions will permit repayment of construction debt and make the park economically self-sufficient. At that point the park will no longer need city funds, although it will continue to feed the neighborhood's economy.

Spartanburg goes for the green

In the late 1980s at the request of city government, the local Flagstar Corporation of Spartanburg, South Carolina, selected downtown instead of a suburban site for a new corporate office building. Because part of the goal was to revitalize the downtown area, Flagstar executives realized that a single office building would not do the trick, so a formal corporate plaza and a traditional downtown park with flower gardens, walkways, benches, and lawns were added as magnets for downtown renewal.

The result? By 1993, property values in the central business district had increased

325 percent over their 1983 value. Retail sales had also risen, with some downtown businesses reporting increases of as much as 100 percent. Residential rents in the area have more than doubled since creation of the redevelopment and park. In all, more than \$250 million in investment flowed into downtown Spartanburg between 1988 and 1996. In the fall of 1996, officials announced a \$100 million development proposal that includes a four-star hotel, a conference center, a golf course, an exhibit hall, and new office and residential development.⁴²

To Dan Biederman, who helped organize the Bryant Park effort, the lesson is clear. “If building owners and the agents help protect urban open space they will be more than paid back for their efforts, both in increased occupancy rates and in increased rent—all because their building has this attractive new front yard.”

Similar projects are underway elsewhere:

- In East Boston, Massachusetts, plans are under way for a \$17 million, 6.5-acre park at the abandoned East Boston piers to serve as a locus of economic development along a new recreational waterfront. The new park offers playgrounds, gazebos, and views of downtown Boston.⁴³
- With the help of the Trust for Public Land, Santa Fe, New Mexico, recently acquired a 50-acre former rail yard—the last large undeveloped parcel downtown. The land will be used for a park and as a site for community-guided development.⁴⁴
- In Burlington, Vermont, a former 20-acre fuel tank farm will become a park on the Lake Champlain waterfront. Anticipating the economic benefits the park will bring, the city purchased an adjacent 25 acres as a reserve for future commercial development—land expected to appreciate as the park takes shape.⁴⁵



SUSAN LAPIDES



ERIC SWANSON

A greenway along the piers in East Boston, Massachusetts (above), a former rail yard in Santa Fe, New Mexico (left), and a lakefront park in Burlington, Vermont (below) are part of urban redevelopment efforts.



GLEN RUSSELL

Brownfields Payback

One way to preserve valuable landscapes while accommodating a growing population is to redevelop previously used urban lands—sometimes known as “brownfields.”

Even with the expense of environmental clean-up, a recycled parcel is often less expensive to develop than new land, because it is already serviced by roads, utilities, and other infrastructure. Brownfield development also limits the pressure to develop farms and other open space.

Since 1993 the U.S. Environmental

Protection Agency has been helping communities redevelop some of the nation’s estimated 130,000 to 425,000 brownfield properties, and these projects are already showing economic benefit:

- In Buffalo, New York, a 763,000-square-foot greenhouse on a former steel mill site produces up to 8 million pounds of hydroponic tomatoes each year and employs 175 workers.
- In North Birmingham, Alabama, a reseller of industrial byproducts has established a facility where a steel mill once stood. The business—

which will create 30 jobs—is the first tenant in a 900-acre brownfields target area that may eventually bring as many as 2000 jobs to the economically depressed neighborhood.

- In Emeryville, California, a hotel, office, and residential complex on former industrial property is expected eventually to generate as many as 10,600 new jobs. Future tenants include the biotechnology company Chiron Corporation, which will construct a 12-building, 2.2 million-square-foot campus over the next 20 years.⁴⁶

Blending housing with open space

Packaged together, affordable housing and open space can bring powerful changes to an urban neighborhood.

For years, the grounds of a former state mental hospital offered the only open space in the high-density Broadway neighborhood of Cleveland, Ohio. This lovely site in the midst of the city contained a strip of green along meandering Mill Creek, flowering meadows, and gently wooded hills. But even though residents could see this space, it was off-limits and patrolled by guards—fenced, contaminated, and littered with trash.

Residents were eager to see the site developed as a park, but the Cleveland Metro Parks Department balked at the idea of tearing down the buildings, arguing that the department was in the business of preserving and maintaining natural lands, not restoring already developed sites.

Eventually, the Broadway Area Housing Coalition (now known as Slavic Village Development) came up with a plan for the 100-acre site. The goals were to preserve the best of the open space and attract middle-class home buyers to an inner-city development. Planners also wanted to connect the open space to 45-foot Mill Creek waterfall—the tallest waterfall in Cuyahoga County—long blocked from public use by railroad tracks, bridges and buildings.

The mental hospital was torn down, and the contamination was cleaned up. A private housing development of 217 units is being developed on 58 acres of the land. Parkland totaling 35 acres will include the stream corridor and trails connecting to the waterfall. Houses along the park are selling as quickly as they are built, and entrepreneurs are leasing properties near the waterfall, which is expected to attract 40,000 to 50,000 visitors each year. Community residents are delighted at last to have access to open space.⁴⁷

The Martin Luther King, Jr. National Historic Site has brought stability and investment to its Atlanta, Georgia, neighborhood.



PETER BENEY

► Parks for Community Revitalization

American cities large and small are creating parks as focal points for economic development and neighborhood renewal. “Revitalizing public parks is a phenomenally cost-effective way to generate community economic development,” says Steve Coleman, a Washington, D.C., open space activist. “If you think of [a park] as an institution, it can be a site for job training, education, or cultural performances.”

Coleman has been active in revitalizing Washington’s secluded and long-neglected Meridian Hill Park, which stands on a hill with a distant view of the White House. In 1990, Coleman and his neighbors organized Friends of Meridian Hill to restore the park as a neighborhood asset. An Earth Day clean-up and celebration was held, complete with a blues concert. Park activists encouraged youth groups to schedule events in the park. Today, the restored park is frequented not only by residents, but by busloads of tourists who enjoy the multiethnic ambience of the Meridian Hill neighborhood. Visitation has tripled, and many park visitors patronize local restaurants and retail businesses. Occupancy rates in surrounding apartment buildings have soared.

A similar story comes out of Atlanta, Georgia, where the expansion and restoration of the Martin Luther King, Jr. National Historic Site has sparked a revival of the African-American “Sweet Auburn” neighborhood. The Trust for Public Land—which began acquiring properties for the historic site in the early 1980s—recently acquired several more historic homes and demolished a dilapidated factory to provide land for the park. The improved site, with additional open space, has become a catalyst for community reinvestment. Crime is also down. Dozens of homes have been built or restored, and the site’s 500,000 annual visitors have bolstered neighborhood businesses.

None of this would have been possible without the investment in the national historic site, says real estate developer Bruce Gunter, who has developed nonprofit, low-income housing within the district. “The National Park Service is



CAROL COLLARD

Bruce Gunter.

there for the long haul,” Gunter says. “People considering commercial or residential development can be confident that the benefits of the park aren’t going to disappear.”

Gunter and others are now planning a greenway park along the new Freedom Parkway, connecting the King Historic Site, the Jimmy Carter Presidential Center, and Atlanta’s downtown. The park will contain bike trails, benches, and street lighting and will be what Gunter calls, “a real-life, honest-to-God, throw-a-Frisbee, get-a-drink-of-water, have-a-picnic kind of a park.” Gunter and other businesspeople are helping to raise money for the park, which should boost property values and spur business along its length.

“This is pure market economics at work,” Gunter says. “There are eight neighborhoods that surround this parkway, and they will all be strengthened. The whole point is to try to keep the middle-class families that are living there and to attract others. The park will be a real anchor for an in-town middle class.”

Paul Grogan, former president of Local Initiative Support Coalition (LISC), a community development group in New York City, agrees that open space can play a crucial role in revitalizing low-income, inner-city neighborhoods. “Low-income neighborhoods are principally residential neighborhoods where the economics have gotten weak because of depopulation and disinvestment,” Grogan says. “The key to restoring their economic vitality is restoring the residential vitality. The residents of such communities regard quality open space—parks, ball fields, and gardens—as vital to the health of their community.” ■

The whole point is to try to keep the middle-class families that are living there and to attract others. The park will be a real anchor for an in-town middle class.

—BRUCE GUNTER
Atlanta real estate developer

Ask Frederick Law Olmsted

As early as the 1850s, landscape architect Frederick Law Olmsted justified the purchase of land for New York’s Central Park by noting that the rising value of adjacent property would produce enough in taxes to pay for the park.

By 1864, Olmsted could document a \$55,880 net return in annual taxes over what the city was paying in interest for land and improvements. By 1873, the park—which until then had cost approximately \$14 million—was responsible for an extra \$5.24 million in taxes each year. ⁴⁸



ROBERT CADENA

Community parks and gardens bring vitality to urban neighborhoods. Creston Avenue Community Playground, Bronx, New York.

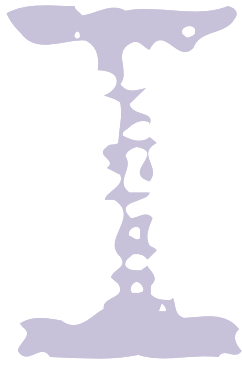
Boosting Tourism

**Open space boosts local economies
by attracting tourists and
supporting outdoor recreation.**



PHIL SCHERMEISTER

Rock climber in
Cantara, California.



In 1996, the Trust for Public Land helped add 17 acres to the Gauley River National Recreation Area in Nicholas County, West Virginia. The acquisition helped protect the river's water quality, wooded banks, and scenic canyon. But it was also driven by a bottom-line economic motive. Tourism is West Virginia's fastest growing industry, and whitewater rafting is one of that industry's fastest growing segments. Each fall whitewater rafters come to run a 24-mile scenic stretch of the Gauley River, pumping \$20 million into the local economy.⁴⁹ Elsewhere in West Virginia, rafting provides 1,000 seasonal jobs in Fayette County while contributing \$50 million to the local economies—mostly from the sale of videos, photos, T-shirts, cookbooks, food, and lodging.⁵⁰

Across the nation, parks, protected rivers, scenic lands, wildlife habitat, and recreational open space help support a \$502-billion tourism industry. Travel and tourism is the nation's third largest retail sales industry, and tourism is one of the country's largest employers, supporting 7 million jobs, including 684,000 executive jobs. At present rates of growth, the tourism/leisure industry will soon become the leading U.S. industry of any kind.⁵¹

Outdoor recreation, in particular, represents one of the most vigorous growth areas in the U.S. economy. Much of this recreation is supported by public and private parks and open land. Popular outdoor recreational activities include hiking, camping, biking, birding, boating, fishing, swimming, skiing, and snowmobiling. According to the Outdoor Recreation Coalition of America, outdoor recreation generated at least \$40 billion in 1996, accounting for 768,000 full-time jobs and \$13 billion in annual wages.⁵²

Protecting Tourism and Recreation Resources

Where do Americans go for recreation? A poll for the President's Commission on Americans Outdoors found natural beauty and quality of view to be the most important criteria for tourists seeking outdoor recreation sites.⁵³

Recognizing this, many communities now work to attract tourists by protecting scenic views and vistas, moving utility wires underground, and preserving trees and historic build- ►



THOMAS R. FLETCHER

Whitewater rafting is an economic mainstay of West Virginia's rural communities. Gauley River National Recreation Area.

Across the nation, parks, protected rivers, scenic lands, wildlife habitat, and recreational open space help support a \$502-billion tourism industry.

In land we trust



WILLIAM POOLE

How interested are Americans in guiding growth and protecting quality of life? One striking measure is the increasing

number of local, state, and regional land trusts, grassroots nonprofit organizations that help communities conserve land—most often by purchasing or accepting donations of land or conservation easements.

According to the Land Trust Alliance, the number of land trusts jumped 63 percent, to more than 1,200, between 1988 and 1998, with the most dramatic growth coming in the Rocky Mountain states (160 percent), the Southwest (147 percent), and the South (118 percent).

In that same decade, land trusts conserved an area nearly the size of Connecticut, more than doubling the land protected by land trusts to 4.7 million acres.

Of that 4.7 million acres, 1.4 million are protected by conservation easement, by far the fastest growing land protection strategy of local land trusts. A conservation easement, sometimes called a “purchase of development rights,” limits development on land. Depending on how the easement is written, it may also preserve such essential productive uses as farming, ranching, watershed protection, and recreation.

Land on which local land trusts hold conservation easements increased nearly 400 percent between 1988 and 1998. In Montana, where easements have become an important tool for protecting ranchlands, land trusts hold easements on more than a quarter million acres. New York land trusts hold easements on nearly 200,000 acres; Vermont land trusts on nearly 140,000 acres.

More than one million Americans are members and financial supporters of local land trusts. Land protected by local land trusts includes forests, wetlands, wildlife habitat, historic landscapes, farmland, and ranches.⁵⁶

*If you develop everything,
you destroy what people come
here to see.*

—BRUCE NOURJIAN
President, Stowe Land Trust

- In Stowe, Vermont—a popular resort and winter sports center—developers seeking building permits must guarantee preservation of scenic vistas and signature landscapes.

“People come to Vermont to see cows, pastures, green fields and meadows, so protecting open space is healthy for our local economy. If you develop everything, you destroy what people come here to see,” says Bruce Nourjian, a sometime developer and president of the Stowe Land Trust, which over the past 12 years has protected over 2,500 acres in the Stowe Valley. In Stowe, Nourjian adds, most developers support land conservation, because they know that by preserving the area’s rural character they are protecting the value of their investment.

The Value of Recreation on Federal Lands

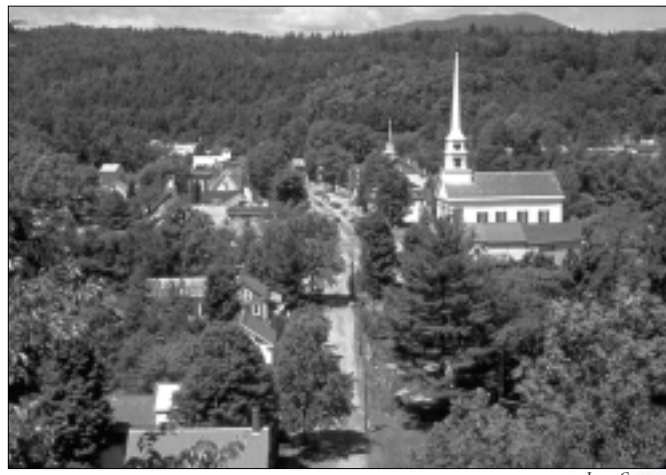
Other communities benefit from tourism and recreation on nearby federal lands. The National Park Service estimates that in 1993 national park visitors contributed more than \$10 billion in direct and indirect benefits to local economies.⁵⁴ And recreation is the second largest producer of direct revenue from U.S. Forest Service lands—bringing in more than grazing, power generation and mining combined—and may account for as much as 74 percent of the economic benefit from these lands when indirect contributions are taken into account.⁵⁵

Many towns that traditionally have depended on logging, mining, and other extractive industries on public lands are now working to bolster local economies by attracting tourists.

Wildlife watchers spent \$29.2 billion on trips, equipment, and other expenditures in 1996, according to the U.S. Fish and Wildlife Service.



CAROLYN FANNON



JEFF CLARKE

Preserving open space is key to protecting the rural character that attracts people to Stowe, Vermont.

In Berlin, New Hampshire—a paper mill town adjacent to the White Mountains National Forest, which attracts 6 million visitors each year—environmentalists and businesspeople are conducting “moose tours,” and planning excursions that explore the history and heritage of the paper and pulp industry. Tourists would learn how trees are grown and harvested, and they would visit a paper mill and a model logging camp to understand what life was like when the local Androscoggin River was filled with logs on the way to the mill.

“We want to nurture the constituency that sees the economic value in conserving natural resources, because we think that will lead to more conservation,” says Marcel Polak, who explores alternative business opportunities that promote conservation efforts for the Appalachian Mountain Club (AMC) in the upper Androscoggin Valley.⁵⁷

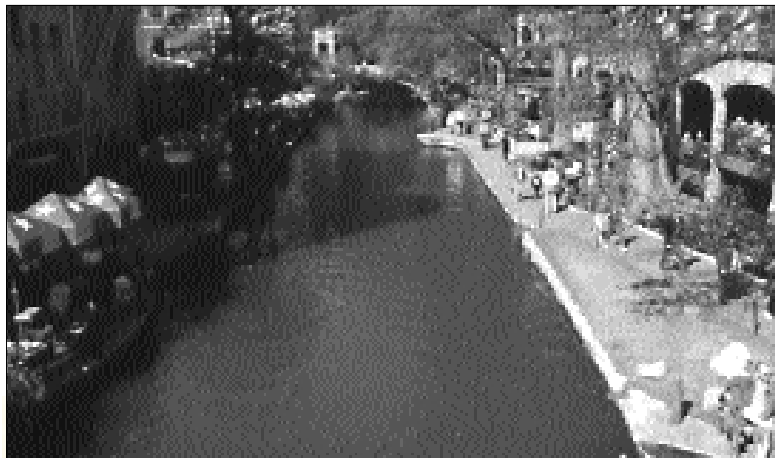
For such programs to succeed it is essential to protect forestlands across a broad swath of New York and New England. These forests have supported communities for generations, but global competition has weakened the forest products industry, and many timber companies seek to sell land for development. Unfortunately, the most desirable land for second homes and other development is also the most important for wildlife habitat and recreation. ➤

Open space brings billions to New Hampshire

- Estimated annual value of open space to the economy of New Hampshire: **\$8 billion**
- Approximate fraction of the state's total economy this amount represents: **25 percent**
- Number of jobs supported by New Hampshire's open space: **100,000**
- Annual contribution of open space to state and local taxes: **\$891 million**
- Fraction of all state and local tax receipts this contribution represents: **35 percent**⁵⁹

State land protection programs

- Amount that Maryland's Rural Legacy Program will spend to preserve farms and other rural open space in the next five years: **\$70 million to \$140 million**
- Amount of land that will be protected by these funds: **50,000-75,000 acres**
- Amount of land conserved over the past ten years with funds from Florida's Preservation 2000 Program: **1 million acres**
- Proportion of voters that approved an extension of the Preservation 2000 Program in November 1998: **70 percent**
- Annual amount from state lottery proceeds that Oregon voters set aside to purchase river corridors, watersheds and wetlands, and native salmon habitat in November 1998: **\$45 million**
- Proportion of Oregon voters approving this investment: **67 percent**
- Minimum annual amount set aside by the North Carolina legislature for dedicated Clean Water Management Trust Fund: **\$30 million**
- Amount granted for land conservation projects from the North Carolina Clean Water Trust Fund since its inception in 1997: **\$36 million**⁵⁸



LAURA A. McELROY

The San Antonio Riverwalk is the most popular attraction in the city's \$3.5-billion tourist industry.

Remember the Riverwalk

In the early 1900s, engineers in San Antonio, Texas, planned to bury the San Antonio River to prevent recurrent flooding. But citizens envisioning a riverfront park stopped the project.

Eventually a channel was cut, and flood-gates were added to control flooding. Trees and shrubs were planted, and a mile and a half of walkways were added along the shore. Stairways connected the walkways to city streets, and 21 pedestrian bridges spanned the river. Riverside buildings, which had long faced away from the waterway, were given new entrances facing the park.

Created for \$425,000, the park has been enlarged twice, including the addition of new canals and walkways. Today, Paseo del Rio is lined with outdoor cafés, shops, bars, art galleries, and hotels—an irreplaceable retreat for city residents and workers. The Riverwalk has also overtaken the Alamo as the single most popular attraction for the city's \$3.5-billion tourist industry.⁶⁵

- ▶ “The lake frontage, river frontage, hillsides and ridges—those are the places people want to build homes,” says Tom Steinbach, the AMC’s director of conservation. “But if communities don’t preserve these lands, they will lose their future economic base.”

The Impact of Trails and Wildlife Tourism

Hiking and biking trails can also stimulate tourism. Each year 100,000 people come to ride the famous Slickrock Mountain Bike Trail near Moab, Utah. The trail generates \$1.3 million in annual receipts for Moab, part of \$86 million spent by visitors to nearby desert attractions that include Arches and Canyonlands National Parks. In 1995, tourism in Moab supported 1,750 jobs, generated nearly \$1.7 million in taxes, and accounted for 78 percent of the local economy.⁶⁰

Trails along former railroad corridors also pay handsome dividends. In recent years the federal government has invested more than \$300 million in more than 9,500 miles of rail trails in 48 states, and this investment is already paying off.⁶¹ For example, in Dunedin, Florida, store vacancy rates tumbled from 35 percent to zero after the Pinellas Trail was built through town beginning in 1990.⁶² In 1994 the Maryland Greenway Commission authorized a study of the 20-mile Northern Central Rail Trail near Baltimore. Researchers found that whereas the trail cost \$191,893 to maintain and operate in 1993, that same year it returned \$304,000 in state and local taxes.⁶³ In another study, the National Park Service found that three rail trails—in Iowa, Florida, and California—contributed between \$1.2 million and \$1.9 million per year to their home communities.⁶⁴

Natural open space supports fishing, hunting, and other wildlife-based tourism. Sport fishing alone boosted the nation’s economy by \$108.4 billion in 1996, supporting 1.2 million jobs and generating household income of \$28.3 billion.

*At present rates of growth, the tourism/
leisure industry will soon become the leading
U.S. industry of any kind.*

—NATIONAL PARK SERVICE

Sport fishing added \$2.4 billion to state tax coffers—nearly 1 percent of all state tax receipts—while contributing \$3.1 billion in federal income taxes.⁶⁶ Another \$85.4 billion is generated for the U.S. economy each year by people who feed birds or observe and photograph wildlife.⁶⁷

Funding Resources for Tourists

Recognizing the connection between open space and tourism, some communities have begun taxing tourists to raise funds for park and open space preservation. In 1985 the Montana legislature authorized some small communities that derive a large portion of their income from tourism to levy a sales tax of up to 3 percent on tourist-related goods and services to pay for infrastructure and tourist services, including parks and recreational services. Using receipts from this tax, the town of Whitefish, Montana is building a bike path.⁶⁸

Flagstaff, Arizona, is another community that supports parks and land acquisition using funds generated by tourists. Two million tourists visit this community of 50,000 people each year, attracted by nearby Indian ruins, skiing, national forests and Grand Canyon National Park. In 1988, the city passed a 2 percent “bed, board, and booze” tax (known locally as the BBB tax), which currently raises \$3.3 million each year. A third of the money goes to city park improvements, and an additional portion goes to city beautification and land acquisition. The funds are helping to build a 27.5-mile urban trail system connecting neighborhoods, commercial areas, and national forest lands.⁶⁹

As travel and tourism swells to become the nation’s leading industry within the next few years, communities from coast to coast are coming to see their parks and open lands in a new light. Long appreciated as resources for residents, increasingly they are being appreciated for their attraction to visitors and as economic engines for the next millennium. ■

In 1996, sport fishing contributed \$7.1 billion to California’s economy. East Walker River, Bridgeport, California.

Recreation = Fun + Profit

- Annual contribution of river-rafting and kayaking to the economy of Colorado: **\$50 million**⁷⁰
- Amount outdoor recreation adds to the economy of Arkansas each year: **\$1.5 billion**⁷¹
- Amount of this figure contributed by canoeing: **\$20.1 million**⁷²
- Amount spent by Americans on the purchase of canoes and kayaks in 1996: **\$99.1 million**⁷³
- Amount spent on hiking footwear each year: **\$374 million**⁷⁴
- Contribution of sport fishing to the economy of California in 1996: **\$7.1 billion**⁷⁵
- Annual value of hunting, camping, fishing, and horseback riding on federal Bureau of Land Management lands: **\$376 million**⁷⁶
- Annual value of sport fishing on U.S. Forest Service land: **\$1.2 billion**⁷⁷
- Rank of recreation among all economic activities on U.S. Forest Service lands: **278**
- Visits to national wildlife refuges in 1995: **27.7 million**⁷⁹
- Revenue of local businesses from these visitors: **\$401 million**⁸⁰
- Income from the 10,000 jobs supported by these visitors: **\$162.9 million**⁸¹



PHIL SCHERMEISTER

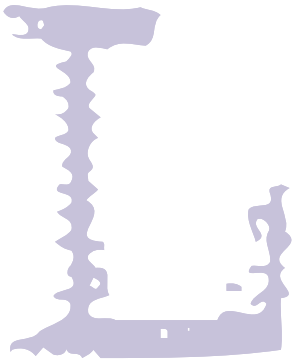
Protecting Farms and Ranches

Protecting agricultural lands

**safeguards the future of
farming economies and communities.**



CAROLYN FANNON



located in rolling, coastal hills north of San Francisco, the dairy farm of the Straus Family Creamery occupies some of the potentially most valuable land in California. In the 48 years that Ellen and Bill Straus have owned their Marin County farm, they have seen other farms give way to development up and down the California coast. “But we think farming is important, and we love this land,” Ellen Straus says. So the couple has turned down many lucrative offers for the land and hopes to pass the farm on to their children.

To protect her land, Ellen Straus became an open space advocate. In 1980, Straus cofounded the Marin Agricultural Land Trust (MALT), established with the help of the Trust for Public Land. MALT and other agricultural land trusts use public or donated funds to purchase the development rights to agricultural land. The purchase of development rights reduces the taxable value of the land so that a family can afford to keep it in agriculture. The purchase reimburses the farmer for the economic benefit the open land brings to the community. Some farmers use the funds to buy new equipment or upgrade the farm.

Using such techniques, MALT has helped protect 38 farms, totaling more than 25,000 acres of agricultural open space in Marin County since 1980—including the 660-acre Straus farm, which has since become the first organic dairy and creamery west of the Mississippi.⁸²

In addition to protecting farms, vistas, and the character of rural communities, MALT’s work has protected an irreplaceable economic asset. Marin County generated more than \$57 million in agricultural production in 1997, including \$35 million in milk and other livestock products. Two decades after Marin County pastures were first threatened by encroaching development, milk remains the county’s most important agricultural product.⁸³ ►



STEVEN SAMUELS

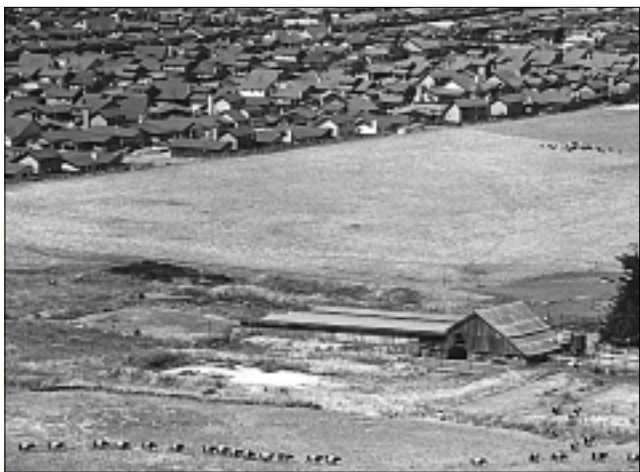
Conservation easements safeguard Marin County, California ranches from development. The county, which adjoins San Francisco, generated \$57 million in agricultural products in 1997.

Fresno's Choice

Fresno County, in the heart of the fertile San Joaquin Valley of California, is the nation's top producing agricultural county, generating \$3.3 billion in gross agricultural revenues each year. But if current development patterns continue, the county's population is expected to triple over the next 40 years, consuming nearly 20 percent of agricultural land.

In response, farm and business groups have formed the Growth Alternatives Alliance to work against farmland loss. In a 1998 report, “A Landscape of Choice: Strategies for Improving Patterns of Community Growth,” the Alliance proposed a plan that would direct development away from valuable farmland and into somewhat denser, mixed-use, pedestrian-friendly neighborhoods in existing communities.

According to the report, “Each acre of irrigated agricultural land should be considered a factory that produces between \$6,000 to \$12,000 per year for the local economy. The loss of even 1,000 acres of agricultural land can remove as much as \$15 million from our local domestic product.”⁸⁴



EVAN JOHNSON

Productive farmland is being lost to development at a rate of 50 acres every hour. Sonoma County, California.

Let them eat sprawl?

A recent report by the U.S. Department of Agriculture documents the loss of U.S. farmland. During 1992-1997, the report found, nearly 14 million acres of farmland were taken out of production—nearly 320 acres every hour.⁸⁶

Reaction to the report singled out sprawl development as a prime culprit.

“There’s a market force at work that makes it more and more difficult for the farmer,” banker Jim Kommertzheim told Kansas’s *Wichita Eagle*. “Demand for land for home development increases the price to the point where a farmer can’t afford to buy it for agricultural production.”⁸⁷

Scott Everett of the Michigan Farm Bureau also blamed urban sprawl for driving up the price of farmland. “Once the erosion of our land base begins to affect production,” he said, “you’re never going to be able to turn it around.”⁸⁸

The Value of Endangered Farmland

The nation’s farms and ranches are often referred to as “working landscapes” because of the food and fiber they produce. The best of these lands are literally irreplaceable, their agricultural productivity the result of geologic and climatic factors that cannot be reproduced. Even though they also have value as developable land, their highest economic use derives from their long-term productivity as farms and ranches.

“If agriculture is going to be a vital part of a community or valley or region, then it’s vitally important that a critical mass of farmland be permanently protected,” says Ralph Grossi, president of the American Farmland Trust (AFT), which works to preserve the nation’s farmland.

American agriculture is an industry of great value. According to the U.S. Department of Agriculture, farm receipts reached a record \$202.3 billion in 1997, generating approximately \$50 billion in farm income that was cycled through local communities. That same year the U.S. exported \$57 billion in agricultural products, which accounted for a \$21 billion balance-of-trade surplus for such products.

Unfortunately, the land that supports this valuable industry faces increasing pressure from suburban growth and second-home development. The AFT estimates that 13 million acres of open land were converted to urban uses between 1982 and 1992. Of this, 32 percent—4.2 million acres—was prime or unique farmland. During these years, prime farmland was lost to development at the rate of nearly 50 acres every hour.⁸⁵

“Farms are often the most stable part of the local economy,” says AFT’s Ralph Grossi. “They have been passed down for generations and tend to stay put rather than move around as other jobs and businesses do. Agriculture lends economic stability to a community, providing a net inflow of dollars—year in, year out—from the sale of agricultural products.”



RICK TANG

Ralph Grossi.

If agriculture is going to be a vital part of a community or valley or region, then it's vitally important that a critical mass of farmland be permanently protected.

—RALPH GROSSI
President, American Farmland Trust

Lands under the most imminent threat of development produce 79 percent of the nation's fruit, 69 percent of its vegetables, 52 percent of its dairy products, 28 percent of its meat, and 27 percent of its grain. AFT estimates that if present trends continue, by 2050 farmers and ranchers could be required to produce food for 50 percent more Americans on 13 percent less land, and that the nation might eventually become a net food importer.⁸⁹

Protecting Ranchlands

In the West, where "wide open spaces" aren't as wide or as open as they used to be, communities are scrambling to protect land that supports the economic engines of ranching, tourism, and business growth. The West has experienced explosive growth in recent decades. As land values rise, ranching families are pressured to sell what is often a region's most beautiful and productive lands for development. Typically, a family may be forced to sell to finance education or retirement or to pay crushing inheritance taxes on steeply appreciating property. As a result in some areas, open range is fast disappearing. As fences go up, the health of the grasslands is compromised and wildlife corridors are cut.

Although communities across the West are working to preserve ranches, activity is particularly intense in Colorado, which is losing 90,000 acres of ranchland each year.⁹⁰ In 1992, the state launched Great Outdoors Colorado (GOCO), a grants program funded by state lottery revenues that supports wildlife preservation, recreation programs, and open space acquisition. Since 1994, GOCO has awarded \$145 million in grants to state agencies, counties and municipalities, park and recreation districts, and nonprofit land conservation organizations. Of these funds, \$35 million helped protect more than 60,000 acres of open space.⁹¹ ▶

Minding your PDRs

States and communities use several techniques to help keep farmland and ranchland in agriculture. In some instances farmland may be taxed at a special lower rate so long as it is used for farming. But states and communities are increasingly purchasing the development rights to agricultural land and restricting this land to farm, woodland, or other open space use.

Purchase-of-development-rights (PDR) programs began on the East Coast and have since spread across the country. Fifteen states and dozens of county and municipal governments now sponsor PDR programs, with funds for some transactions coming from both state and local sources. State PDR programs alone have protected more than 470,000 acres.

Maryland, among the first states to launch a PDR program (in 1977), has protected nearly 140,000 acres of farmland. Other states with major PDR programs include Vermont, New Jersey, Massachusetts, and Connecticut.⁹²



Traverse City, Michigan's orchards are losing ground to development.

TERRY W. PHIPPS



ERIC SWANSON

Recreation and tourism bring both dollars and development. Gunnison County, Colorado, and other rural communities are trying to balance growth and their traditional way of life.



DAVID HARP

- ▶ Local land protection efforts are also under way in several rural Colorado counties that are threatened by development. In Gunnison County, home to the Crested Butte ski resort and mountain bike center, efforts have focused on preserving a critical mass of rangeland, especially private land that offers access to summer grazing allotments on U.S. Forest Service land. These lands also provide habitat for wildlife that attracts tourists, hunters, and anglers. Hunting and fishing alone contribute more than \$62 million each year to the Gunnison County economy.⁹³

Ranchlands and Tourism

Rangeland protection also helps safeguard the tourist economy by preserving the vistas and open landscapes tourists love, says Will Shafroth, executive director of GOCO, which has channeled more than \$2.5 million of state lottery funds into



MICHAEL K. NICHOLS

Higher density development could protect farmland and save billions in tax dollars in California's Central Valley.

Saving a billion dollar breadbasket

Each year, urban sprawl consumes 15,000 acres of farmland in the Central Valley of California, the nation's most productive agricultural region. At current growth rates and development patterns, the valley's \$13 billion in annual production will be slashed by \$2.1 billion a year by 2040—a reduction equivalent to the current agricultural production of New York, Virginia, Oregon, or Mississippi.

A 1995 study for American Farmland Trust examined two growth scenarios for the Central Valley. In one, development continued at its current density of three dwelling units per acre. In the other scenario, this rate of growth was doubled, to six dwelling units per acre. Among the study's findings are the following:

- ▶ Compact, efficient growth would slash farmland conversion in half between now and the year 2040.
- ▶ While agricultural sales and related economic benefits would decline under both growth scenarios, compact growth would reduce this loss by more than half, saving communities \$72 billion by 2040.
- ▶ Farmland protection and efficient growth would save 21,500 jobs, equivalent to the number of civilian jobs lost in California during the recent round of military base closings.
- ▶ Because low-density growth costs governments more to service than does high-density development, farmland protection and efficient growth could save Central Valley taxpayers \$1.2 billion each year.⁹⁴

In Colorado communities lacking a land protection program, 63 percent of survey respondents wanted one; in communities that already had a program, 81 percent approved of it.

the purchase of agricultural easements in Gunnison County. “Surveys tell us that the people who come to Crested Butte to ski in the winter and mountain bike in the summer place a very high value on open space,” Shafroth says. “They leave the airport and they don’t have to drive through subdivision after subdivision to get to the ski area. Some ski areas may have great skiing, but their surroundings are less interesting because they’re completely paved over.”

GOCO’s efforts in Gunnison County have been in cooperation with the Gunnison Ranching Legacy Project, a local group dedicated to ranchland preservation.⁹⁵ Other funding for land protection has come from county and local sources. In 1991, Crested Butte began collecting a real estate transfer tax that has raised more than \$1.5 million for open space conservation, and in 1997 county residents passed a dedicated sales tax to fund open space protection.

In addition, more than 100 Crested Butte merchants collect an informal 1 percent sales tax and donate the money to the Crested Butte Land Trust and the Gunnison Ranching Legacy Program. The idea for this voluntary customer donation was generated by the merchants themselves. The donation program raised an estimated \$100,000 for land protection in 1998. Working together, the town of Crested Butte and the Crested Butte Land Trust have helped protect more than 1,000 acres around their mountain community. “There’re just a lot of people in this town that really value open space,” says town planner John Hess.

Throughout Colorado, 29 counties and municipalities levy taxes or have approved bonds to fund the protection of agricultural lands and other open space, and the number is growing. An October 1998 poll of 600 randomly selected Colorado residents found strong approval for local land protection programs. In Colorado communities lacking a land protection program, 63 percent of the respondents wanted one; in communities that already had a program, 81 percent approved of it.⁹⁶ In Colorado—as across the nation—communities are recognizing that once farms, ranches, and other open space are gone, the economies they support are lost forever. ■

Farms keep taxes lower

➤ More than 40 studies from 11 states have found that farms can save communities money by contributing more in taxes than they demand in tax-supported services.

Examples include:

➤ Hebron, CT: Farms required \$0.43 in services for every dollar they generated in taxes. In contrast, residential properties required \$1.06 in services for every dollar contributed in taxes.

➤ Minneapolis-St. Paul, MN: In three nearby rural communities, farms drew an average of \$0.50 in services for every tax dollar paid. Residential properties required an average of \$1.04 in services for every tax dollar.

➤ Dunn, WI: Farms required \$0.18 cents in services for every tax dollar; residential development cost taxpayers \$1.06 for every tax dollar collected.⁹⁷



SUSAN LAPIDES

TPL helped save the last working farm in Billerica, Massachusetts, from development as a discount chain store.

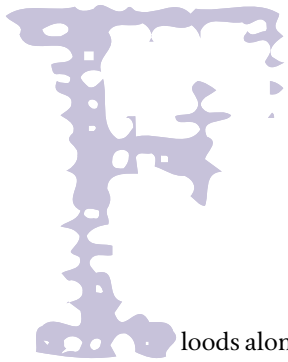
Preventing Flood Damage

**Floodplain protection offers a
cost-effective alternative to
expensive flood-control measures.**



RICHARD DAY/DAYBREAK IMAGERY

Inappropriately sited
development costs bil-
lions in flood damage.
Alma, Illinois.



loods along Northern California's Napa River have caused an average of \$10 million in property damage each year since 1960. It's not that engineers haven't tried to control the river's rages. Like many rivers, the Napa River—which flows through the famous Napa Valley wine-growing region—has been dredged and channeled. Levees have been built, and the river's banks have been fortified with concrete. Still, seasonal floods have wreaked havoc on lives and property and threatened to disrupt the valley's lucrative tourist trade.

But in 1998, Napa County voters approved funding for a radical new river-management plan. Instead of trying to control the river, the engineers will let it flow, and 500 acres of floodplain will be acquired to accommodate winter rains. Bridges will be raised, some levees will be lowered, and 17 homes in the floodplain will be purchased and demolished, as will several businesses and a trailer park. The estimated cost: \$160 million to "fix" a river that has done \$500 million in flood damage since 1960.⁹⁸

According to the U.S. Army Corps of Engineers, flood damages in the U.S. average \$4.3 billion each year.⁹⁹ But a protected floodplain contains no property to be damaged and acts as a permanent "safety valve" for flooding, reducing destruction to developed areas downstream. A 1993 study by the Illinois State Water Survey found that for every 1 percent increase in protected wetlands along a stream corridor, peak stream flows decreased by 3.7 percent.¹⁰⁰

Communities across the nation are learning that building in floodplains is an invitation to disaster, despite expensive dike and levee systems that simply increase flooding farther downstream. Expense piles on expense as residents and businesses demand costly drainage improvements, flood control projects, flood insurance, and disaster relief. In the heavily developed floodplain of New Jersey's Passaic River, for example, inappropriate development resulted in \$400 million in flood damages in 1984 alone. One mitigation proposal envisioned construction of a \$2.2 billion tunnel; another would require the purchase and condemnation of 774 homes.¹⁰¹ ►

Save the bay!



ALEX TEHRANI

Students test the waters of Barnegat Bay, New Jersey.

Only 40 miles from New York City, Ocean County, New Jersey, is among the fastest growing counties in the nation's most densely populated state. It is also a

place of great natural beauty and home to a network of streams and marshes along slender Barnegat Bay.

Inappropriate development across Ocean County is polluting the ground water and threatening the quality of life. Despite this, county leaders were long reluctant to ask voters to spend money on open space protection, fearing that the largely Republican and senior electorate would not support new property taxes for land conservation.

But polling and other research by the Trust for Public Land suggested that voters would support local open space funding. TPL helped organize a citizens committee to promote a property tax measure and helped draft a measure that their research indicated voters would support. When county leaders approved the measure for the November 1997 ballot, TPL made a grant to a community organization to educate the public about the issue.

Today, Ocean County is one of 16 New Jersey counties and 99 municipalities to have dedicated open space trust funds, making them eligible for state grants. Ocean County's measure is expected to generate \$4 million annually to protect watershed and agricultural lands.

Reaping the benefits of the forests and the trees



NANCY WARNER, PACIFIC FOREST TRUST

Susan Pritchard of the Pacific Forest Trust visits a sustainably-managed forest protected from development by conservation easements.

Private timberlands contribute to community economies through the production of lumber and other forest products, by hosting recreation and tourism, and by performing vital ecological and biological services such as cleaning the air, stabilizing watersheds, and safeguarding biodiversity.

In Virginia, for example—where 77 percent of more than 15.4 million acres of timberland is held by more than 400,000 private landowners—timber production and wood processing contribute \$11.5 billion a year to the state economy and employ 220,000 workers. Wildlife and forest-based recreation contribute an additional \$11.7 billion.¹⁰²

But as the timberland becomes valuable for development, small timber owners may no

longer be able to afford to pay property taxes, and families of deceased timber owners may have to sell the land to pay crushing inheritance taxes.

According to the Pacific Forest Trust, which protects timberland through conservation easements, some nine million acres of forestland—one quarter of all private holdings—may be in danger of conversion to non-forest use in the Pacific Northwest alone.¹⁰³

Just as an agricultural easement prohibits development while allowing a farmer to farm, a timberland easement prohibits development while allowing a specified level of timber harvest. The easement reduces the taxable value of the land, so a landowner can afford to keep it in forest, and preserves the forest's economic value while reducing the community's costs for schools, roads, and other development-related infrastructure.

In recognition of the need to conserve working forests, in 1990 Congress created the Forest Legacy Program to fund purchases of forestland and easements.¹⁰⁴ By 1998, the program had distributed approximately \$38 million—barely enough to make a dent in conservation needs.

In 1999, as part of its effort to increase federal funding for land protection, the Clinton administration requested \$50 million in Forest Legacy funds. Other money for forest protection comes from state and local programs. Many forest easements are held by the nation's more than 1,200 local land trusts.

Governments at all levels are prohibiting development in floodplains or are acquiring these lands for permanent flood protection.



RICHARD DAY/DAYBREAK IMAGERY
Standing levee along the Mississippi River.

► **Communities Acquire Floodplains**

No wonder that more and more governments at all levels are prohibiting development in floodplains or are acquiring floodplains for permanent flood protection. Near Boston, for example, officials protected—through purchase or easement—over 8,000 acres of wetlands along the Charles River that are capable of containing 50,000 acre-feet of water as an alternative to a \$100 million system of dams and levees. Loss of these wetlands would have caused an estimated \$17 million in flood damage annually.¹⁰⁵

Similarly, the residents of Littleton, Colorado, created a 625-acre park and seasonal wetland rather than channel 2.5 miles of the South Platte River. (Local bonds and federal grants paid for the floodplain acquisition.)¹⁰⁶

Some towns have even relocated to avoid the ongoing expense and trauma of trying to prevent—and rebuild after—a disastrous flood. In 1978, the entire population of Soldiers Grove, Wisconsin, moved out of reach of the Kickapoo River to avoid the devastating floods that had descended once each decade. The U.S. Army Corps of Engineers proposed a \$3.5 million levee to protect the town, but maintenance expenses would have been double the town's annual property tax receipts. It cost the U.S. Department of Housing and Urban Development \$1 million to move the town, saving an estimated \$127,000 a year in flood damage.¹⁰⁷

Because of the high cost of recurring flood damage, in 1988 the Federal Emergency Management Agency (FEMA) announced that in the future it would work to relocate homes and businesses out of the path of "recurring natural disasters."

Valmeyer, Illinois, relocated out of the reach of the Mississippi River after the Midwest floods of 1993—the most costly in U.S. history, with damage estimates between \$12 billion and \$16 billion. Residents of Valmeyer (pop. 900), 30 miles south of St. Louis, reestablished their town on a nearby hill after FEMA announced it would help rebuild homes only in a new, higher location.¹⁰⁸

FEMA granted \$2 million dollars in disaster assistance to Arnold, Missouri, after flooding by the Mississippi and ►

Open space in Minnesota? You bet!

- **Proportion of proceeds from Minnesota state lottery dedicated to that state's Environment and Natural Resources Trust Fund since its establishment in 1988: 40 percent**
- **Amount granted from that fund in its first decade to protect land and complete other environmental projects: \$82.8 million**
- **Proportion of Minnesota voters that in November 1998 approved a 25-year extension of the Environment and Natural Resources Trust Fund: 77 percent**
- **Annual amount expected to be generated by this fund by the year 2010: \$50 million¹⁰⁹**

The town of Valmeyer, Illinois was relocated to save money spent on flood damage.

RICHARD DAY/DAYBREAK IMAGERY



A protected floodplain that doubles as a wildlife refuge or recreation area may generate economic benefits by attracting hunters, birdwatchers, and other tourists to a community.

Voters in Arnold, Missouri, passed a bond initiative to raise funds to buy endangered open space.



MIKE MOORE

Urban trees, please

- Proportion of tree cover in the total land area of Atlanta, Georgia: **27 percent**
- Estimated annual value of this tree cover to improving Atlanta's air quality: **\$15 million**
- Additional annual economic benefits to air quality that would be realized if Atlanta's tree cover were increased to 40 percent, the proportion recommended by the forestry organization American Forests: **\$7 million**
- The amount Atlanta's current tree cover has saved by preventing the need for stormwater retention facilities: **\$883 million**
- Additional economic benefits in stormwater retention that would be realized if Atlanta's tree cover were increased to 40 percent: **\$358 million**
- Decline in natural tree cover in the Atlanta metropolitan area since 1972: **60 percent** ¹¹³

- ▶ Meramec Rivers in 1993. The assistance was awarded in part because of the town's strong flood-mitigation program, which includes the purchase of damaged or destroyed properties and a greenway along the Mississippi River floodplain. In 1995, another large flood struck Arnold, but this time damage amounted to less than \$40,000 because of public acquisition of flood-prone and flood-damaged properties.¹¹⁰

FEMA estimates that federal, state, and local governments spent a total of \$203 million acquiring, elevating or removing damaged properties from floodplains after the 1993 floods. This mitigation resulted in an estimated \$304 million in reduced future disaster damages.¹¹¹

Protected floodplains also create economic benefits by providing open space for recreation, wildlife habitat, and farming. A protected floodplain that doubles as a wildlife refuge or recreation area may generate economic benefits by attracting hunters, birdwatchers, and other tourists to a community.

In the Katy Prairie near Houston, Texas, the Trust for Public Land is helping flood control officials and a local land conservancy to purchase agricultural land to serve as a safety valve for seasonal flooding. Much of the land is leased to farmers for growing rice, and it also serves as critical habitat for migratory waterfowl, which attract bird watchers and hunters. Each dollar invested in the project will yield multiple economic benefits that promote local industries and tourism.¹¹² ■



RICHARD DAY/DAYBREAK IMAGERY

Acquiring land, along with elevating and removing properties after the 1993 mid-west floods saved an estimated \$304 million in future flood damages.

Safeguarding the Environment

**Open space conservation is often
the cheapest way to safeguard drinking water,
clean the air, and achieve other environmental goals.**



DON RIEPE, NATIONAL PARK SERVICE

Green heron.

Communities are realizing that keeping water clean is almost always cheaper than cleaning it up.

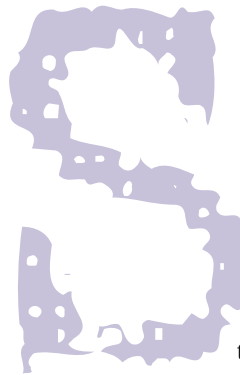
Thirsty?

- Increase in chlorine added to Chicago's drinking water as a result of source contamination since 1965: **30 percent**
- Increase in Cincinnati water bills to pay for activated carbon filtration needed to remove pesticide contamination: **10 percent**
- Amount spent to protect Milwaukee drinking water against *Cryptosporidium* bacteria, which killed 103 residents in 1993: **\$54 million**
- Annual reduction in water treatment costs after the city of Gastonia, North Carolina, relocated its drinking water intake to a lake without surrounding development: **\$250,000**
- Estimated cost to New York City to buy watershed lands to protect upstate drinking water supplies: **\$1.5 billion**
- Estimated cost to New York City to build a filtration plant if upstate watershed lands are developed: **\$6 billion to \$8 billion**¹¹⁷

The purchase of watershed lands can provide clean drinking water without constructing an expensive treatment plant. Sterling Forest, New York.



CESAR ALONSO



terling Forest, on the New York-New Jersey border, is more than just a pretty woodland. The 16,000-acre forest gathers drinking water for more than two million people—a quarter of New Jersey's population. A few years ago the private owners of the forest proposed the construction of 13,000 homes, eight million square feet of commercial and light industrial development, and three golf courses. New Jersey officials calculated that this would so pollute the watershed that a new filtration plant would be required. Estimated cost: \$160 million.

As an alternative, New Jersey officials offered \$10 million toward the purchase of the land. The Trust for Public Land and the Open Space Institute entered negotiations with the owners and helped raise \$55 million from public and private sources to preserve more than 90 percent of Sterling Forest. The purchase helped consolidate 150,000 contiguous acres of parks and protected land, conserving important habitat for bears, bobcats, beavers, and birds, including scarlet tanagers, while protecting seven miles of the Appalachian Trail.¹¹⁴

Communities nationwide face billions of dollars in expenses to treat polluted drinking water. Development of watersheds brings pollution from septic and sewer systems, from lawn and garden chemicals, and from highway runoff. Currently, 36 million Americans drink water from sources that violate EPA contaminant standards, and the agency has estimated that \$140 billion will be needed over the next 20 years to make drinking water safe.¹¹⁵

As a result, more and more communities are realizing that keeping water clean is almost always cheaper than cleaning it up. Recognizing this, Congress has authorized the use of a portion of federal clean water funds for watershed acquisition. A 1991 study by the American Water Works Research Foundation concluded that "the most effective way to ensure the long-term protection of water supplies is through land ownership."¹¹⁶

Other communities also are reducing filtration costs by protecting watersheds:

- New York City is spending \$1.5 billion to protect 80,000 acres of its upstate watershed—which seems like a lot of money until you understand that the alternative is an \$8 billion

Securing land around Mountain Island Lake and its tributaries will protect the primary drinking water source for metropolitan Charlotte, North Carolina.



WAYNE MORRIS

water filtration plant that would require an additional \$300 million a year in operating costs.¹¹⁸

- With TPL's help, the San Antonio (Texas) Water System and the Edwards Underground Water District recently acquired more than 5,000 acres atop the Edwards Aquifer, where development would have polluted drinking water for 1.5 million people.
- In North Carolina, TPL recently purchased and conveyed to Mecklenburg County 1,300 acres on Mountain Island Lake, the water source for over half a million people in and around Charlotte. In 1996 the North Carolina legislature guaranteed at least \$30 million a year to protect the state's water resources—including funds for the purchase of watershed land and easements.

Other communities are working to protect both water *quality* and water *quantity* by guaranteeing that rainwater recharges underground aquifers. Pervasive development can cover large areas with impervious surfaces (such as roads and rooftops) which shunt runoff away from drinking water aquifers and into culverts and streams. In these areas, there is simply not enough undeveloped open space to absorb rainfall. ►

Save the species!

Natural ecosystems support endangered species and other genetic resources of incalculable economic and biological value. In recognition of this value, state and federal laws protect endangered species in the path of development. But these essential laws can also prompt costly litigation and development delays without guaranteeing the network of protected habitat a species may need to survive.

Booming San Diego County, California—often cited as an endangered species “hot spot”—is pioneering an alternative approach to endangered species protection. Under the auspices of California's Natural Communities Conservation Program, local, state, and federal officials are working with landowners and conservation groups to develop a regional sys-

tem of habitat reserves while easing development regulations on less sensitive land.

In support of this program, the Trust for Public Land has purchased and transferred to public ownership several crucial parcels, including songbird habitat along the Sweetwater River; coastal sage habitat in the Tijuana River Estuarine Research Reserve; breeding ground for the endangered California gnatcatcher; and five square miles of mesa, woodlands, meadows, and wetlands within Escondido city limits.

Such efforts support community economies by allowing guided development to continue while protecting valuable biological resources. By protecting the land on which other species live, we also protect the ecosystems on which all species—including our own—depend.

All wet

- Estimated annual value of water quality improvement by wetlands along a three-mile stretch of Georgia's Alchovy River: **\$3 million**¹¹⁹
- Estimated fraction of U.S. commercially valuable fish and shellfish that are spawned in wetland habitat: **75-90 percent**¹²⁰
- Estimated annual value of water storage and aquifer recharge in a single 557,000-acre Florida swamp: **\$25 million**¹²¹
- Estimated value of all economic benefits generated by a single acre of wetland: **\$150,000 to \$200,000**¹²²



ANTHONY MERCECA

California gnatcatcher.

Banking land on the Cape

Long a favorite with summer vacationers, Cape Cod has been the fastest growing region of Massachusetts in recent years. The Upper Cape has become an extension of the Boston megalopolis 90 miles to the northwest. Elsewhere, summer homes have been converted to year-round residences for retirees and telecommuters.

In some communities, development has been so furious that property taxes have doubled to pay for schools and other services. The water table is being polluted by septic tanks, and roads are clogged with traffic.

In November 1998, voters decided that one sure way to protect the Cape's open land was to buy it. Fifteen communities—every town on Cape Cod—passed a 3 percent property tax surcharge to fund the purchase of open space for a Cape Cod Land Bank, at an average annual cost of \$57 per household.

"People have to understand that every parcel that isn't saved is going to cost them, both in higher taxes and in a deteriorating lifestyle," said Representative Eric Turkington, who sponsored the state enabling legislation that made the votes possible.¹²⁶

Researchers settled on \$33 trillion a year as the most likely value of nature's worldwide environmental services.

- A 1998 report by the Massachusetts Clean Water Council showed that as much as 30 percent of that state's natural groundwater recharge may be lost due to development.¹²³

Nature's Economic Services

Watershed conservation is only the most obvious way that protected open space can help communities meet environmental goals in a cost-effective manner. Open land provides the space for nature to perform life-sustaining services that otherwise would have to be provided technologically at great expense:

- degradation of organic wastes
- filtration of pollutants from soil and water
- buffering of air pollutants
- moderation of climatic change
- conservation of soil and water
- provision of medicines, pigments, and spices
- preservation of genetic diversity
- pollination of food crops and other plants

In one much-quoted study, 13 researchers led by Robert Costanza, an ecological economist at the University of Maryland, judged the worldwide annual value of 17 natural environmental services to be between \$16 trillion and \$54 trillion. Within this range, the researchers settled on \$33 trillion a year as the most likely value of nature's worldwide environmental services.¹²⁴

The Value of Wetlands, Forests and Wooded Buffers

Forested open space and wetlands are particularly valuable. Trees control erosion, help clean the air of pollutants, mitigate global warming by absorbing carbon dioxide and other greenhouse gasses, and help shelter and cool our homes. The forestry organization American Forests estimates that trees in the nation's metropolitan areas contribute \$400 billion in stormwater retention alone—by eliminating the need for expensive stormwater retention facilities.¹²⁵

Wetlands serve as wildlife habitat, absorb storm and flood water, and reduce pollutant and sediment loads in watershed



ROBERT CADENA

Wetlands filter pollutants and are essential to fisheries. Barnegat Bay, New Jersey.

Protecting the Barton Creek watershed from development preserves Austin, Texas's wildlife and water quality.



ERIC SWANSON

runoff. These are all services society would have to pay for otherwise. Natural open space provides these services for free; in its absence, society must pay for them.

Protected buffers along rivers, lakes, streams, and reservoirs help preserve clean waters that generate profits from tourism and fisheries. In the Pacific Northwest, the U.S. Forest Service is acquiring stream buffers to help protect a fishing industry that accounts for 60,000 jobs and \$1 billion in annual income.¹²⁷ In one project, TPL helped the Forest Service acquire 790 acres along Washington's Bogachiel River to protect runs of chinook, coho, pink, and chum salmon, and steelhead and cutthroat trout. The purchase helped "show citizens that the land was more valuable for fishing and tourism than it was for timber," says N. J. Erickson, who administers the Pacific Northwest Streams Acquisition Program for the Forest Service.

Protected buffers also filter pollutants and nutrients from agricultural and residential runoff—a serious hazard to inland and coastal waters and the important economies they support. Scientists recently discovered a 7,000-square-mile "dead zone" in the Gulf of Mexico off Louisiana. Caused by excess nutrients in the rivers feeding the Gulf, this zone of depleted oxygen threatens a fishery worth \$26 billion a year.¹²⁸

States, communities, and the federal government are attempting to stem such losses by setting aside environmentally sensitive stream buffers. The U.S. Department of Agriculture helps farmers set aside wetlands through the Conservation Reserve Program, which will help fund restoration of 420,000 acres of wetlands, forests, and native grasses along the Illinois and Minnesota Rivers. A similar program pays farmers to retire flood-prone or eroding cropland along rivers and streams leading into Chesapeake Bay, where agricultural runoff threatens the \$90 million blue crab fishery.¹²⁹

Even the most ambitious attempts to place a dollar value on natural systems must fail, for ultimately these systems have value beyond our ability to measure. But that their loss results in significant economic loss is undeniable, and their preservation is essential to any effort to "grow smart" and create a livable future for all Americans. ■

TPL's Public Finance Program

In November 1998 the Trust for Public Land worked in support of 29 state and local park and open space bond measures, 26 of which passed, generating \$2.6 billion in new funding.

TPL's Public Finance Program works with citizen groups, elected officials, and public agencies to help craft, pass, and implement public finance measures for conservation. TPL's team of campaign strategists includes experts in law, public finance, policy research, communications, public opinion polling, direct mail, and legislative analysis.

TPL offers the following services:

- **Feasibility Assessment:** research, public opinion surveys, and analysis to ascertain the level of public support for new parks and open space funding.
- **Measure Development:** identification of the most appropriate sources of funding and design of a measure that meets legal requirements, that will attract public support, and that protects priority conservation lands.
- **Campaign Management:** assistance with polling, political strategy, direct mail outreach, and coalition building.

For more information, call 617-367-6200 or see <http://www.tpl.org/tech>.

Endnotes

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