Greene County Grassland Habitat Management Plan

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The Greene County Soil and Water Conservation District initiated the development of this management plan; however, a wide range of organizations and individuals played key roles in its development, and still more will have a role in implementation. Major project guidance was provided by the Greene County Habitat Advisory Committee, a unique partnership created to advise the Conservation District in habitat conservation. The following organizations and individuals are represented on the Greene County Habitat Advisory Committee and assisted in the development of this plan:

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New York State Department of Environmental Conservation provided funding for this project from the Environmental Protection Fund through the Hudson River Estuary Program.

Suggested Citation: Strong, K., R. VanSchaack, and I. Haeckel. 2014. Greene County Grassland Habitat Management Plan. Greene County Soil and Water Conservation District and Greene County Habitat Advisory Committee. Cairo, NY. 82 pp.

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Executive Summary

Between the Kalkberg Ridge and the Hudson River in Greene County lies a mosaic of active and abandoned farmland and open meadows, with major transportation corridors and county population centers. This area is also home to some of the best habitat in the Hudson Valley for grassland birds, a group of species at-risk throughout North America. Eastern Greene County hosts seven of the eleven species identified as high priority for conservation by the New York Grassland Bird Conservation Partnership (Morgan and Burger 2008). The *Greene County Grassland Habitat Management Plan* focuses on the state-listed Short-eared Owl and Northern Harrier. Conserving these birds and the grassland habitat they depend on in eastern Greene County requires maintaining a grassland landscape under threat by continued farmland abandonment and increasing pressure from industrial, commercial, and residential development. This plan establishes a framework to preserve grassland birds in the region for the enjoyment of future generations while accommodating expected growth.

The plan is a collection of work completed over the last ten years to offer an informative foundation for municipalities, developers, local residents, and other stakeholders interested in maintaining this locally treasured landscape and its wildlife for the future. The plan is designed to establish the groundwork and provide guidelines for consistent and effective environmental planning. With the information, maps, and strategies outlined in the plan, developers can make more informed decisions, while state and local agencies can better negotiate land uses and trade-offs.

This plan was created through a unique partnership among the Greene County Soil and Water Conservation District, Greene County Industrial Development Agency, and a group of local citizens, planning boards, regional non-profit organizations, and state agencies. The partnership was driven by the pursuit of a greater vision for habitat conservation in this part of Greene County, and the *Grassland Habitat Management Plan* is the result.

Purpose of the Plan

The primary purpose of developing the *Greene County Grassland Habitat Management Plan* was to foster a better understanding of habitat types critical to grassland breeding birds of conservation concern and the potential threats they face in eastern Greene County. In doing so, the plan aims to engage a wide range of stakeholders interested in grassland habitat issues and develop a proactive strategy to effectively manage habitat resources into the future.

Increased development in eastern Greene County in the 2000s made evident the need for a comprehensive plan for long term protection and management of critical habitat resources. Unlike many parts of the Hudson Valley, Greene County still has the opportunity to identify important habitat resources in advance of significant development pressure and to take effective measures balancing the impact of future development and habitat protection.

To meet these goals, the Greene County Soil and Water Conservation District (GCSWCD) convened a Greene County Habitat Advisory Committee comprised of state and federal agencies, local municipalities, planners, sportsmen, conservation organizations, and others. The specific objectives targeted for this project included:

- Developing an up to date, comprehensive inventory of existing habitat resources and management opportunities within the focus area.
- Developing a long-term strategy for addressing wetland and habitat protection, with a focus on developing practical, implementable projects
- Identifying research and education needs for habitat management, stormwater management, and mitigation activities.
- Facilitating training for GCSWCD staff, the Greene County Habitat Advisory Committee, and other stakeholders to provide a resource base for future inventory, assessment and protection of habitat.

Project Partners

The Greene County Soil and Water Conservation District (GCSWCD) initiated the development of this management plan; however, a wide range of stakeholders played key roles in developing the plan, and still more will have a role in implementing it. Major project guidance was provided by the Greene County Habitat Advisory Committee, a unique partnership originally established to advise the Conservation District in habitat conservation. Partners include the Greene County Industrial Development Agency (GCIDA), GCSWCD, and a group of local citizens, planning boards, regional non-profit organizations, and state agencies. A listing of all participants in this effort is provided on the inside cover of the document. Additional input was sought from development and conservation interests; local, state and federal agencies; and other non-governmental organizations. Greene Land Trust (GLT) was created during the development of this plan, and it has an important role managing the Coxsackie Creek Grassland Preserve and a private landowner stewardship program. Moving

forward, members of the Habitat Advisory Committee will work with GLT, GCSWCD, GCIDA, local municipalities, and other stakeholders to implement and monitor progress on the plan.

Plan Audience

In developing this management plan, GCSWCD and its partners sought to produce a document that would be helpful to a wide range of audiences. While the management plan is primarily targeted at municipal officials (including planning and zoning boards), resource agencies, regulators, and developers, it is expected that many different stakeholders will find it useful. The document was furthermore designed to provide GCSWCD with a comprehensive plan to assist in targeting program resources into the future. Ideally, the management plan will help to encourage cooperative environmental planning for future development in eastern Greene County by providing a foundation for understanding the biological integrity and significance of local grassland bird habitat.

Local land-use and environmental planning involve community input; thus, the general public is the secondary audience for this management plan. The plan was developed to help educate, engage, and support the community and private landowners in conserving grasslands and to enable residents to form educated opinions on proposed development in their towns.

Plan Outline:

Section 1 provides an introduction to Greene County's grasslands and the need for this plan. **Section 2** details the significance of the grasslands, habitat threats, and regional land-use trends. **Section 3** provides the scientific basis for the plan's goals, describing the biology of the two focal species, threats to them, and their conservation needs. **Section 4** describes the habitat inventory and identifies potential grassland habitat patches for conservation. **Section 5** identifies the target grassland conservation areas and goals for eastern Greene County based on the habitat inventory and analysis and biology of the focal species. **Section 6** presents a wide range of conservation tools to implement the plan, including targeted acquisition, landowner stewardship, local land-use planning and project review, and outreach and education.

Section I: Introduction

The agricultural legacy of eastern Greene County created today's landscape mosaic of active and abandoned farms, shrublands, and shallow wet meadows, endowing the region's pastoral character and providing for remarkable wildlife habitat. With nearly 10,000 acres of these open habitats, eastern Greene County is one of the few remaining places in the Hudson Valley where large grassland and agricultural areas persist. Among them, only the Shawangunk Grasslands National Wildlife Refuge in Ulster County provides habitat for as many rare and declining grassland species. Eastern Greene County is important for populations of Short-eared Owl, a state endangered species, and Northern Harrier, a state-threatened species. Other species of conservation concern that are known from the area are Bobolink, Eastern Meadowlark, Savannah and Grasshopper Sparrows, Upland Sandpiper, American Kestrel, Least Bittern, and Stiff-leaved Goldenrod.

However, this rich natural heritage is at risk. After years of being virtually "undiscovered," development increased significantly in Greene County in the 1990s and 2000s. Eastern Greene County is attractive for growth due to the availability of large, flat, open tracts of land as well as the presence of water and wastewater infrastructure. Additionally, proximity to key transportation systems such as the NYS Thruway and CSX freight rail plays a role in attracting development as do the region's scenic ridges, grasslands, and the Hudson River. The availability of relatively cheap land has drawn developers from Long Island and downstate areas where such large tracts are limited. Open lands in the transportation corridor between the Town of New Baltimore and the Village of Catskill have become prime targets for large-scale development.

The future of eastern Greene County's rural character and natural habitats depends on guiding growth with the landscape and wildlife in mind. Fortunately, much is known about local habitats and there are opportunities to conserve key portions of the landscape as the region develops.

History of Grasslands in New York State

Historically, most of the Northeast was forested. Before the 1800s, grassland birds used scattered grassy clearings in New York State created by natural disturbances such as fires, floods, infertile or shallow soils, storm damage, beaver dams, and possibly open areas created by Native Americans. By the turn of the century, however, grasslands became widespread in New York as people cleared forest to create a landscape dotted with small family farms, hayfields, and pastures. This land-use change resulted in increased habitat for grassland birds, which began to thrive.

Greene County landowners maintain large areas of grasslands, but the unique habitat is at risk of loss to development, fragmentation, and re-forestation.

By the early 20th century, however, the landscape changed once again. An increase in human population in the Northeast, changes in agricultural technology, and the abandonment of local family farms brought about a decline in the quantity and quality of grassland habitats for wildlife. As a result of this continuing trend, populations of grassland birds that had adapted to the agricultural landscape are now at risk as farmland is left idle, reverts to forest, or is developed. In general, the grasslands that remain in New York State today tend to be smaller, more isolated, and cropped more intensively, reducing suitable habitat for grassland species.

Hope for Eastern Greene County Grasslands

Although many of eastern Greene County's small farms, pastures and hayfields are beginning to disappear, the local agricultural legacy has created and sustained a viable landscape mosaic of active and abandoned farms, old fields, and shallow wet meadows that remain today. The grasslands of Coxsackie, New Baltimore, and Athens, known locally as the "Coxsackie Flats," currently support healthy overwintering populations of two New York State Threatened and Endangered grassland bird species, Northern Harrier and Short-eared Owl. In fact, Coxsackie Flats provide one of only four key wintering areas for the Short-eared Owl in the Hudson Valley, and supports more Harriers on a consistent basis than any other site north or west of the Hudson Valley. These key grasslands encompassed by local fields, pastures, and farms also provide critical summer nesting areas for many migratory songbird species such as Bobolink, Eastern Meadowlark, and Grasshopper Sparrow.

Current Threats to Grasslands and Grassland Birds

Grasslands in the transportation corridor between the Town of New Baltimore and the Village of Catskill have become prime targets for large-scale industrial, commercial, and residential development in recent decades. Development pressure, loss of farmland, changes in farming technology, habitat fragmentation, and succession to forest have all contributed to grassland habitat loss in the county. For example, farm acreage in Greene County has decreased by 87% since 1900 and there has been a 75% decrease since 1950 (see Table 2-2 for references).

Farms, pastures and hayfields that serve as grassland habitat are at risk of being lost due to development and other factors.

As a result of extensive habitat loss in the past 40-50 years throughout New York, the statewide decline of various grassland bird species ranges from 70-90% according to NYS Breeding Bird Atlas data. Grassland birds have specific habitat requirements that must be met or populations will continue to decline and ultimately be lost from our area. The most important and challenging habitat requirement of grassland birds may be the need for contiguous, large areas of open grasslands in a grassland landscape. Some species, such as the Northern Harrier and Short-eared Owl, need large acreages of contiguous, or connected, grassland habitat for breeding and hunting; for example, Northern Harrier home ranges in the literature range from 420 ac – 37,000 ac (Smith et al. 2011). Major threats to grassland habitat include the following:

1. **Land-use changes** from farmland and open space to large-scale industrial, commercial, and residential developments along the major transportation corridor in eastern Greene County. Diverse factors at the

root of this trend include the availability of cheap open land, increased interest from downstate developers as land availability decreases in that region, the presence of municipal water and sewer infrastructure, interest and sometimes necessity among large landowners to sell land and relieve their substantial NYS property tax burden, and the decreased viability of farming as a profitable enterprise in the area.

2. **Habitat fragmentation**, when grasslands are divided into progressively smaller patches resulting in less suitable habitat size, as well as new barriers to wildlife movement between grasslands.

3. **Invasive species** that, once established, create a monoculture, disrupting habitat for native wildlife and plants by competing for essential resources and changing the plant structure of a habitat. In Greene County's grasslands, the species of greatest concern are: purple loosestrife (*Lythrum salicaria*), spotted knapweed (*Centaurea stoebe)*, pale swallowwort (*Cynanchum rossicum*) and black swallowwort (*Cynanchum louiseae*); reedgrass (*Phragmites australis*) is also a problem in some wet fields and meadows.

Purple loosestrife © B. Rice

4. **Natural vegetative succession** from grassland to forest. If former agricultural land and open space is left unmanaged, grasslands will naturally grow into forest over time and grassland habitat will be lost.

5. **Farmland loss** has resulted in loss of grassland bird habitat. Although active farms may not provide ideal nesting or roosting habitat, they contribute to the overall grassland landscape that attracts birds and they provide foraging habitat for winter raptors. Hayfields that are not cut every year can be good nesting habitat. With less farmland and greater production pressures, hayfields are now mowed early in the season each year, placing nests at risk and further reducing grassland songbird populations. Repeated mowing in mid- to late-summer furthermore reduces winter habitat quality for raptors, since fewer meadow voles will occupy fields hayed late in the summer.

6. **Municipal planning** currently lacks an emphasis on wildlife habitat protection. Planners are becoming accustomed to accommodating stormwater and wetland protection needs, but tend to be less equipped to evaluate potential developments from the perspective of habitat conservation.

Importance and Benefits of Grasslands to People

While there is merit to conserving grasslands for grassland birds and other wildlife habitat for their own sake, there are many additional community benefits to open space and grassland conservation in Greene County.

Preservation of rural character, farmland and open space: In community surveys from the last decade in New Baltimore, Coxsackie, and Athens, residents stated that the preservation of rural character, open space, and farmland were important. In the town of Coxsackie, for example, 90% of the respondents indicated that the Town and Village should work to preserve the rural character of the community. The survey also indicated a very strong preference of the community to protect farmland, open space, historic resources, and wetlands. The open, rural character of these neighboring communities is clearly unique and worthy of preservation as a community amenity.

In a recent community survey, 90% of Coxsackie residents felt the preservation of rural character, open space, and farmland were important.

Environmental services provided by grasslands: In addition to conserving important open spaces and natural vistas, the community receives what are increasingly known as "environmental services" from grasslands and other open space. These services include the protection of water quality and the increase of stormwater infiltration by grasses, thereby reducing the threat of downstream flooding.

Benefits to farmers: On agricultural lands, such as pasture, hayfields, and cropland, conserving grasslands and associated grassland birds can result in a reduction of potentially harmful insects, such as certain caterpillars, weevils, cutworms, beetles and flies, because these "pests" are a main food source for many grassland birds. Additionally, grassland conservation can aid in the protection of farm-friendly insects such as pollinators like bees and butterflies. Finally, farmers who engage in conservation management have the opportunity to win favor with the public as environmental stewards and can even use "bird-friendly" in their marketing techniques to consumers of grass-fed meats and dairy products.

Economic benefits: There are also local economic benefits to conserving and managing local grasslands. A Cost of Services Analysis for Coxsackie completed in 2007 revealed that open space required $0.20 in service for every $1.00 paid in taxes on these properties. In contrast, residential land-use costs $1.23 in the Town and $1.28 in the Village of Coxsackie for every $1.00 of tax collected from these properties. Protection and enhancement of natural resources can help the region's economy in other ways. High quality parks, preserves, and boat launches bring visitors to eastern Greene County for outdoor recreation and can provide economic benefit to the surrounding communities. In 2011, state residents and nonresidents spent approximately $9.2 billion on wildlife-related recreation in New York, including trip and equipment costs for hunting, fishing, and wildlife observation (USDI et al. 2014). To the south of the focus area, parks in the Shawangunk Mountains in Ulster County attracted nearly 400,000 visitors annually,

Hiking and bird watching continue to bring people to Greene County.

contributing more than $12.3 million in annual economic impact between local restaurants, hotels, and other area businesses (Zweig 2010).

Multiple uses of grasslands: Grassland conservation is compatible with many human uses, both passive and active, as well as productive uses. Even while being managed for bird habitat, grasslands can have multiple uses sometimes referred to as "productive conservation," including recreation as well as pasturing, haying, and even active cultivation of certain crops. Grassland conservation is thus a realistic goal for a wide variety of land uses and landowners.

Section 2: Greene County's Grassland Habitat

Background

The focus area for the *Greene County Grassland Habitat Management Plan* encompasses 46 square miles (about 30,000 acres). It is bound by the Albany County border to the north, the Hudson River to the east, NYS Route 23 to the south, and Interstate 87 or US Route 9W to the west (whichever is most westerly). The towns of New Baltimore, Coxsackie, and Athens and the villages of Coxsackie and Athens are within the focus area.

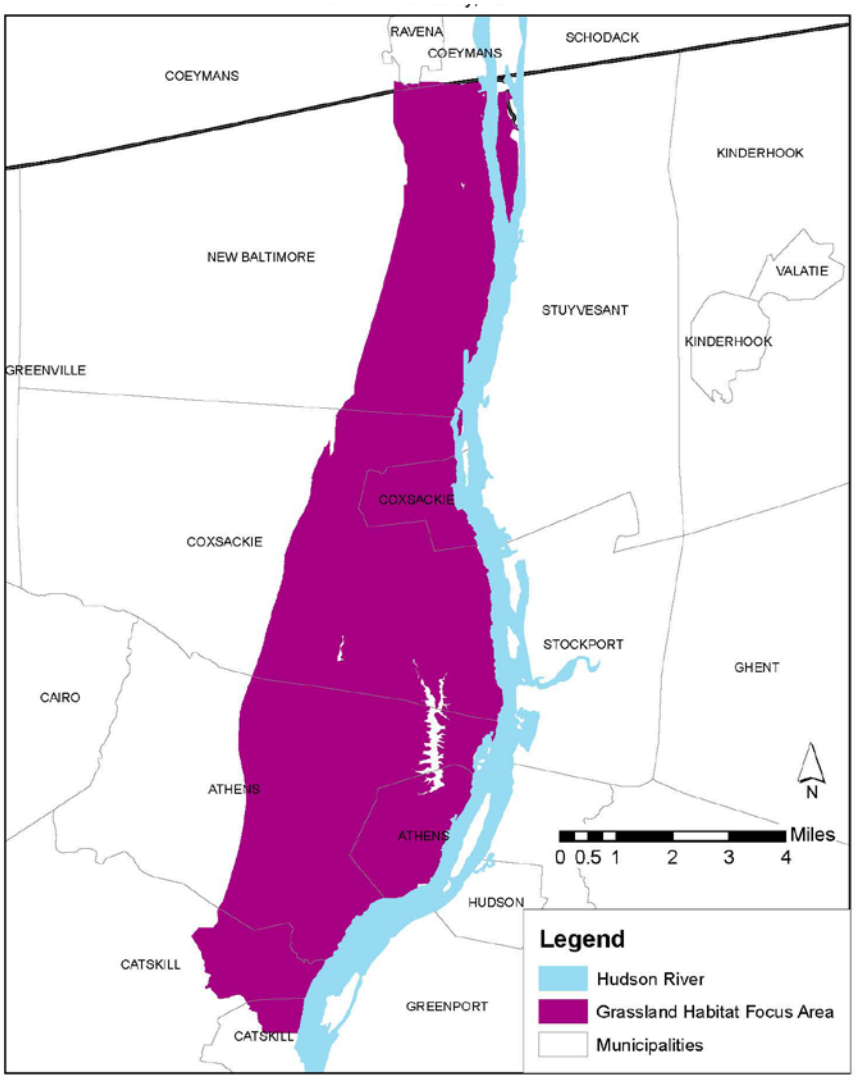

Figure 2-1. Grassland Habitat Focus Area.

The focus area runs approximately 17 miles from north to south and spans approximately 5 miles at its widest location (from Interstate 87 to Four Mile Point) and 1.4 miles at its narrowest (from 9W to the Hamlet of New Baltimore).

Greene County is characterized by a generally rural landscape dominated by mixed deciduous forest cover (Table 2-1). In contrast with more rugged forested areas to the west, the 46-square mile focus area is relatively flat and low in elevation, has far more extensive grassland and shrubland cover types, and hosts a greater concentration of residential areas and other development. Forty three percent (43%) of Greene County's population lives in focus area.

Table 2-1. Greene County Land Cover (NOAA 2007)

Cover type	Percent of county area (%)
Forest	76.6 %
Agriculture/Grassland/Shrubland	11.0 %
Open Water (does not include Hudson)	1.5 %
Developed	2.6 %
Wetland	8.3 %

Geographic setting

Physiography

The physiography of the focus area is unique in Greene County. The majority of Greene County's land area is comprised of glacial till, kame deposits, and mountainous regions associated with the Appalachian Plateau (the Catskill Mountains); in contrast, the 9W Corridor is located predominantly within the Hudson Valley section of the Ridge and Valley Province. The Hudson Valley section consists of a level terrace (100 – 150 feet in elevation) extending along the Hudson River, bounded to the west by the north-south trending Kalkberg Ridge and to the north by the Hoogeberg Hills (numerous rounded hills rising 600 – 800 feet in elevation).

Bedrock Geology

Most of the corridor is underlain by the north-south trending Austin Glen unit of the Normanskill Formation. Predominant geology consists of highly folded and faulted arkosic sandstone with some chert and dark gray to black shale. Remnants of the Stuyvesant Falls Formation trend north-south along the very edge of the Hudson River, bordered by a narrow north-south trending Mount Merino Formation to its west. This geology is characterized by deposits of shale, limestone, and sandstone. The Austin Glen Formation is exposed in the northern portion of the focus area near the town of New Baltimore.

Surficial Geology

The terrace along the river associated with the Hudson Valley section of the Ridge and Valley Province is comprised of glacial till (in some areas overlain by alluvium) and lacustrine sand and delta deposits. The rest of the corridor is predominantly lacustrine silt and clay, with narrow stretches of till trending north-south to the east and west of the railroad tracks in the southern portion of the focus area.

Soils

The majority of soils within the focus area are within the Kingbury-Rhinebeck-Hudson soil unit. The soils are primarily very deep, nearly level to very steep, moderately well-drained and somewhat poorly-drained, and fine textured. The Kingbury-Rhinebeck-Hudson soil unit formed on glacial lakebeds, broad flats, and shallow

drainageways and is ideal for agricultural hay and pasture use. Seasonal wetness, poor tilth, and erosion limit this soil unit for use as successful cropland. Inclusions of the Nassau-Farmington soil unit within the focus area are situated along the southern portion of US Route 9, in the Town of Athens, and along the Hudson River shoreline. Soils within this unit are shallow, gently sloping to very steep, well drained and somewhat excessively drained, and medium textured. Because this soil type is not well suited for agricultural use, it is primarily forested (Broad 1993).

Climate

The focus area has a continental, temperate climate of four seasons, with winter and summer marking the two extreme ends of temperature. Climate data collected at Freehold, NY (approximately 15 miles west from the center of the focus area) indicates the average winter temperature is 24° F, and 68° F in the summer. Average precipitation is approximately 37 inches, with 50% typically falling during the growing season of April through September. The average seasonal snowfall is 29 inches.

Climate change is expected to bring warmer temperatures and more precipitation in New York. The *State of the Birds Report* predicts that despite additional precipitation, northern grasslands will be warmer and drier because of increased evapotranspiration (North American Bird Conservation Initiative, U.S. Committee, 2010). Some grassland birds may be impacted more than others. Bobolink is a long distance migrant that breeds in Greene County's grasslands and may have trouble adapting to warmer temperatures. The report also states that protecting larger patches of managed grassland habitat will be essential for allowing grassland birds to move north as temperatures increase. Greene County's Grasslands will be a key link.

Water Resources

The Coxsackie Creek and Murderer's Creek drain most of the focus area to the Hudson River. Hannacroix Creek drains the northernmost portion and small unnamed tributaries drain the southernmost area. Sleepy Hollow Lake is a 260-acre drinking water supply reservoir on the Murderer's Creek. Two water resources in the focus area are on the state's 303 (d) or Priority Waterbody List: The Coxsackie Creek is listed as having minor impacts from urban runoff and Sleepy Hollow Lake is listed as an impaired segment because of streambank erosion and urban runoff. The Hannacroix Creek is considered not impacted by the NYS Department of Environmental Conservation, and its coldwater habitat supports trout. Figure 2-2 shows the water resources mentioned here.

Land Use

Greene County has a generally rural landscape. In contrast to the extensive forests and protected land in western Greene County, the focus area hosts some of the county's more concentrated residential, commercial, and industrial areas. The towns of New Baltimore, Coxsackie, and Athens and the Villages of Coxsackie and Athens are within the focus area. Two New York State correctional facility complexes are located in the Town of Coxsackie along US Route 9W. Forty-three percent of Greene County's population resides in the 9W Corridor.

One hundred years ago, land use in Greene County was primarily agricultural. An increasing trend of farmland abandonment over the last century has marked the county with a patchwork of second-growth forest, shrubland, and fields. The 2012 US Agricultural Census identified 273 farms in all of Greene County covering 42,986 acres (Table 2-2), with a slight decrease in agricultural land use in recent years. Historically, farmed acres have decreased by 87% since the agricultural peak in 1900, and by 75% since 1950. With this in mind, 13.3% of

the focus area remains in agricultural use. Agricultural fields are located primarily between the towns of Coxsackie and Catskill, and following declines in dairy and sheep production most farm acreage in the focus area is now hayfield or pasture. More recently, however, high commodity prices have spurred the conversion of some hayfields in the focus area to corn production.

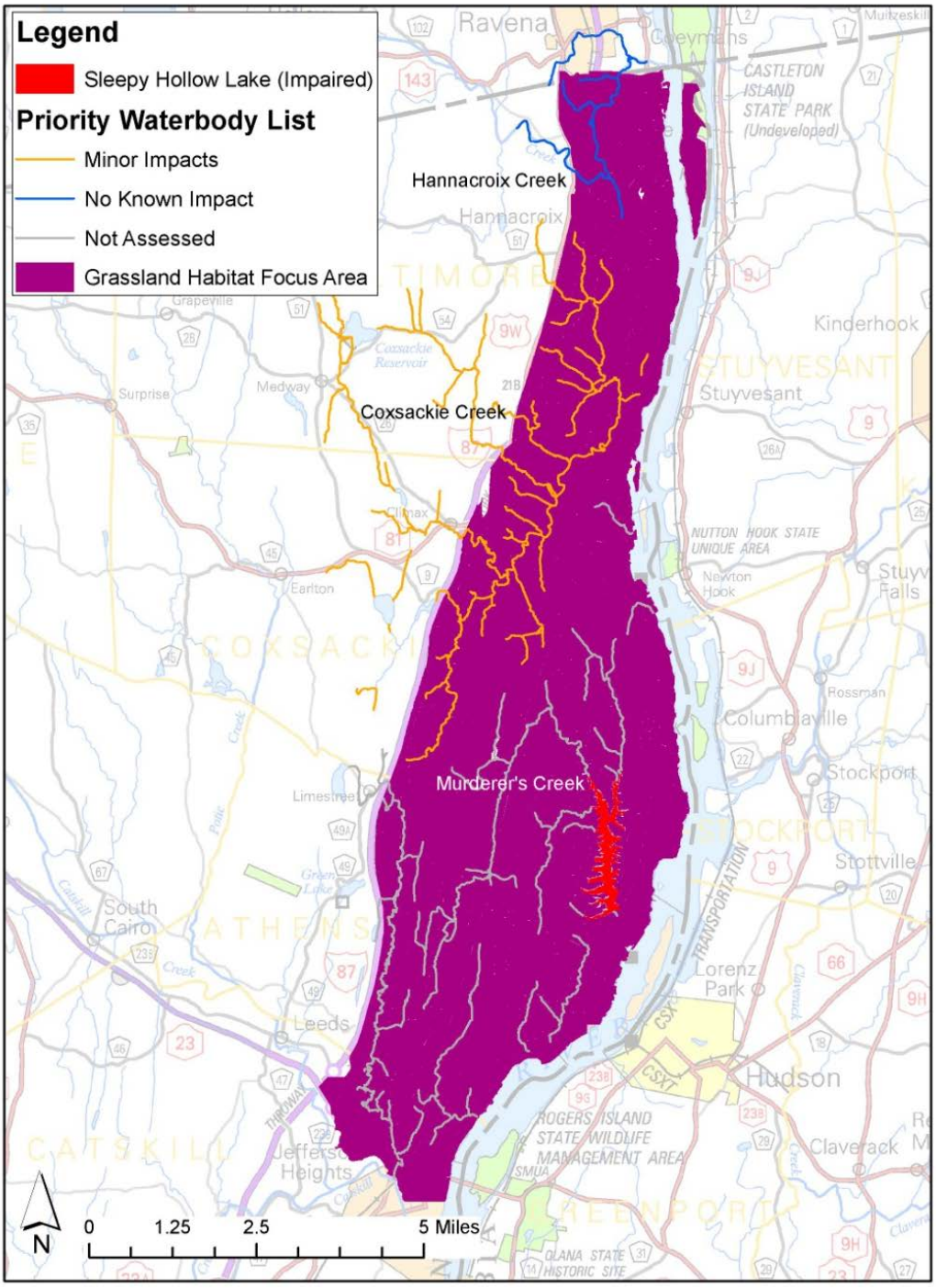

Figure 2-2. Status of Major Water Resources in the Grassland Habitat Focus Area

Table 2-2. Number of Farms and Farm Acreage in Greene County (US Bureau of the Census 1913; US Bureau of the Census 1952; National Agricultural Statistics Service 1994; National Agricultural Statistics Service 1999; National Agricultural Statistics Service 2004; National Agricultural Statistics Service 2009; National Agricultural Statistics Service 2014).

Year	Number of Farms	Acreage in Farms
1900	2,748	337,909
1910	2,654	309,124
1950	1,300	171,835
1987	279	56,441
1992	222	45,820
1997	244	48,770
2002	342	57,898
2007	286	44,328
2012	273	42,986

Archaeology

The focus area includes some of New York State's richest archeological resources. The Flint Mine Hill Archeological District is located south of the Village of Coxsackie and was listed on the National Register of Historic Places in 1978. The 18,350 acre site is one of the most extensive lithic tool workshop areas from the Paleo-Indian era in the eastern United States. Chert from the district has been found widely throughout the Northeast. The primary flint mine site is privately owned and protected by a non-profit archeological society, while the remaining land in the District is in private ownership and subject to potential development.

To the southwest of Flint Mine Hill, Four Mile Point is also well known for its dense concentrations of historic and prehistoric artifacts. Four Mile Point has yielded a wealth of information on how prehistoric and woodland Indians lived in the Hudson Valley and is a potential candidate for the National Register of Historic Places. Since 1991, GCSWCD has worked with partners such as Scenic Hudson Land Trust and the Town of Coxsackie to protect these resources while allowing access for passive recreation and educational purposes.

Existing and potential archeological sites within the focus area may play a role in habitat conservation. The interest of local residents and archeological groups as well as state and federal agencies in these resources presents a challenge to large scale development in much of the area. When coupled with habitat protection goals, the protection of archeological resources can result in additional benefits and help justify protection of large tracts of land from development.

Demographics

The 1990s brought a population boom to eastern Greene County that slowed in the 2000s, but nevertheless demonstrated the potential for future growth along the transportation corridor. Between 1990 and 2000, population in the towns of New Baltimore, Coxsackie, and Athens increased by 1.4%, 16.4%, and 12.1%, respectively, while the county as a whole experienced 7.7% population growth during the same period (U.S. Census Bureau). Between 2000 and 2010, population in New Baltimore decreased by 1.4%, while in Coxsackie

and Athens growth slowed to 0.3% and 2.5%, respectively, and the county as a whole grew by 2.1%. Recent new and renewed residential and commercial development proposals suggest that the continued economic recovery will bring renewed development pressure in the grassland focus area.

Biological Setting

Greene County's grasslands are nestled between two areas of significant biodiversity identified in the *Hudson River Estuary Wildlife and Habitat Conservation Framework* (Penhollow et al. 2006). Figure 2-3 shows the context of the Grassland Habitat focus area in relation to the Hudson Valley Limestone and Shale Ridge significant biodiversity area (SBA) to the west (known locally as the Kalkberg Ridge and Potic Mountains) and the Upper Hudson River SBA to the east. The Catskill Mountains SBA is located farther to the west. See Table 2-3 for a list of the rare plants, rare animals, and significant ecosystems in eastern Greene County from the NY Natural Heritage Program database. Although management of resources outside the focus area is beyond the scope of this plan, plan users should be aware of the other valuable biological resources in their communities.

Figure 2-3. Grassland Habitat Focus Area in Relation to Significant Biodiversity Areas of Greene County

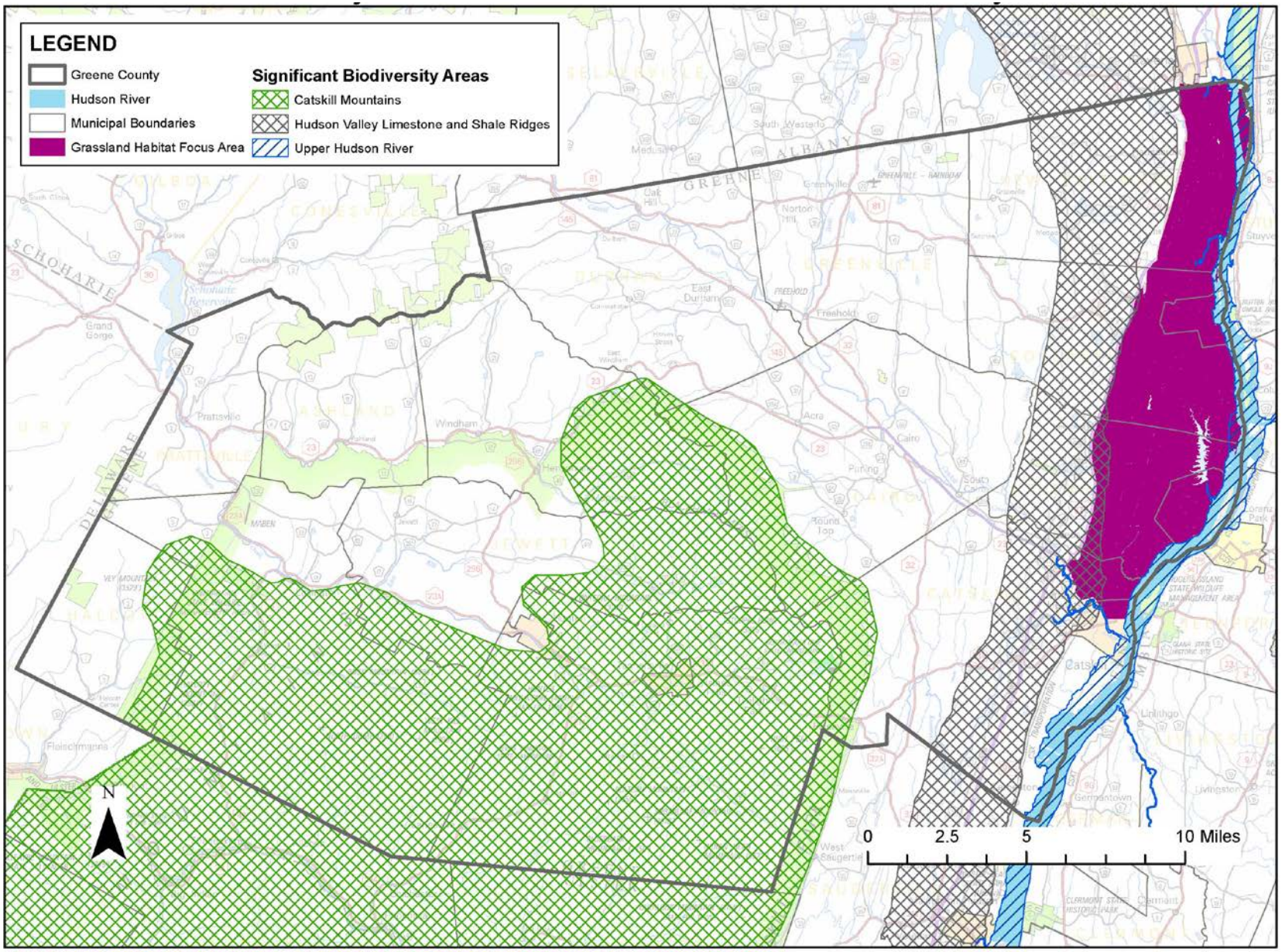

Table 2-3. Rare Plants, Rare Animals, and Significant Ecosystems in Eastern Greene County

Information from the NY Natural Heritage Program biological databases. A list for each town can be created with the NY Nature Explorer. More information on each resource can be found in the NY Natural Heritage Program Conservation Guides.

Common Name	Description	Scientific Name	State Listing
Grassland Habitat Focus Area			
Raptor Winter Concentration Area	Animal Assemblage	n/a	
Stiff-leaf Goldenrod	Rare Plant	*Oligoneuron rigidum var. rigidum*	Threatened
Northern Harrier*	Rare Bird	*Circus cyaneus*	Threatened
Short-eared Owl*	Rare Bird	*Asio flammeus*	Endangered
Upland Sandpiper*	Rare Bird	*Bartramia longicauda*	Threatened
Hudson River			
Anadromous Fish Concentration Area	Animal Assemblage	n/a	
Freshwater Intertidal Mudflats	Rare Natural Community	n/a	
Freshwater Intertidal Shore	Rare Natural Community	n/a	
Freshwater Tidal Creek	Rare Natural Community	n/a	
Freshwater Tidal Marsh	Rare Natural Community	n/a	
Freshwater Tidal Swamp	Rare Natural Community	n/a	
Tidal River	Rare Natural Community	n/a	
Russet-tipped Clubtail*	Rare Dragonfly	*Stylurus plagiatus*	
Bald Eagle*	Rare Bird	*Haliaeetus leucocephalus*	Threatened
Least Bittern*	Rare Bird	*Ixobrychus exilis*	Threatened
Shortnose Sturgeon*	Rare Fish	*Acipenser brevirostrum*	Endangered (State and Fed)
American Waterwort	Rare Plant	*Elatine americana*	Endangered
Delmarva Beggar-ticks	Rare Plant	*Bidens bidentoides*	Rare
Estuary Beggar-ticks (Historic)	Rare Plant	*Bidens hyperborea var. hyperborea*	Endangered
Estuary Hatpins (Historic)	Rare Plant	*Eriocaulon parkeri*	
Golden Club	Rare Plant	*Orontium aquaticum*	Threatened
Heartleaf Plantain	Rare Plant	*Plantago cordata*	Threatened

Common Name	Description	Scientific Name	State Listing
Hudson River Water-nymph (Historic)	Rare Plant	*Najas guadalupensis ssp. muenscheri*	Endangered
Long's Bittercress	Rare Plant	*Cardamine longii*	Threatened
Smooth Bur-marigold	Rare Plant	*Bidens laevis*	Threatened
Spongy Arrowhead	Rare Plant	*Sagittaria montevidensis var. spongiosa*	Threatened
Tidal Spikerush	Rare Plant	*Eleocharis aestuum*	
Hudson Valley Limestone and Shale Ridges			
Appalachian Oak-Hickory Forest	High quality common community	n/a	
Calcareous Cliff Community	High quality common community	n/a	
Calcareous Talus Slope Woodland	High quality common community	n/a	
Perched Swamp White Oak Swamp	Rare Natural Community	n/a	
Pitch Pine-Oak-Heath Rocky Summit	High quality common community	n/a	
Shale Cliff and Talus Community	High quality common community	n/a	
Shale Talus Slope Woodland	High quality common community	n/a	
Downy Wood-mint	Rare Plant	*Blephilia ciliata*	Endangered
Stiff-leaf Goldenrod	Rare Plant	*Oligoneuron rigidum var. rigidum*	Threatened
Historic records in other locations			
Blackchin Shiner*	Rare Fish	*Notropis heterodon*	
Fernald's Sedge	Rare Plant	*Carex merritt-fernaldii*	Threatened
Navel-fruited Corn-salad	Rare Plant	*Valerianella umbilicata*	Endangered
Northern Dropseed	Rare Plant	*Sporobolus heterolepis*	Threatened
Reflexed Sedge	Rare Plant	*Carex retroflexa*	Endangered

* Indicates species of greatest conservation need (NYS DEC 2005).

Section 3: Grassland Birds and Habitat Conservation

Background

Grassland birds are the most at-risk group of birds in the United States and are in decline throughout the midwestern and northeastern United States (Norment 2002). Recent reports determine grassland birds are among the fastest and most consistently declining group of birds in North America; 48% are of conservation concern and 55% are showing significant declines (North American Bird Conservation Initiative, U.S. Committee, 2009). In New York, many grassland birds have experienced significant declines over the past 40 years and are listed as Endangered, Threatened, Special Concern, or Species of Greatest Conservation Need (Table 3-1). Aside from than the Shawangunk Grasslands in Ulster County, there are few remaining places in the Hudson Valley that are suitable for grassland conservation. Eastern Greene County hosts an important wintering area for the NYS-Endangered Short-eared Owl (*Asio flammeus*) and NYS-Threatened Northern Harrier (*Circus cyaneus*) (Schneider 2003, NYNHP 2014). Short-eared Owl and Northern Harrier are the focal species for conservation in the focus area.

Table 3-1. Grassland Bird Species of Conservation Concern in New York (adapted from Morgan and Burger 2008)

Common Name	Scientific Name	Trend in NY 1966 – 2005*	State Priority**	Present in Focus Area***	NYS listing status****
Northern Harrier	*Circus cyaneus*	-74.1%	Highest	Yes	Threatened
Upland Sandpiper	*Bartramia longicauda*	-93.8%	Highest	Historic	Threatened
Short-eared Owl	*Asio flammeus*	Insufficient data	Highest	Yes	Endangered
Sedge Wren	*Cistothorus platensis*	-99.1%	Highest	No	Threatened
Henslow's Sparrow	*Ammodramus henslowii*	-99.7%	Highest	No	Threatened
Grasshopper Sparrow	*Ammodramus savannarum*	-97.9%	Highest	Yes	Special Concern
Bobolink	*Dolichonyx oryzivorus*	-17.8%	Highest	Yes	SGCN
Loggerhead Shrike	*Lanius ludovicianus*	Insufficient data	Highest	No	Endangered
Horned Lark	*Eremophila alpestris*	-84.7%	High	Yes	Special Concern
Vesper Sparrow	*Pooecetes gramineus*	-96%	High	No	Special Concern

Eastern Meadowlark	*Sturnella magna*	-85.9%	High	Yes	SGCN
Savannah Sparrow	*Passerculus sandwichensis*	-64.2%	High	Yes	--

* Analysis of Breeding Bird Survey Routes, Morgan and Burger 2008.
** from "A Plan for Conserving Grassland Birds in New York DRAFT", Morgan and Burger 2008.
*** Based on Breeding Bird Atlases, NY Natural Heritage Program database and local observations
**** SGCN= Species of Greatest Conservation Need; All species listed as Threatened, Endangered or Special Concern are also Species of Greatest Conservation Need. For more information, visit http://www.dec.ny.gov/animals/9406.html.

Focal Species and Their Habitats

Although both Northern Harrier and Short-eared Owl have a wide distribution across North America, populations have declined range-wide in the last century. Short-eared Owl populations are declining in New York State as they are throughout the Northeast, while Northern Harrier populations appear to have stabilized (NY Natural Heritage Program 2009a, 2009b).

Both Northern Harrier and Short-eared Owl are area-sensitive species with large home ranges that require large tracts of open habitat. The extent of home range area requirements for these species is unclear in the northeastern United States, where only a few studies have taken place in native coastal grasslands habitat (Schneider 2003, Serrentino 1992). Table 3-2 lists breeding habitat characteristics for both raptors; however, it should be noted that the acreage size shown here for northern harrier is smaller than home range sizes listed in the *Birds of North America* account for this species (Smith et al. 2011). Winter habitat use is less well known than breeding habitat use in both raptors. The size of habitat utilized in winter is virtually unreported for Short-eared Owls, and has been a subject of recent study by NYSDEC.

Table 3-2. Breeding habitat characteristics preferred by the focal grassland bird species (Adapted from Morgan and Burger 2008)

Species[1]	**Northern Harrier**	**Short-eared Owl**
Recommended Field Size (ac)	75+	Large (exact sizes not available)
Shrub Tolerance (% cover)	Medium to high (1-5%)	None indicated
Non-grass herbaceous (% cover)	Low (10%)	Medium (20%)
Litter Depth (in)	No preference indicated	No preference indicated

Species[1]	Northern Harrier	Short-eared Owl
Vegetation Height (in)	Tall (25+)	Medium (15 - 25)
Vegetation Density	High	High
Perches Important		Possible
Notes	Nest success may be higher in wetter sites. Variable in vegetation preferences.	Shares sites with Northern Harrier, but may prefer drier areas.

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.

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.

Short-eared Owl (*Asio flammeus*)

Short-eared Owl is a small- to medium-sized owl with a light brown back and upper wing and a much lighter underside (Tate 1992). Males and females are difficult to tell apart. Unlike most owls that are active at night, Short-eared owls are most likely to be observed at dawn and late afternoon to dusk (Schneider 2008). When flying, they hold their wings horizontally and irregular wingbeats make the flying pattern look floppy or moth-like. (Tate 1992).

Short-eared Owls have been observed winter residents in Greene County since at least the 1970s. Wintering Short-eared Owls in New York typically arrive in November and leave in late March or early April (Clark 1975). Published records in *Kingbird* show that the number of owls observed in Greene County varied considerably from year to year, ranging from 28 owls in February 1975 (Snell 1975) to 1 in February 2001 (Graves 2001). Since 2000, the largest number of owls observed at one time in the Coxsackie-Athens Grasslands was 12. Schneider (2003) considered the Coxsackie Flats to be an important wintering area statewide and one of four in the Hudson Valley. Local populations of this owl are exclusively wintering. However, it is important to note that wintering sites for Short-eared Owl can become breeding sites if food is plentiful (Schneider 2003), and

wintering sites in New York have been documented to turn into breeding sites on at least two occasions (Clark 1975).

NYS Endangered Short-eared Owl winters in Greene County grasslands. Photo: NYS DEC

Short-term trends in NY (from NY Natural Heritage 2009a)

Currently, it appears that populations are continuing to decline, although it is difficult to determine trends due to the lack of precise location data from historical records (Schneider 2003). During the first Breeding Bird Atlas (1980-1985), there were five confirmed breeding records, nine probable breeding records, and 22 possible breeding records (Andrle and Carroll 1988). Data from the second Breeding Bird Atlas suggests a decline with confirmed breeding in four blocks, probable breeding in nine blocks, and possible breeding in 11 blocks (McGowan and Corwin 2008). During the first Atlas, Short-eared Owls were recorded in nine blocks on Long Island, compared to one block during the second Atlas. Breeding may no longer occur in the lower Hudson Valley as well as a number of other historically known breeding sites in the state.

Habitat Requirements

Breeding Short-eared Owls prefer "broad expanses" of open areas dominated by low, grassy vegetation (Tate 1992). They tend to prefer habitats with some water which may be due to the habitat preference of voles, their primary prey. Day roosts are typically on the ground, but also may be under low shrubs, in conifers, or low open perches (NY Natural Heritage 2009a). Breeding season home ranges sizes reported across studies in Manitoba, Massachusetts, and Scotland average 175 acres with a range from 57-598 (Holt and Leasure 1993).

Winter habitat needs are less well known than breeding habitat needs. Preliminary home range size for three Short-eared Owls at Coxsackie in winter 2008-2009 and three owls in winter 2012-2013 vary from 175 to 653 acres, with an average of 418 acres (NYS DEC unpublished data). Home range sizes during the non-breeding season in other parts of the country also vary widely from 30 to 650 acres (Michigan, Craighead and Craighead 1956) and 160 acres (southeastern U.S., Callopy and Bildstein 1987).

Short-eared Owl is a ground roosting species and tends to roost in vegetation that blends with its plumage. In winter, the owls have been observed roosting in conifer trees, particularly when snow pack exceeds 2 inches (Bosakowski 1986, DEC unpublished data). Short-eared owls roost communally at sites across New York State, including in Greene County (DEC, unpublished data).

Adequate meadow vole populations are required for healthy populations of both the Northern Harrier and Short-eared Owl (Schneider 2003). Meadow voles are small mouse-like mammals that feed on grains, seeds, and other plant parts. The population of voles varies annually with population booms and busts. Wintering Short-eared Owls respond sharply to these changes (Tate 1992), with year to year variability in sightings, and presumably regional habitat use (Schneider 2003). Meadow voles need litter buildup in grasslands for food and cover (Tate 1992). Poor prey availability and inadequate habitat structure will cause the raptors to travel longer distances to find prey, requiring larger home ranges to support individuals.

Short-eared Owl Habitat Requirements in Summary

Short-eared Owls require open land with these attributes for breeding or wintering habitat (Tate 1992):

1. Availability of suitable habitat (e.g., at least 418 acres of open grassland with low vegetation, salt or freshwater marshes, old fields, and meadows)
2. Suitable nesting sites
3. Maintain sufficient prey base of meadow voles (i.e., good meadow vole habitat)

Northern Harrier (*Circus cyaneus*)

The Northern Harrier is a medium-sized hawk with long wings, legs, and tail. Females have a dark brown back and upper wing, a buff colored underside, a barred tail, and a white rump. Males are pale grey above, with a white rump and black wingtips (Serrentino 1992). In flight, Northern Harriers hold their wings in a V-shape, which distinguishes them from the Short-eared Owl (Tate 1992). Harriers typically eat small birds and mammals (Serrentino 1992).

NYS Threatened Northern Harrier winters in Greene County grasslands. Photo: NYS DEC

Local Northern Harrier populations are known to winter in the region and may be present in smaller numbers year-round. Harrier populations are larger and seem to be more stable in the region than Short-eared Owl. The Christmas Bird Count data for the Catskill-Coxsackie Circle show that Northern Harrier have been present every year since 1977 (National Audubon Society 2010), with as many as 43 birds observed (1999), and as few as one (1982). These data show their numbers increasing over time. Since NYSDEC monitoring began in 2008, Coxsackie Flats has typically been found to support more harriers on a consistent basis than any other site north or west of the Hudson Valley and as many Harriers as the other well studied Hudson Valley sites (DEC unpublished data). There are also unconfirmed reports of Northern Harriers breeding in the region (Andrle and Carroll 1988, McGowan and Corwin 2008, pers. comm.). There was a probable Northern Harrier breeding site just two miles east of the Greene County Grasslands in Stuyvesant. The nearest confirmed breeding site is in western Albany County, about 26 miles to the northwest of the grassland focus area.

Short-term trends in New York (from NY Natural Heritage Program 2009b)

Northern Harrier populations vary with rodent populations, peaking about every five years. The two New York State Breeding Bird Atlases show the breeding populations are stable. During the first Breeding Bird Atlas (1980-1985), 355 probable or confirmed blocks were reported (Andrle and Carroll 1988) and for the second Breeding Bird Atlas, probable or confirmed breeding was reported in 354 blocks (McGowan and Corwin 2008). Declines were noted by McGowan and Corwin (2008) in the Adirondacks, Coastal Lowlands, St. Lawrence Plains, and Tug

Hill Plateau, while the number of reported blocks increased in the Champlain Valley to the northern Hudson Valley, Mohawk Valley, and Appalachian Plateau (McGowan and Corwin 2008). Wintering populations fluctuate with prey abundance and snow cover, but also appear to be fairly stable.

Habitat Requirements

Northern Harriers use a wide range of open habitats areas to breed and overwinter, including grasslands, shrubland, and salt and freshwater marshes (Andrle and Carroll 1988, McGowan and Corwin 2008; Serrentino 1992). Harriers are also known as marsh hawks because of their affinity for wetlands. Nests are placed on the ground, usually in dense cover, and are difficult to find (Post 2008). Harriers move to their wintering grounds in October and leave during spring migration. These raptors roost on the ground, sometimes communally (Serrentino 1992).

The amount of land required to maintain a viable population of Harriers has not been established, and it appears to be highly variable owing to differences in food supply and habitat type (Serrentino 1992). However, home range sizes averaged across eight studies summarized in *The Birds of North America* (Smith et al. 2011) range from 420 – 37,000 ac with a median of 642 ac. Poor prey availability and inadequate habitat structure will cause Harriers to travel longer distances to find prey, and therefore need larger home ranges to support themselves. Herkert et al. (1999) suggested that Harriers may respond more strongly to total amount of grassland within the landscape than to sizes of individual grassland tracts. There are no data available on fidelity (tendency to return to the same location) to winter home range, although the occurrence of communal roost locations in subsequent years has been noted in the literature and observed at Coxsackie Flats (DEC unpublished data), suggesting there may be winter site fidelity by this species.

Habitat Requirements in Summary

Northern harriers require the following for breeding or wintering habitat (Serrentino 1992):

1. Suitable breeding sites (e.g., cattail marshes, wet meadows, and shrub uplands and wetlands)
2. Hunting habitats, such as early successional fields, grasslands, and wet meadows
3. An adequate prey base, comprised primarily of small mammals and birds.

Primary Threats to Focal Species

The greatest threat to both the Northern Harrier and the Short-eared Owl is the loss of open habitat from forest regrowth and development. Changes in agricultural use from hayfield and pasture to row crops may also have a negative effect on these species.

Habitat Loss and Fragmentation

Loss of farmland in NY has coincided with the decrease of grassland bird populations since 1900. Fragmentation of grasslands results in smaller, lower quality habitat patches and creates barriers to wildlife movement between habitat units. While it is unknown how this may affect the highly mobile Short-eared Owl and Northern Harrier, it appears to have a detrimental effect on meadow voles, a crucial food source (Bock et al. 2002).

Traffic

Increasing road traffic can impact habitat use by grassland songbirds. Roads that carry 8,000 to 15,000 vehicles/day do not appear to have an effect on presence, but breeding may be limited within 985 feet of the road. Both grassland bird presence and breeding were affected as far as 2,300 feet from the road for roads that carry 15,000 to 30,000 vehicles/day (2 lane highway), and for roads that carry more than 30,000 vehicles/day, presence and breeding were affected for nearly 4,000 feet from the road (Forman et al. 2002).

Invasive Species

Purple loosestrife (*Lythrum salicaria*) is a fairly common invasive species in the focus area. It grows in both upland and wetland areas, out-competing most native grassland species. It prefers wetter environments and has formed dense mono-specific stands in many of the focus area wetlands. It is not clear what, if any, the impacts of loosestrife colonization are on the Short-eared Owl and the Northern Harrier. Short-eared Owls were observed ground roosting in thick vegetation in the region, including purple loosestrife (DEC unpublished data). Possible effects include a reduction in rodent population, difficulty hunting in dense vegetation, and/or loss of roosting sites. Spotted knapweed (*Centaurea stoebe)* is also present in the Coxsackie Creek grassland preserve.

Pale swallowwort, an emerging invasive species in northeastern grasslands. Photo: Mass Audubon

Statewide, grassland managers are also concerned about pale swallowwort (*Cynanchum rossicum*) and black swallowwort (*Cynanchum louiseae*), which have a detrimental effect on grassland birds. Neither plant is known to occur in the focus area, but the area should be monitored for early detection/rapid response.

Monitoring Efforts for Focal Grassland Bird Species

Monitoring is an important tool for understanding how the abundance or distribution of a species changes over time. Monitoring is often conducted to see how a species of conservation concern responds to active management efforts. Local bird enthusiasts have observed and recorded hawks, owls, and other bird species in the Coxsackie area for decades; however, NYSDEC, in conjunction with Audubon New York and GCIDA, began formal monitoring efforts for wintering raptors, specifically northern harrier and short-eared owls, during the winter of 2008-2009.

As of 2014, wintering raptor monitoring efforts involve both regular surveys, as well as radio-telemetry of Short-eared Owls. Regular surveys are conducted bi-weekly from December through March and involve recording the location and number of raptors observed at separate "stations". These surveys take place from one half hour before sunset to one half hour after sunset. The number of stations monitored on each survey varies depending on staff and volunteer availability, but generally involves between 5-10 stations scattered throughout the area

with an emphasis on observing fields which were utilized by Short-eared Owl and Northern Harrier in previous years. Radio-telemetry work involves outfitting Short-eared Owls with radio-transmitters, allowing biologists to identify and follow the birds' movements after dark when they are no longer readily visible with binoculars. These efforts are geared toward the identification of roost sites; areas that are used, or not used, for foraging; and for determining the extent of area (home range) utilized by the birds. See Figures 5-2 and 5-3 for monitoring observations of Short-eared Owl and Northern Harrier in the grassland focus area.

Monitoring Efforts for Other Species

While monitoring efforts focused initially on the two focal grassland bird species, it is recognized that other species of conservation concern occur in the Coxsackie area and that habitat management activities may affect the population and distribution of those species as well. Other regionally declining grassland and shrubland habitat species may respond positively or negatively to large scale Northern Harrier and Short-eared Owl management (Zuckerberg and Vickery 2006). To determine how grassland breeding species might respond to management for Harriers and Short-eared Owls, the presence, abundance, and distribution of these birds, and possibly of shrubland birds of conservation concern, should first be documented. In addition, the value of wetland mitigation efforts at the Coxsackie Creek Grassland Preserve to freshwater marsh birds, several of which are species of conservation concern, is important to document.

Currently, in addition to monitoring of winter raptors, two other bird monitoring efforts are being undertaken in the Coxsackie Grasslands area by NYSDEC Region 4 Wildlife staff. These efforts include 1) breeding grassland birds, and 2) breeding freshwater marsh birds.

To date, breeding bird surveys involving point counts have been conducted in several of the past years at the Coxsackie Creek Grassland Preserve for both grassland-nesting species and freshwater marsh birds. These surveys have been completed solely by NYSDEC Wildlife staff. Grassland bird counts have been completed at seven point count locations and follow a protocol initially developed by Audubon New York and slightly modified by a New York Grassland Bird group in 2013. These point counts are typically conducted once in early June and again in late June or early July. Species of conservation concern recorded on the surveys to date include Bobolink, Savannah Sparrow, Eastern Meadowlark, and American Kestrel, with Bobolink and Savannah Sparrow recorded most frequently and in greater numbers.

Marsh bird point counts follow a standardized protocol (Conway 2011) developed for this group of bird species that is now being implemented across the nation to track population trends in a species guild which includes both declining, rare species (Least Bittern, Pied-billed Grebe, American Bittern) and species for which there are legal harvest (Virginia Rail, Sora). These point counts are completed three times per year (first two weeks of May, last two weeks of May, first two weeks of June). Both NYS-Threatened Least Bittern and Virginia Rail have been recorded during these surveys at the Coxsackie Creek Grassland Preserve.

As this plan is implemented and further evolves, these additional grassland bird species might be incorporated in future analysis, planning, and management.

History of Grassland Conservation in Greene County

In 2004, GCSWCD and GCIDA sought to build upon the success of the Greene County Grassland Protection Program (GCGPP). Initiated as mitigation for GCIDA's two Route 9W business parks, the GCGPP was a significant step forward in achieving a balance between development and conservation. The GCSWCD and GCIDA sponsored two efforts which were targeted at developing a better understanding of habitat resources in the 9W corridor: the training of local stakeholders, and the development of a detailed plan for habitat assessment and protection.

Initially, the GCSWCD facilitated training in Hudsonia's Biodiversity Assessment methods. With funding provided by NYSDEC's Hudson River Estuary Program, GCIDA and GCSWCD, a group of conservationists, planners, sportsmen, municipal leaders, agency staff, and local volunteers attended numerous training sessions and completed a detailed inventory and report on the habitat characteristics of over 4,000 acres of land on the Coxsackie/New Baltimore border. The work of this team was further expanded by GCSWCD staff to cover the 29,000-acre focus area addressed in this management plan.

The inventory and assessment as completed by the biodiversity working group and GCSWCD staff was reviewed by the Greene County Habitat Advisory Committee, a separate group of volunteers with planning, development, policy, and various environmental science backgrounds. Habitat inventory results are presented in Section 4.

Summary

Large areas of open habitat in breeding and wintering areas need to be maintained in order to ensure the persistence of Short-eared Owl and Northern Harrier in New York. Any efforts to preserve and maintain grassland habitat for these species will have the added benefit of preserving and maintaining habitat for the species identified in Table 2-4. The similarities between the microhabitats required for each of these grassland bird species makes a management plan that provides all of these microhabitats a realizable goal.

Section 4: Habitat Inventory and Analysis

To better understand the grassland landscape and other important habitats in the focus area, GCSWCD assembled a project team to complete a habitat inventory. The team was made up of GCSWCD staff as well as citizen volunteers. They were trained in habitat inventory by Hudsonia Ltd. through a partnership with NYSDEC's Hudson River Estuary Program. The habitat assessment protocol is detailed in the Biodiversity Assessment Manual for the Hudson River Estuary Corridor (Kiviat and Stevens 2001). This methodology focuses on use of a variety of remote sensing resources including aerial photography, geology, topography, soils, and wetland maps, as well as other physical and cultural features, to analyze the environment and predict habitat types.

Upon completion of the habitat inventory based on available remote sensing resources, habitat types were verified by field visits in selected areas. After completion of hand mapping, the results were entered into a Geographic Information System (GIS). The project team identified 62 habitat types covering 29,441 acres (Table 4-1). Figures 4-1 a, b, and c show the habitat maps by town.

The habitat inventory used in this report is primarily based on remote mapping techniques, only a limited portion of these habitats were field verified due to time and access constraints. The mapping should, therefore, be treated as a base map for general purposes only, providing enough data and analysis to locate sites for conservation and planning efforts that will require supplementary, detailed field assessment and mapping for detailed management guidelines or site development.

Table 4-1. Habitats of the Grassland Habitat Focus Area, including Total Acreage (Habitats identified by volunteers as in Kiviat and Stevens 2001).

Habitat	Total Acres	Habitat	Total Acres
Acidic Rocky Woodland	569.6	Mixed Forest Wet Clay	229.5
Conifer Forest	639.0	Orchard	2.4
Conifer Forest-Riparian	21.9	Pond	61.7
Conifer Plantation	23.6	Rich Rocky Woodland	59.6
Conifer Plantation-Agriculture	64.0	Shrubby Oldfield	747.2
Conifer Swamp	9.3	Shrubby Oldfield-Agriculture	23.0
Conifer Swamp-Riparian	17.5	Shrubby Oldfield-Riparian	15.6
Constructed Pond	78.8	Deciduous Shrub Swamp	162.0
Development	6582.6	Deciduous Shrub Swamp Riparian	23.5
Dredge Spoil Forest	322.7	Supratidal Marsh	8.1
Dredge Spoil Meadow	32.7	Supratidal Pool	3.8
Dredge Spoil Pool	8.6	Supratidal Swamp	9.9
Dredge Spoil Swamp	245.1	Tidal Marsh	130.9
Dredge Spoil Swamp/Supratidal Swamp	0.6	Tidal Swamp	249.1
Dredge Spoil Wet Meadow	21.2	Tidal Shoreline Sandy	0.6
Fresh Tidal Creek	3.2	Tidal Tributary Mouth	60.9
Hardwood Forest	1012.9	Upland Meadow	1369.5
Hardwood Forest-Riparian	103.9	Upland Meadow-Agriculture	827.2
Hardwood Forest Wet Clay	153.1	Upland Meadow-Riparian	4.9
Hardwood Forest Wet Clay-Riparian	9.3	Wet Clay Meadow	1559.3
Hardwood Swamp	318.8	Wet Clay Meadow-Agriculture	2954.3
Hardwood Swamp-Riparian	563.8	Wet Clay Meadow-Riparian	96.2
Hardwood Swamp-Riparian/Beaver Pond	4.8	Wet Clay Meadow-Riparian-Agriculture	3.1
Hardwood Swamp/Intermittent Woodland Pools	13.4	Wet Clay Shrub	1574.2
Hardwood Swamp/Supratidal Swamps	6.8	Wet Clay Shrub-Riparian	40.8
Intertidal Swamp	6.2	Wet Meadow-Agriculture	0.7
Intermittent Woodland Pools	4.1	Wet Meadow-Riparian	3.9
Intertidal Mudflat	6.5	Young Woods	1456.2
Mixed Forest	5778.7	Young Woods-Riparian	14.3
Mixed Forest-Riparian	246.8	Young Woods Wet Clay	843.3
		Young Woods Wet Clay-Riparian	18.1

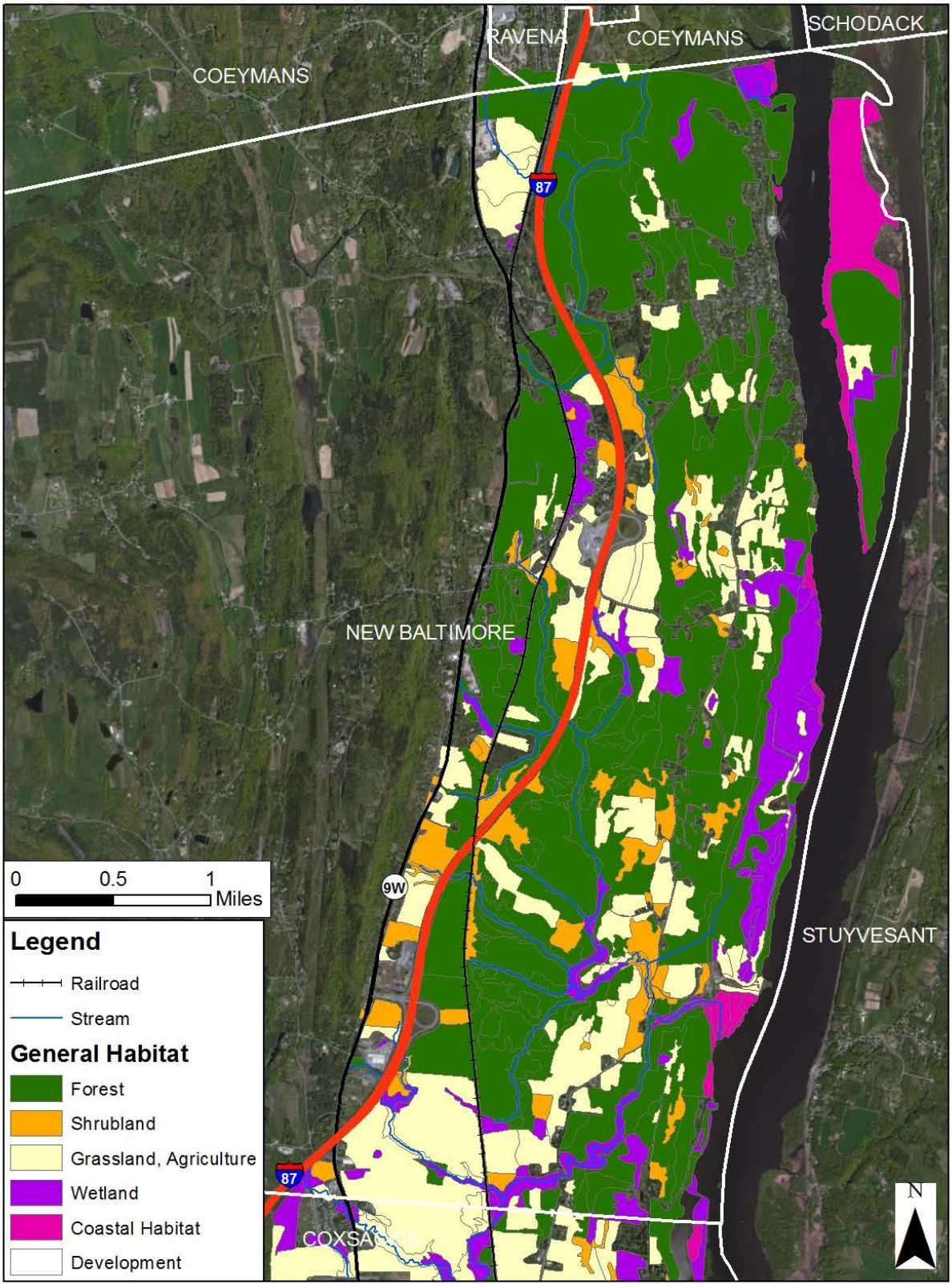

Figure 4-1a. Map of Habitats in the Grassland Habitat Focus Area: New Baltimore **(Habitats identified by volunteers as in Kiviat and Stevens 2001).**

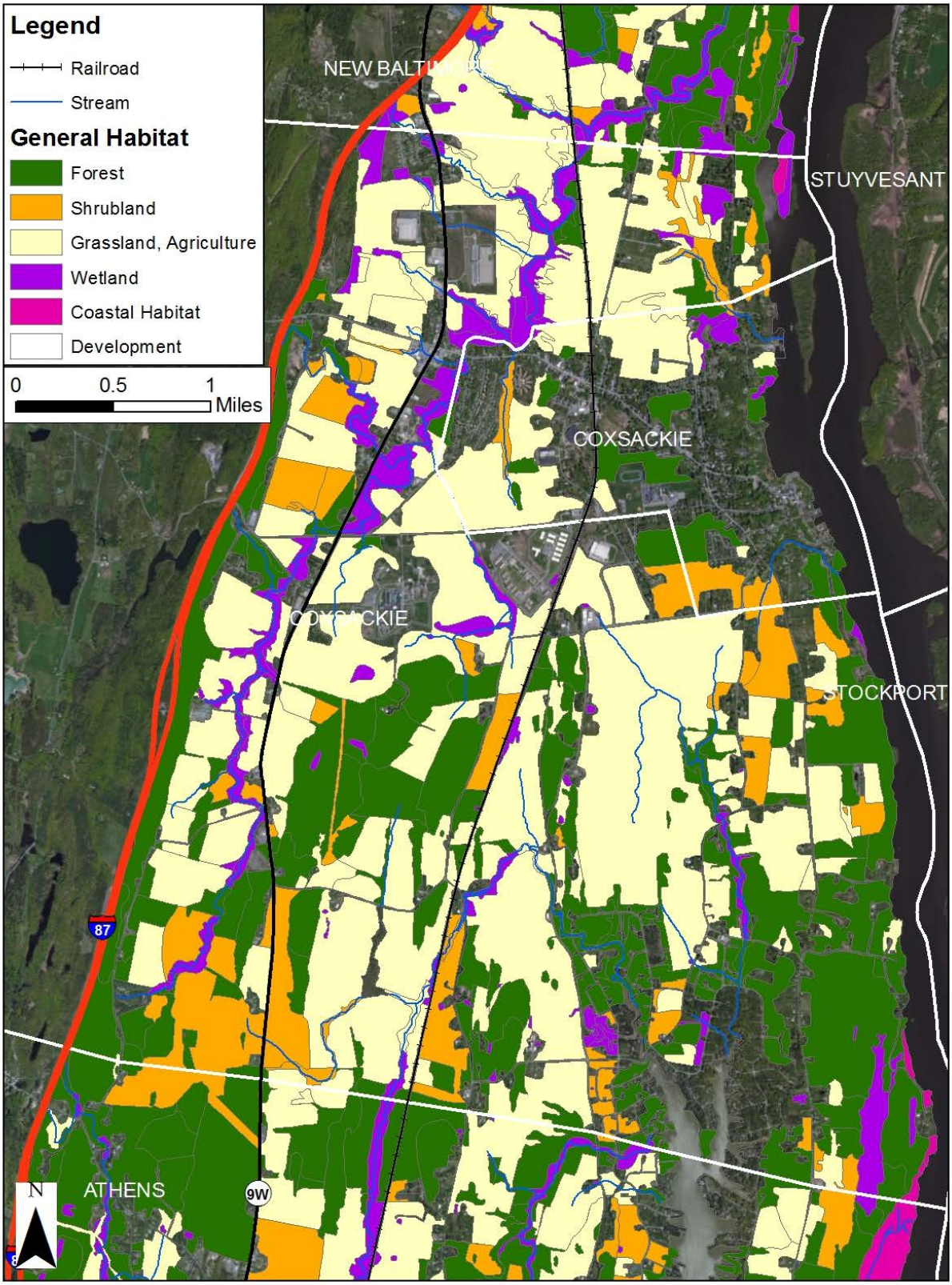

Figure 4-1b. Map of Habitats in the Grassland Habitat Focus Area: Coxsackie **(Habitats identified by volunteers as in Kiviat and Stevens 2001).**

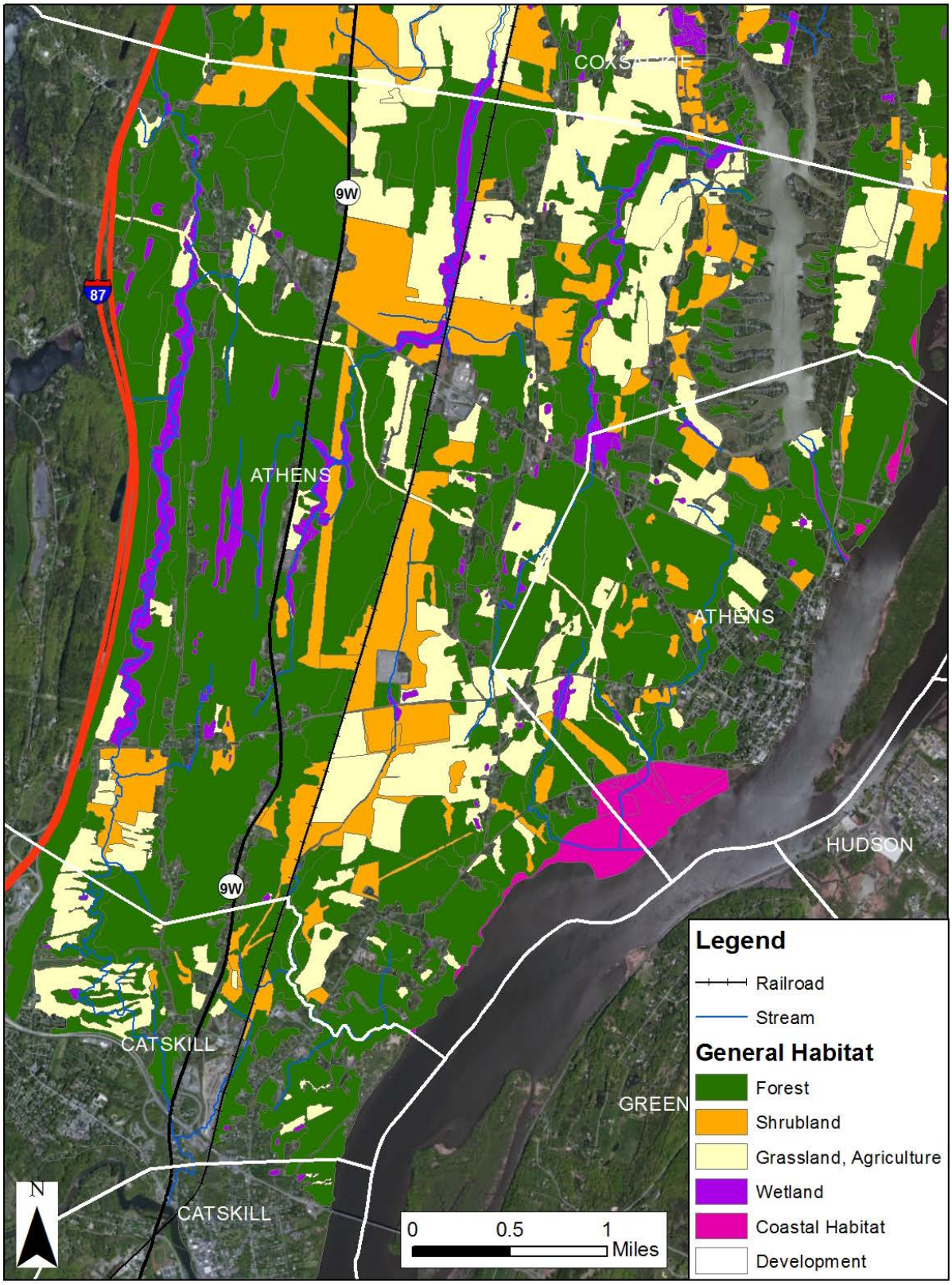

Figure 4-1c. Map of Habitats in the Grassland Habitat Focus Area: Athens and Catskill **(Habitats identified by volunteers as in Kiviat and Stevens 2001).**

Habitat Analysis

In order to better understand the habitats that are most important for Short-eared Owl and Northern Harrier, the 62 habitat types were lumped into five general habitat categories: 1) grasslands, meadows, or agriculture, 2) oldfield or shrublands, 3) wetlands and open water, 4) upland forests, and 5) coastal (tidal) habitats. This provided a more practical way of visualizing the large patches of habitat necessary for the conservation of species of conservation concern. The categorization is based on similar characteristics between the habitats identified in the detailed inventory. Habitats classified as containing wet clay soils were included in upland habitat classes here because they are likely to include a complex combination of wetland and upland habitats and warrant field-based delineation. It is important to note that this classification of similar habitats into general categories simplifies the landscape and does not reflect the complexity of individual habitats or the complexity of the relationship between these habitats.

Grassland Habitat

This habitat category represents the second most common habitat type in the focus area, covering approximately one-quarter of the land area (6,873 ac). This broad-range of habitats includes areas characterized as meadows, hayfields, agricultural lands, and wet meadows. These 'grassland' habitats are critical to the continued utilization of the subject area by the Short-eared Owl and Northern Harrier and are of the highest conservation priority.

Habitats associated with this category are frequently subject to rapid and dramatic changes due to natural conditions such as succession of the vegetative community, as well as human induced changes from development and agriculture. Vegetation in this habitat ranges from cool season grasses to agricultural crops. The various sub-habitats in this category include wetlands such as wet clay meadows. Grassland habitats are often in transition from agricultural operations to old fields and shrub cover.

Also included in this category is upland dredge spoil habitat created from the disposal of sediments dredged from the Hudson River during development and maintenance of the navigation channel. Habitats located on dredge spoil areas can include open meadows and wet meadows. While this habitat is limited to select areas located in a narrow band along the river, their diversity supports a wide range of important species.

Agricultural lands in the focus area are primarily used for hay production, but forage corn and soybeans are produced as well. Corn production has increased in recent years with high national demand for ethanol and may represent a future trend. Poor soil drainage limits the success of many crops. There is one large vegetable farm in the focus area. While there is no medium- to large-scale animal based agriculture (i.e., dairy, beef) in the focus area, there are a number of smaller or hobby farms that include animals. Although agricultural habitats are continuously disturbed, these sites

Wet clay meadows such as these fields in the Coxsackie Creek Grassland Preserve are preferred habitat for harriers and other grassland bird species.

do provide important habitat for wildlife and have played a key role in keeping a significant portion of the land base undeveloped.

Shrubland Habitat

Oldfield or shrubland habitat covers approximately 8% of the mapped area (2,414 ac). Shrublands describe non-forested uplands with significant shrub cover. The various sub-habitats in this category include shrubby oldfield, shrubby oldfield agriculture, oldfield riparian, wet clay shrubland, and orchard. Shrublands are often areas in transition between grassland or agriculture and young forest and host a variety of meadow grasses and forbs, shrubs, and scattered seedling and sapling-size trees. Like grasslands, shrubland habitats are often characterized by rapid and significant changes due to naturally occurring succession of the vegetative community, as well as human induced changes from development.

Like grassland, shrubland and young forest habitat is dwindling throughout the northeastern United States as abandoned agricultural lands have reverted to mature forest and human development has expanded. As a result, populations of many wildlife species depending on shrubland habitat are falling, including American woodcock, golden-winged warbler, ruffed grouse, and eastern box turtle, among many others. Active management or restoration of shrubland and young forest habitat is necessary in many areas to maintain this important habitat.

Keeping in mind these considerations, certain shrublands might present good opportunities for grassland restoration in the grassland focus area; in particular, recent shrubland areas within future grassland preserves and shrublands adjacent to other areas under grassland management. However, maintaining existing grassland land cover should be the first priority of management.

Wetlands and Open Water

This habitat category occupies only 5% of the focus area (1,511 ac). Wetland habitat includes ponds and non-tidal wetlands in which the soil is saturated or flooded for at least part of the growing season; **however, for the purposes of this plan, wet meadows were included as grassland habitats, freshwater tidal wetlands were considered coastal habitats, and wet clay habitat types were considered upland habitats**. Freshwater wetland habitats may be found throughout the focus area. They range from small isolated ponds to larger, interconnected complexes of wetlands, streams and ponds.

Freshwater wetland habitats have a diverse vegetative cover which may include both upland species (e.g. honey suckle, garlic mustard) and wetland adapted species (e.g. yellow iris, skunk cabbage, duckweed, sedges, cattails) that can tolerate standing water. Non-tidal swamps are breeding grounds for many amphibians and reptiles, and can provide a barrier from noise, visual, pollution, invasive species, and microclimate alteration that may degrade wildlife habitat value. Although relatively small in overall acreage, the protection and management of freshwater wetlands is critical for many wildlife species. There are many activities, such as development and improper recreational uses (i.e. ATVs), which may impact these habitats by increasing erosion, slumping, and destruction of wetlands.

A subset of freshwater wetlands, vernal pools (intermittent woodland pools) are habitats that are characterized by seasonal, shallow pools of standing water surrounded by upland forest. The pools typically last 6 to 9 months during the winter and spring and dry up by mid-summer. Vernal pools host a diverse array of wildlife that are well adapted to the seasonal wet and dry cycle. These small and often overlooked wetlands provide breeding habitat for some rare and declining amphibians. The prolific amphibian egg masses produced in the spring are an important food source for turtles and migrating birds.

Upland Forest

Upland forests are dominated by woody vegetation including canopy trees, understory trees, shrubs, and herbs. Habitats falling under the broad category of upland forest include acidic rocky woodland, conifer forest, conifer plantation, dredge spoil forest, hardwood forest, mixed forest, rich rocky woodland, and young woods. Upland forests comprise the majority of the mapped habits within the focus area, covering 11,573 acres (39%). Beyond the areas mapped here, there are a number of exemplary forest types to the west of the grassland area. See Table 2-1a under Hudson Valley Limestone and Shale Ridges for more information.

Upland forests provide critical habitat for an especially diverse invertebrate community, mammals, birds, wildflowers, sedges and ferns. Fragmentation resulting from development activities is the predominant threat to upland forests and the species that use them.

Tidal Habitat

Tidal habitats are found adjacent to the Hudson River Estuary and are defined by the effect of the estuary's tides on coastal areas and tributaries. Tidal habitat represents approximately 486 acres (1.7%) of the area mapped under this project. The various habitat types that are included in the tidal habitat category are supratidal pools, marshes, swamps, tidal marshes, swamps, intertidal mudflats, hardwood swamps, and dredge spoil swamps. These habitats are very significant regionally and harbor a unique and at-risk assemblage of plant and animal species.

There are a number of rare plants and exemplary wetland types on the Hudson River Shoreline at the easternmost part of the grassland area. See Table 2-3 under Hudson River for more information.

Riparian Habitat

Riparian habitats were mapped as a subset of all habitats and comprise 1,204 acres or 4% of the focus area, but are not shown in the simplified habitat maps provided here. Riparian habitats are found along stream and river corridors, and may include a wide range of vegetative cover types, including both upland and wetland types of grassland, shrubland, and forest habitats. Riparian habitats are diverse in their form and extents, and may be found on low broad floodplains or on upland terraces and steep slopes that border streams. While small in area, riparian corridors are critical habitat zones that often co-exist with important aquatic habitats and connect uplands to the Hudson River Estuary.

In addition to habitat benefits, riparian areas also provide significant physical function and chemical function. Physically, riparian buffer vegetation provides a stabilizing influence on stream stability, with root systems holding together soil along stream banks. Chemically, riparian buffer vegetation provides filtration of upland runoff before it reaches the stream or river. Riparian plant communities are diverse, dominated by forbs,

grasses, sedges, shrubs (e.g. dogwoods, hawthorns), or mature trees (e.g. red maple, slippery elm, green ash, sycamore, cottonwood, hemlock). The morphology of the stream corridor, i.e., slope, hydrology and other factors, strongly influences the vegetative cover type and species assemblage.

Map of Potential Grassland Bird Habitat

Grassland habitat types were combined to complete a landscape analysis of potential grassland bird habitat. Literature reviews (detailed in the next section) suggest 40 acres as a *minimum* patch size for grassland bird conservation. Patches of potential grassland bird habitat larger than 40 acres were identified using a Geographic Information System (ArcGIS v9.3.2). The habitat inventory map developed by local volunteers using methods by Kiviat and Stevens (2001) was used to identify the areas of potential grassland bird habitat. Digitized habitats were converted to a 30-m pixel raster grid and reclassified by major habitat type in groupings developed by consensus of the Habitat Advisory Group and reviewed by Erik Kiviat of Hudsonia Ltd. Potential grassland habitat was limited to grassland habitats, open agriculture, and open wetlands, and patches smaller than 40 acres were excluded. Conversion to raster aggregated adjacent grassland patches within 15-m, including those separated by local roads and driveways. Aggregated grassland patches spanning Rt 9W, Rt 81, and the CSX railroad line were manually split, as these busy transportation corridors were considered significant fragmenting features. The results are shown in Figure 4-2.

There are nearly 7,000 acres of potential grassland bird habitat in 274 patches in the focus area, including open agricultural land, grasslands and meadows, and open wetlands. When patches smaller than 40 acres are excluded, there are 5,385 acres in 31 patches. Figure 2-5 shows two large clusters. The northern cluster near the Coxsackie-New Baltimore border has seven grassland patches totaling 1,261 acres. The southern cluster from the Village of Coxsackie south into Athens has 14 grassland patches totaling 3,295 acres. Several isolated patches are found to the north and south of the clusters. These blocks have the greatest potential to provide productive grassland bird habitat, and they should be the priority areas for conservation efforts.

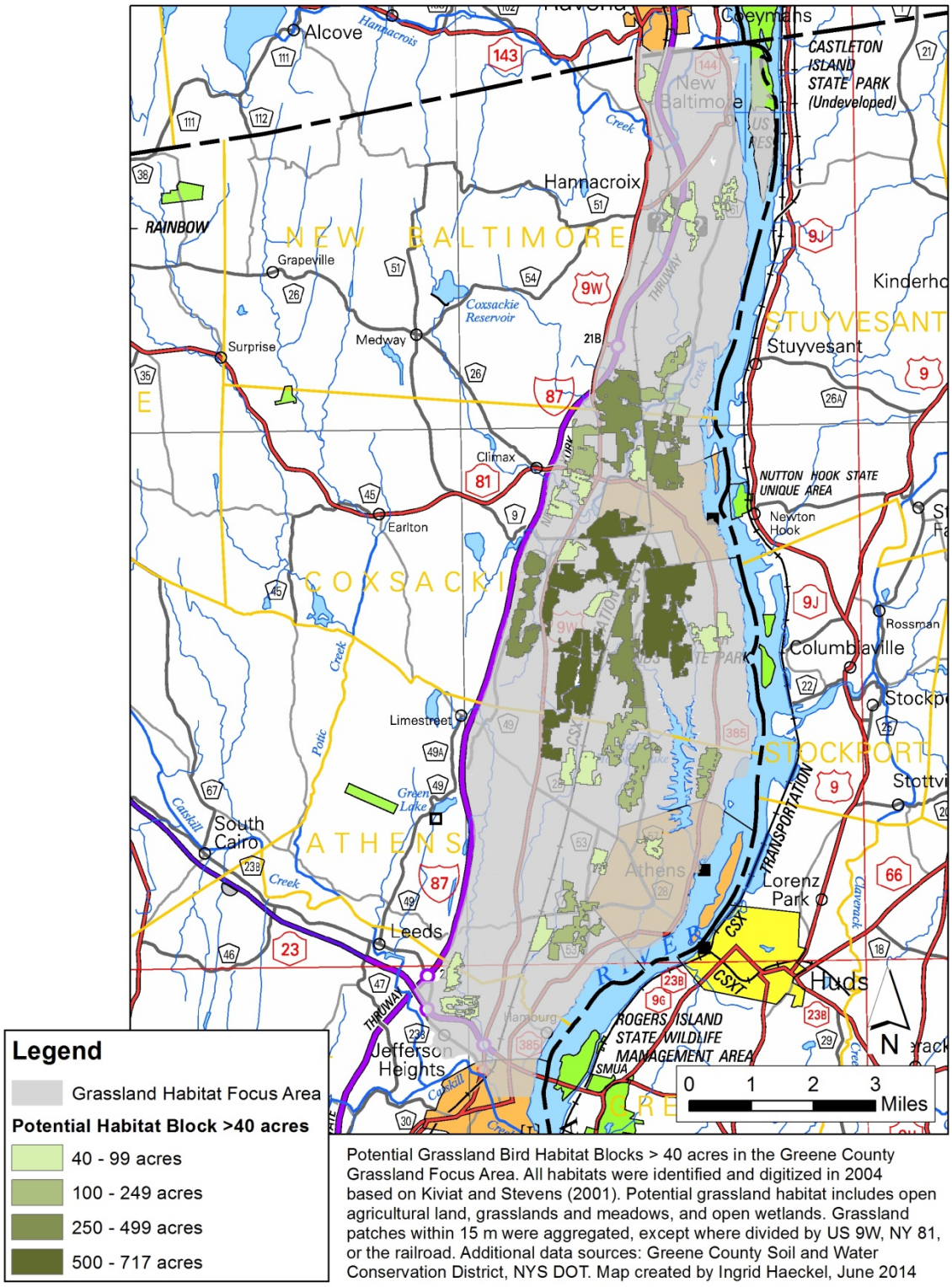

Figure 4-2. Grassland Blocks larger than 40 acres in the Grassland Habitat Focus Area.

Section 5: Conservation Plan

Conservation Vision

The open landscape of eastern Greene County sustains rural character valued by local residents and provides habitat for rare grassland bird species. This plan envisions that the landscape will be maintained such that it continues to be a winter home for Northern Harrier, Short-eared Owl, and other raptors, and a summer home for rare and declining grassland breeding birds.

Photo: James Coe

Not enough is known about Short-eared Owl and Northern Harrier in eastern Greene County to set specific population goals. Therefore, the current goal is to stabilize and improve the area of high quality habitat in order to regularly support Short-eared Owl numbers more typical of the mid 1970s-mid 1980s period, to maintain Northern Harrier winter numbers, and to provide a significant area of breeding habitat for other rare and declining grassland birds. As more information becomes available, this goal and those that follow will be refined.

"Grassland preserves" will protect core habitat areas and other conservation tools will be used to maintain the grassland landscape. Example tools include voluntary conservation agreements, management agreements, natural resources standards, landowner stewardship, and farmland conservation. Realizing this vision will require cooperation among county, state, and federal agencies, local government, non-profit organizations, businesses, and private landowners. Opportunities and tools for each of these entities are covered in more detail in Section 6.

Implementation of this plan will provide benefits to the local community. Conservation lands will enhance local recreational opportunities, including hiking, wildlife watching, and hunting. A grassland landscape maintains farmland, rural character, and other community assets. Development projects fund some conservation work and provide jobs and tax base. The goals presented below address natural resources, grassland management, and community goals that directly benefit local people. Conservation projects can provide multiple benefits.

Finally, although this area is not included in the statewide grassland bird conservation plan, a strong case can be made for its inclusion and we will advocate for its addition to the plan.

Grassland Landscape Conservation Framework

The habitat requirements of the focal species described in Section 3 and the area of suitable habitat identified in Section 4 provide the basis for identifying the location and extent of habitat to target for grassland bird conservation. This section describes the science behind the grassland landscape conservation framework. More information on methods to accomplish these goals can be found in the goals and objectives section.

Harriers (Herkert et al. 1999) and other grassland birds (Ribic et al. 2009) may respond more strongly to total extent of grassland within the landscape rather than to the size of individual grassland tracts. Lazzazero and Norment (2006) show that grassland birds are attracted by an overall grassland landscape. This is especially important when individual parcels are small. Sample and Mossman (1997) developed a model framework for grassland bird conservation in Wisconsin for large-, medium- and small-scale landscapes. Although Wisconsin has much more grassland habitat than New York, it is similar in that much of the grassland potential is in agricultural management and is highly fragmented. This plan adopts the Sample and Mossman (1997) framework for eastern Greene County.

Mapping by the Biodiversity Assessment Team in 2004 identified nearly 7,000 acres of open meadows and agricultural lands in eastern Greene County. Assuming that some of this land will be developed or used for high intensity agriculture, maintaining 5,000 acres of grassland cover is a reasonable landscape goal. This extent of grassland cover makes eastern Greene County equivalent to a medium-scale landscape for grassland birds according to Sample and Mossman (1997). The conservation framework for medium-scale landscapes calls for the establishment of 20% of the landscape as core, managed grassland habitat and an additional 35% of the grassland outside of core habitats to be conserved in long-term grassland cover among scattered blocks, with the remaining area maintained as open as possible.

Core Habitat

Applying the Sample and Mossman (1997) framework to Greene County, a minimum of 1,000 acres of core habitat should be established in grassland conservation management. Based on existing grassland patch sizes, we suggest the establishment of two core grassland preserves of at least 500 contiguous acres each, understanding that the target acreage may change as more is learned about local habitat use of the Short-eared Owl and Northern Harrier. Vickery et al. (1994) recommends conserving grassland habitat patches of at least 500 acres based on breeding studies of grassland songbirds in Maine, and the preliminary home range calculations for six wintering Short-eared Owls at Coxsackie support this extent of acreage as well. Northern Harrier and Short-eared Owl may nest in smaller patches of grassland (125 – 250 acres) if the overall landscape is primarily in grassland cover (Heckert et al. 1999).

There are several opportunities to conserve 500+ contiguous acres of grassland habitat (see Figure 4-2). The core habitat patches should have as small an edge to area ratio as possible (i.e., a circle or square) (Lazazzero and Norment 2006). The Coxsackie Creek Grassland Preserve north of the Village of Coxsackie already conserves 345 acres of habitat under grassland management, with grassland bird conservation being the primary goal of

management activities. Adjacent and nearby grassland parcels could help achieve the goal of a 500+ acre core preserve. These core acreage goals should protect core wintering habitat for Northern Harrier and Short-eared Owl and would allow for Northern Harrier breeding, *provided the key roosting and hunting areas are protected* (Morgan and Burger 2008, Serrentino 1992, Vickery et al. 1994, Winter et al. 2006). Although the literature on non-breeding habitat is limited, studies indicate that the overall grassland context of the region is important for attracting wintering raptors in the long term. In order to maintain and increase Short-eared Owl and Northern Harrier winter populations, partners need to protect regularly used roosting areas and primary hunting grounds. Maintaining core preserve habitat in contiguous grassland management would generally improve habitat suitability and is expected to improve population size.

The Surrounding Landscape

Based on the Sample and Mossman (1997) framework, an additional 1,400 acres of grassland habitat should be maintained outside the contiguous core habitat areas to conserve the overall grassland landscape attracting Northern Harrier and Short-eared Owl. The 1,400 acres should be kept in open management and include connections between preserve areas to help facilitate bird movement.

According to Sample and Mossman (1997), at least seventy-five percent of grassland conserved outside of core habitat areas (1,050 acres) should be in blocks 40 acres or larger (See Figure 4-2). Strips of managed grassland habitat should be at least 220 yards wide.

Goals and objectives for grassland conservation in eastern Greene County

Goal 1. Conserve Short-eared Owl and Northern Harrier on the landscape
Goal 2. Understand how Northern Harrier and Short-eared Owl use the region.
Goal 3. Maintain diversity of other grassland flora and fauna, including other wintering raptors, grassland songbirds, and rare plants. Advance goals of Comprehensive Wildlife Conservation Strategy for New York State (NYSDEC 2006).
Goal 4. Engage the community to develop guidelines for a vital countryside that enhances quality of life for people and meets the needs of grassland birds.
Goal 5: Raise awareness of the value of the Greene County Grasslands among the public.
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The objectives for each goal, detailed below, lay out specific targets based on existing research and local conditions. Grassland bird habitat use should continue to be monitored in the focus area to determine if the objectives and targets for accomplishing the plan's goals need adjustment.

Goal 1. Conserve Short-eared Owl and Northern Harrier on the landscape

Objectives

A) Protect enough core winter habitat for Northern Harrier and Short-eared Owl to ensure their long-term persistence (1,000 acres)

The current goal is to establish in grassland conservation management a minimum of 1,000 acres in two patches of at least 500 contiguous acres, understanding that the target acreage may change as more is learned about local habitat use of the Short-eared Owl and Northern Harrier. Where conserving a single grassland block greater than 500 contiguous acres is not possible, parcels separated by narrow strips of other vegetation should be considered. Regularly used roosting areas and primary hunting areas must be protected. One core area will build on the existing conservation lands of the Coxsackie Creek Grassland Preserve in the habitat management block north of the Village of Coxsackie, and opportunities to establish a second core area in the habitat management block south of the village will be explored (Figure 5-1). Conservation lands will be maintained through grassland management focused on grassland bird conservation.

Contiguous grassland management will require a regularly updated management plan for preserve lands that provides for maintaining grass cover. The plan should be updated to incorporate innovative management techniques and new information on bird habitat use from monitoring data as more becomes known about the birds' home ranges, location of roost sites, and areas used for foraging. The decision whether to allow recreational uses on preserve lands should address ways to minimize potential impacts to breeding and overwintering grassland birds, including disturbances caused by walking and jogging, dog walking, snowmobiling, radio-controlled aircraft, and hunting.

<u>Core Grassland Habitat Management Objectives</u>

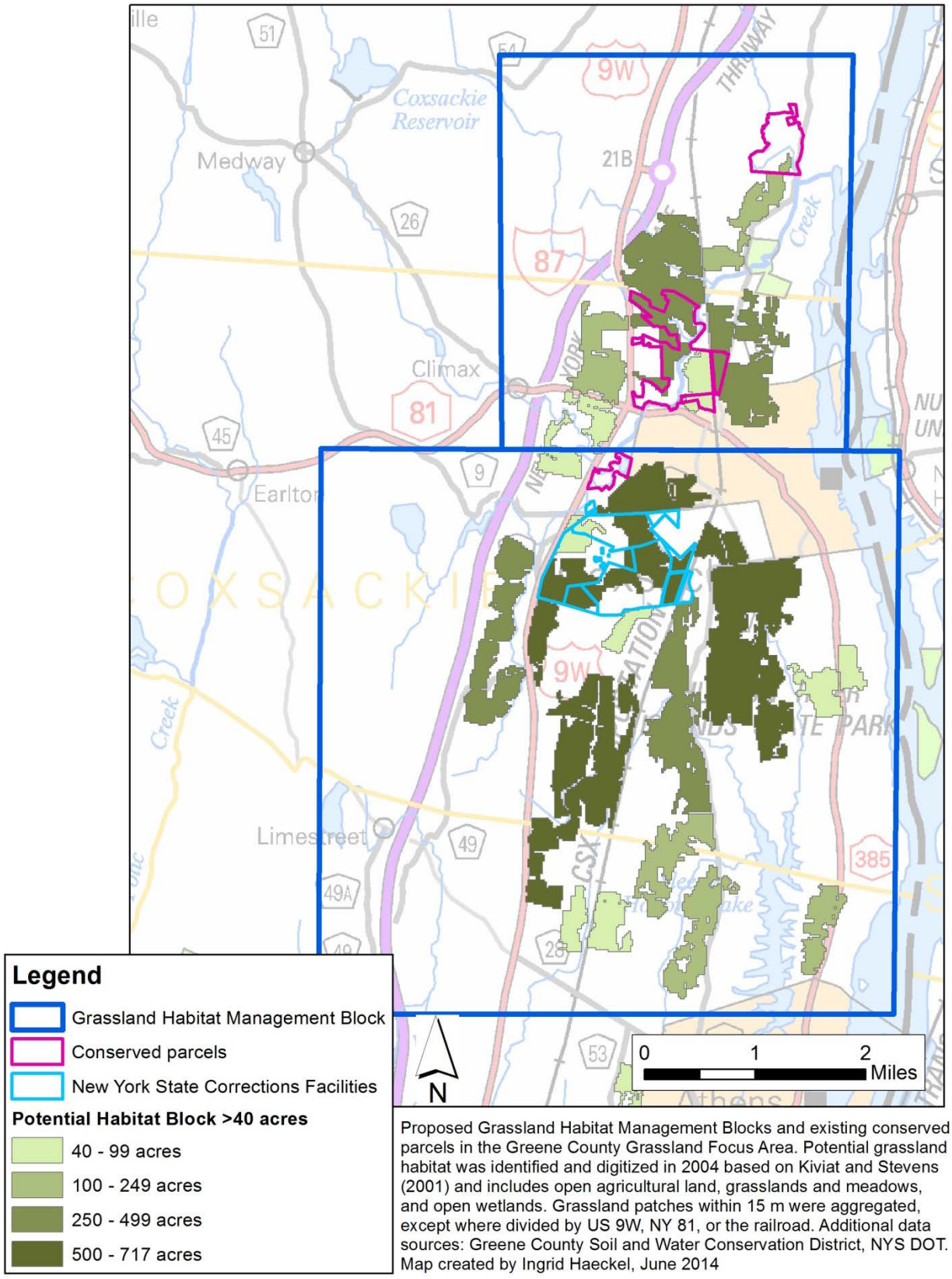
i. Maintain grass as primary cover

Active management is needed to prevent grassland from reverting to dense shrubland and eventually forest. Mowing is the most commonly used tool to maintain grass cover with brush-hogging utilized in areas of shrub encroachment. Managed areas should be maintained in a mosaic of multi-aged fields (with varying grass height) to benefit both Northern Harrier and Short-eared Owl. Non-native cool season grasses are better than warm season grasses for grassland birds in the northeast (Lazzazero and Norment 2006).

ii. Assess and manage invasive species impacts

The extent to which invasive species affect the wintering habitat or potential breeding habitat of grassland birds on the preserve site is unknown. Invasive plants should be monitored regularly for possible impacts. Control of purple loosestrife began with the release of beetles for biological control at three release sites in 2003: behind the Save-a-Lot food warehouse, in the wide ravine between the Greene Business and Technology park and Kalkberg Commerce park, and in the southeast corner of the wetland mitigation site on route 81, just west of 9W/81 intersection. Further efforts may be needed to build on these actions. Invasive management should also include monitoring for pale and black swallowwort (Morgan and Burger 2008) and spotted knapweed.

iii. Adjust management actions and timing as necessary to ensure they are best meeting the needs of local Short-eared Owl and Northern Harrier populations (adaptive management).



Proposed Grassland Habitat Management Blocks and existing conserved parcels in the Greene County Grassland Focus Area. Potential grassland habitat was identified and digitized in 2004 based on Kiviat and Stevens (2001) and includes open agricultural land, grasslands and meadows, and open wetlands. Grassland patches within 15 m were aggregated, except where divided by US 9W, NY 81, or the railroad. Additional data sources: Greene County Soil and Water Conservation District, NYS DOT. Map created by Ingrid Haeckel, June 2014

Figure 5-1. Proposed Grassland Habitat Management Blocks for Core Winter Habitat Protection

i. Serve as a model for grassland habitat management

Be a resource for others looking to manage their property for grasslands, especially in other landscapes experiencing high development pressure, but seeking to maintain a rural character.

The Coxsackie Creek Grassland Preserve is a major part of the *Grassland Habitat Management Plan*. For more details, see the *Coxsackie Creek Grassland Preserve Management Plan*.

B) Maintain a minimum of 1,400 additional acres of grassland outside the contiguous core habitat preserves to conserve the grassland landscape

A minimum of 1,400 acres will be kept in open management (e.g., hayfields, rowcrops, and pasture) to maintain connectivity between core habitats and preserve the overall grassland context of the area. Grassland connections between preserve areas should be targeted to help facilitate bird movement.

Seventy-five percent of this acreage (1,050 acres) should be in blocks 40 acres or larger. Strips of managed grass habitat should be at least 220 yards wide. For more details in how this will be accomplished, see Goal 4.

Goal 2. Understand how Northern Harrier and Short-eared Owl use the region.

Objectives

A. Identify roost areas for both species.

Slater and Rock (2005) note that roosting sites are an important component of non-breeding habitat for Northern Harrier, but are often ignored in conservation plans. Winter raptor research throughout New York State, including Greene County, indicates roost site fidelity between some years and in some locations for both Short-eared owl and Northern Harrier (DEC unpublished data).

B. Monitor wintering Northern Harrier and Short-eared Owl to better understand habitat use and hunting patterns.

Ongoing research has begun to identify how Short-eared Owl habitat use in the region (NYSDEC). Northern Harrier are known to be more abundant, but less is known about how they use habitat locally. Both species are highly mobile, and populations vary from year to year. The monitoring methodology developed by DEC for a four year winter raptor study (Appendix 1) should be followed until a more formal, long term monitoring scheme is developed. Preliminary results from the winter raptor study confirm Short-eared Owl and Northern Harrier habitat use within both grassland habitat management blocks (Figures 5-2 and 5-3). Not all potential grassland habitat blocks have been regularly covered during the surveys, but available data show both species present in several large grassland blocks within the focus area.

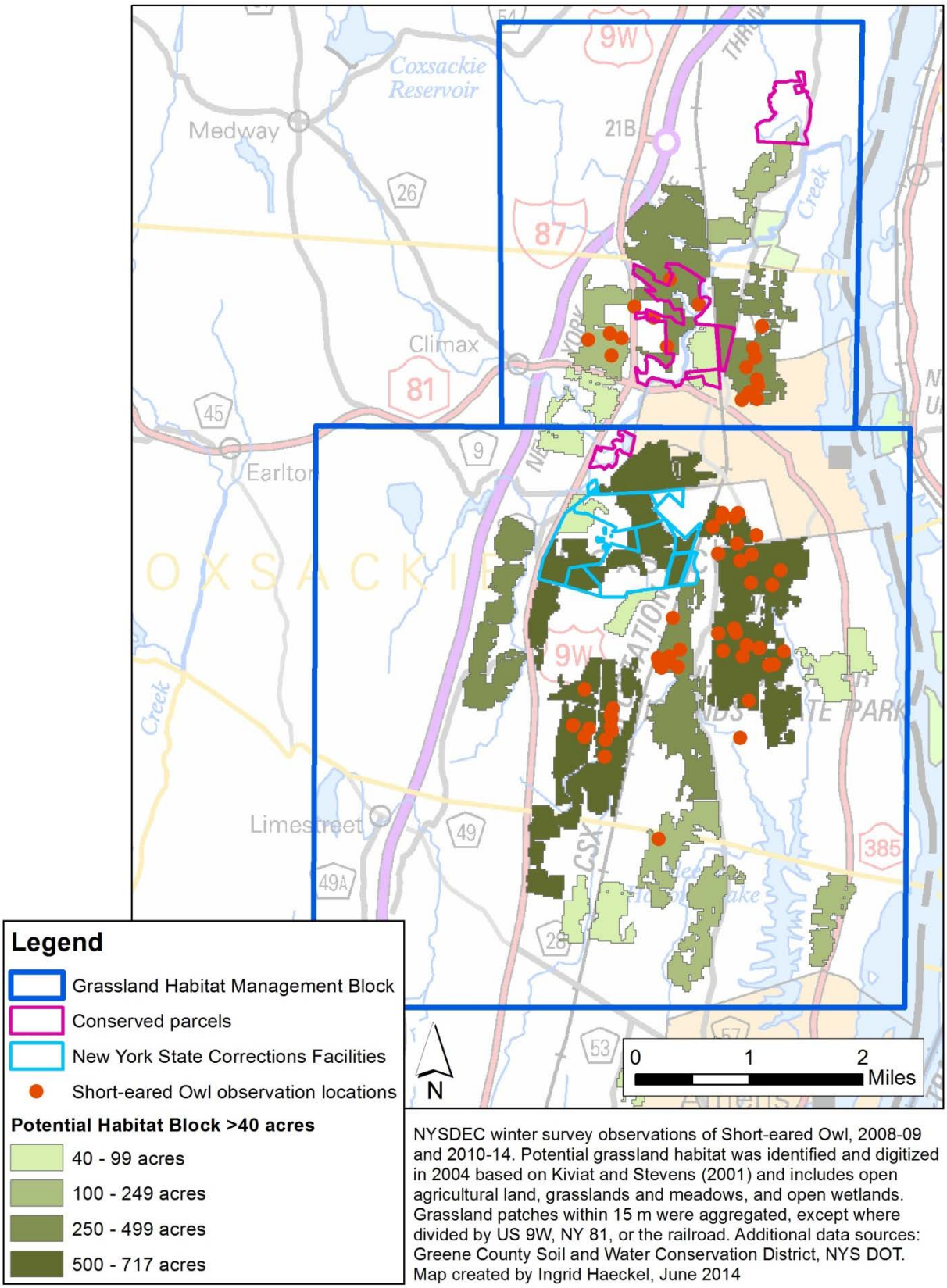
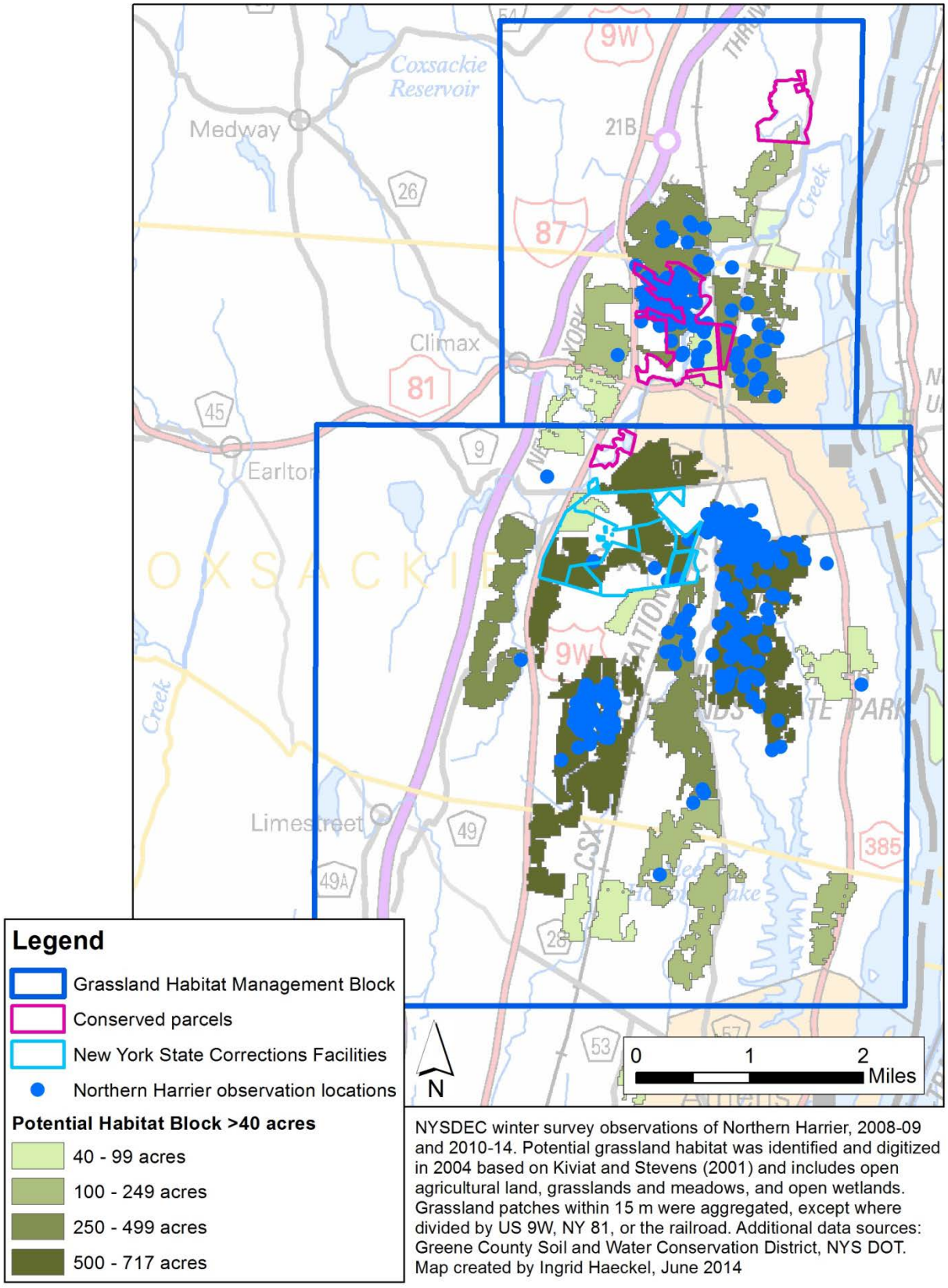


Figure 5-2. Short-eared Owl winter survey observations in the Grassland Habitat Focus Area



NYSDEC winter survey observations of Northern Harrier, 2008-09 and 2010-14. Potential grassland habitat was identified and digitized in 2004 based on Kiviat and Stevens (2001) and includes open agricultural land, grasslands and meadows, and open wetlands. Grassland patches within 15 m were aggregated, except where divided by US 9W, NY 81, or the railroad. Additional data sources: Greene County Soil and Water Conservation District, NYS DOT. Map created by Ingrid Haeckel, June 2014

Figure 5-3. Northern Harrier winter survey observations in the Grassland Habitat Focus Area

C) Determine if Northern Harrier are breeding

Northern Harrier have been observed in the area throughout the year, but it is not known if they are breeding (McGowan and Corwin 2008). A male and female northern harrier were observed several times, though not together, during the summer of 2012 during the course of conducting marsh bird point counts on Coxsackie Creek Grassland Preserve, and a juvenile was observed in August (DEC unpublished data). These observations are strongly indicative of a probable breeding pair in the vicinity during 2012 and highlight the need for continued breeding bird surveys. Grassland bird monitoring protocols (under development with the Northeast Coordinated Bird Monitoring Partnership, and adapted for use on NYSDEC owned lands and private lands enrolled in the New York State Landowner Incentive Program for Grasslands) include a May visit specifically to better capture early nesting species such as Northern Harrier and Short-eared Owls. This early visit should be implemented, minimally, at the Coxsackie Creek Grassland Preserve to determine whether breeding does occur. If breeding is documented, observations to determine nesting or fledging success would be valuable.

D) Evaluate sources of mortality and other disturbance factors that may affect populations of Short-eared Owl and Northern Harrier, including but not limited to train collisions, collisions with vehicles, predation, and various recreational activities on the preserve, such as snowmobiling.

E) Determine impacts of invasive plant species like purple loosestrife, spotted knapweed, and pale and black swallowwort on grassland birds and meadow voles.

F) Better understand the meadow vole population to determine how it influences the Short-eared Owl and Northern Harrier winter populations.

G) Partner with local colleges, universities, NYSDEC, and other research institutions (e.g., the NYS Museum) to reach research and monitoring goals.

H) Reevaluate the size and configuration of the focus area as new information becomes available.

Goal 3. Maintain diversity of other grassland flora and fauna, including other wintering raptors, grassland songbirds, and rare plants. Advance the goals of the Comprehensive Wildlife Conservation Strategy for New York State (NYSDEC 2006).

Objectives

A) Document and monitor the bird species of greatest conservation need (NYS DEC 2005) that use eastern Greene County, including grassland breeding birds, early successional/shrubland birds, and wintering raptors. In order to employ the best management plan for the preserve, the Land Trust needs to know which additional grassland birds of concern are using the site and how they are responding to management efforts. To that end, NYSDEC began conducting breeding season point counts for grassland bird species on the Coxsackie Creek Grassland Preserve in 2010. Additional points will be added in 2014 and points will be established in any

additional grasslands added to the preserve in future years. Consideration could be given to adding points on other privately owned grasslands in the Coxsackie Flats (with landowner permission) or completing additional point surveys via roadside counts. Monitoring should coordinate with the Kestrel Conservation Project.

B) Identify rare plant populations found in the focus area (e.g., Stiff-leaved goldenrod).

Stiff-leaved goldenrod is documented in the NY Natural Heritage database within the focus area in the Town of Athens. Other potential rare plants include Bush's sedge, ragged fringed orchid, and devil's bit (Kiviat and Stevens 2001). The first priority is to identify these on preserve lands and determine how they respond to management.

C) Identify other plant and animal species of conservation concern which occur or may occur in the focus area

In addition to listed threatened and endangered species, New York State maintains a list of "species of greatest conservation need" that are deemed rare, imperiled, or for which status has not been established. One reptile species of greatest conservation need, the Eastern box turtle (*Terrapene carolina*), was documented in the area during surveys conducted for an environmental impact statement, but it is unknown whether the area supports a population of this declining turtle. Jefferson's salamander (*Ambystoma jeffersonianum*), an amphibian species of special concern that is dependent on vernal pools, was identified during environmental review for the Hamlet on Hudson project. Least bittern (*Ixobrychus exilis*) has been observed in at least one wetland in the focus area (Guthrie pers. comm.). Other species of greatest conservation need observed in the focus area include spotted turtle (*Clemmys guttata*), wood turtle (*Glyptemys insculpta*), and ribbon snake (*Thamnophis sauritus*). Additional species of greatest conservation need may also occur in the focus area.

D) Protect streams and wetlands in the focus area, especially the Coxsackie Creek and the Murderer's Creek.

Wetlands are an important part of grassland habitat in Eastern Greene County, especially for Northern Harrier, which are also known as marsh hawks. Wetlands provide benefits to people such as flood water storage and water filtration. During project review at the local level, it is necessary to map and field verify potentially wet areas to determine the presence or absence of regulated wetlands, as well as unregulated smaller wetlands that are important habitat for the species of conservation concern. Riparian corridors, which are additional critical habitat areas, are also threatened. These corridors are highly sensitive to all forms of human-alteration and pollution. Development on open meadows and old fields typically extends to edges of creeks, clearing the riparian corridor of woody vegetation. Destroying the stream's natural buffer increases pollution and erosion to the waterway.

Goal 4. Engage the community to develop guidelines for a vital countryside that enhances quality of life for people and meets the needs of grassland birds.

Objectives

A) Partner with municipalities to conserve productive farmland

Farmland is a key component of rural character for the eastern Greene County landscape and is important to conserving grassland bird habitat. The 2005-2007 comprehensive plan updates for Athens, Coxsackie, and New Baltimore show that the residents of these communities value farmland protection. Maintaining productive farmland has obvious large benefits for the local economy, local food security, the scenic character of the landscape, and the culture of local communities. Figure 5-4 illustrates the significant overlap between grassland blocks >40 acres and high quality farmland soils in the Grassland Habitat Focus Area. The potential for synergy between conserving valuable farmland and maintaining grassland bird habitat is great.

Partners can help communities find ways to keep farmland productive and conserve grassland bird habitat. Generally, pasture and hayfields are better for grassland birds than row crops (Lazazzero and Norment 2006). Minimizing pesticide and herbicide use is important because some chemicals accumulate in the target species, reducing nesting success and killing their prey (rodenticide). Excellent guides cover combining the goals and tradeoffs of food production and grassland bird conservation. See *Conserving grassland birds: Managing agricultural lands including hayfields, crop fields, and pastures for grassland birds* (Jones and Vickery 1997a), *Enhancing Pastures for Grassland Bird Habitat* (Ochterski 2005a), *Hayfield management and grassland bird conservation* (Ochterski 2005b), and *Improving Grassland Bird Habitat in Large Fields and Idle Cropland* (Ochterski 2005c). Develop guidelines for balancing biomass fuel with grassland bird conservation.

B) Partner with municipalities and the Greene County IDA to create development and land-use guidelines.

The Town and Village of Coxsackie, Town and Village of Athens, and Town of New Baltimore have all updated their comprehensive plans in the last decade. Town leaders have done a great deal of work to identify resources important to their communities, which included open space and wildlife habitat. The local municipalities are an important partner for implementation of this plan.

Prime grassland habitat is often also prime development area because of flat topography, access to key transportation corridors and proximity to population centers. Development should balance grassland bird needs where possible. The GCIDA business parks on Route 9W conserved 1.4 acres of habitat for every acre developed and are an excellent model. Both the Town and Village of Coxsackie have adopted natural resource protection standards to help their planning boards manage development impacts. Wetland protection, especially wet meadow habitat, is an important component of conserving Northern Harrier and Short-eared owl on the landscape.

In addition, towns and applicants should consider using an impact area concept because once built, structures and associated human activity have an impact on surrounding habitat. Snyder et al. (2007) recommends a buffer of at least 165 feet around buildings and parking lots, which should not be considered suitable habitat. There is also evidence that roads have an impact on bird presence and nesting, where lesser traveled roads with lower

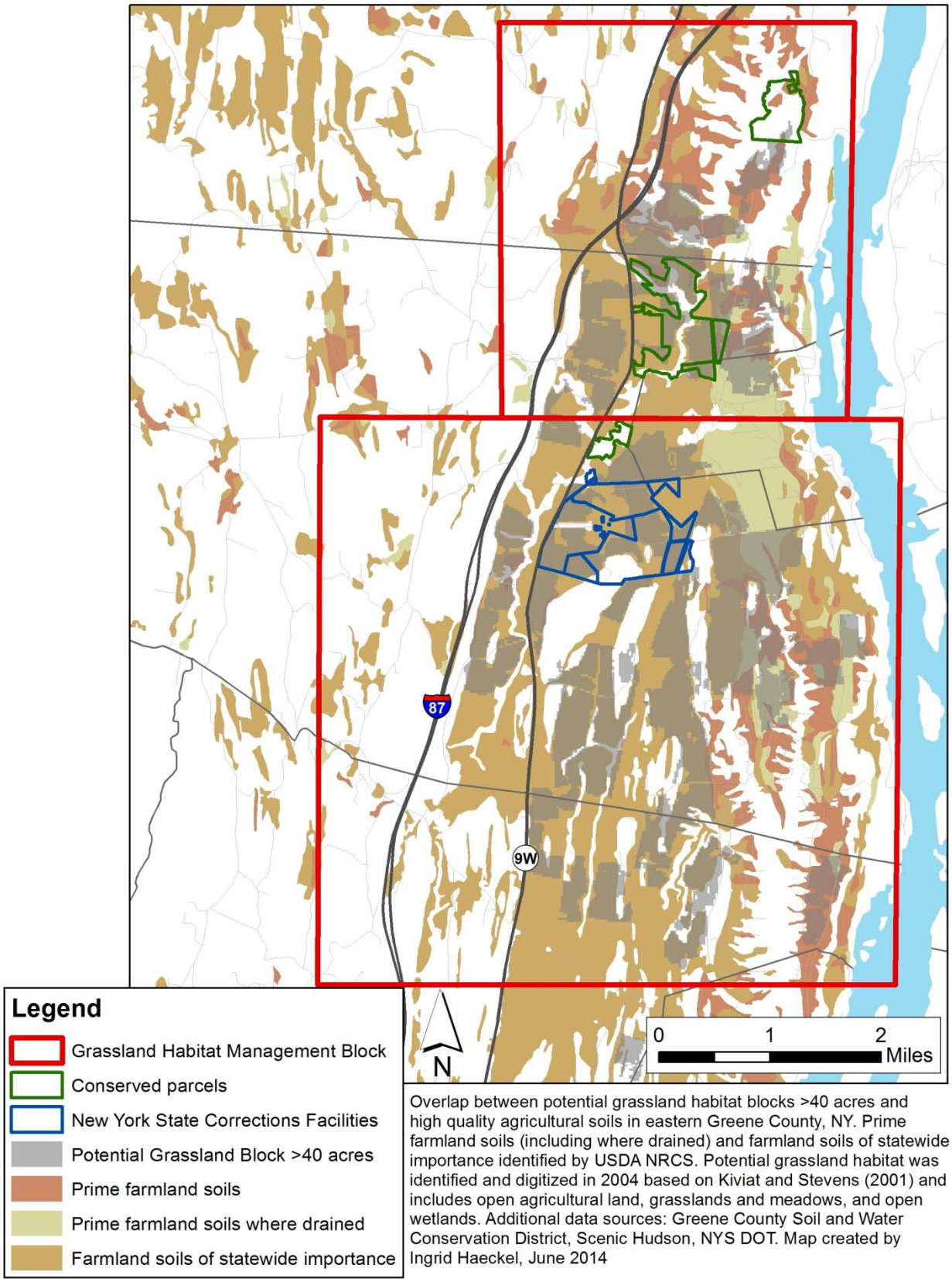


Figure 5-4. Overlap of agricultural soils and grassland blocks in the Grassland Habitat Focus Area

speeds have less of an impact than heavily traveled, high-speed roads (Forman et al. 2002). The NYS Thruway, in particular, may affect bird presence and nesting over 330 feet away.

C. Partner with private landowners, businesses, and institutional landowners to manage their lands in ways that benefit grassland birds.

Active management is needed to prevent grassland from reverting to forest. Mowing is the most commonly used management tool to maintain grass cover with brush-hogging utilized in areas with shrub encroachment. Managed fields should be maintained in a mosaic of grass heights to benefit a variety of bird species. GLT's publication "Conserving Greene County Grasslands: A Landowner's Guide" lays out management strategies for grassland landowners and is available upon request.
Maintain existing open space parcels, such as those owned by the Coxsackie Correctional Facility, National Grid power, Athens Generating, and NYS Thruway by obtaining agreements with owners or working with municipalities to assure that the design of any development of such sites is consistent with maintaining a grassland landscape. Tools include: private landowner stewardship (through voluntary agreements), management agreements with utilities and public landowners, voluntary conservation agreements (conservation easements), and to a lesser extent, land purchases.

Develop guidelines for emerging issues such as wind turbines for homeowner use. DEC has developed "Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects" (NYSDEC 2009). Excellent references are available to assist landowners. See *Transforming fields into Grassland Bird Habitat* (2005c), *Conserving grassland birds: Managing large grasslands including conservation lands, airports, and landfills over 75 acres for grassland birds* (Jones and Vickery 1997b), and *Conserving grassland birds: Managing small grasslands including conservation lands, corporate headquarters, recreation fields, and small landfills for grassland birds* (Jones and Vickery 1997c).

Goal 5: Raise awareness of the value of the Greene County Grasslands among the public.

Objectives

A. Raise awareness of local grassland values among grassland landowners.

Maintaining and managing sufficient habitat for grassland birds in the focus area cannot succeed without the participation of numerous private landowners, who own the majority of grassland acres within the target management areas. Engaging local landowners in stewardship and conservation efforts on their land will require consistent education and outreach.

B. Raise awareness of local grassland values among residents in the grassland focus area towns.

This plan will be the most effective if the people of Athens, Coxsackie, and New Baltimore know the unique nature of local grasslands and the numerous values they currently provide, as well as understand the threats

facing them. Public support will help build the case for private and institutional land stewardship practices and for municipal land-use planning strategies that balance development needs with conservation of priority grassland areas.

Section 6: Grassland Plan Implementation

Plan Implementation

The Greene County Grassland Habitat Management Plan outlines a proactive approach to natural resource protection. Habitats and wildlife occur cross property and political boundaries, and without a landscape-scale conservation strategy, Greene County's grassland birds are destined to disappear by the slow but steady loss of quality habitat. This plan is a major step forward for landscape-level planning with an eye toward habitat, wildlife, and water quality protection based on sound ecology. This section establishes the framework and lays out strategies for implementing the conservation plan vision outlined in Section 5.

Strategies

Conserving a landscape requires six primary strategies, all of which are underway to some extent in the Greene County focus area. By working together on implementing these strategies with the plan as an organizing principle, stakeholders can achieve the goals set forth in Section 5.

Strategy 1: Land conservation
Strategy 2: Effective use of regulation
Strategy 3: Local Land-use Planning
Strategy 4: Land Management
Strategy 5: Outreach and Education
Strategy 6: Research and Monitoring
Strategy 7: Partnerships

Strategy 1: Land Conservation

When people think of land conservation, they often think of land purchase, which is an important strategy; however, voluntary agreements called conservation easements or restrictions are another important tool for establishing conservation land. To maintain grassland habitat, management to prevent the growth of trees and shrubs is essential (see Strategy 4 for more information). Land conservation is only part of the conservation puzzle, but it is a key strategy for maintaining grassland conservation management over the long term. This strategy is essential for implementing Goals 1A and 1B.

Land Purchase or Donation

The Coxsackie Creek Grassland Preserve (CCGP) is an example of land purchase in the focus area. The preserve currently conserves 345 acres of grassland habitat as well as significant natural areas along the Coxsackie Creek

and several smaller tributaries. The CCGP is essential to the goal of conserving two blocks of 500 acres each in grassland management. It was created as mitigation for the Greene and Kalkberg business parks and purchased by GCIDA. GLT was created to insure long term protection and management of the habitat land and oversees management of the Coxsackie Creek Grassland Preserve. To further enhance the assemblage of protected lands in this area, GLT and GCIDA have continued to work on additional acquisitions. In 2009, GLT added a 28 acre parcel located upstream from the main Grassland Preserve in the Town and Village of Coxsackie, between Kings Road and Route 9W. It provides important habitat in its own right and also helps to protect the water quality downstream in Coxsackie Creek as it passes through the Grassland Preserve. The Coxsackie Creek wetland was offered to GLT at a reduced price (partial donation or bargain sale), and the remainder was funded by a NYSDEC Hudson River Estuary Grant. Both properties are now owned and managed by GLT, with grassland management support from the Greene County Soil & Water Conservation District.

Voluntary Land Preservation Agreements

A conservation easement or restriction is a legal agreement whereby private landowners voluntarily agree to limit uses of their land, most often the development potential. The agreements are permanent, yet highly flexible, and designed to meet the needs of the landowner and easement holder. In New York, perpetual easements may be held by the state, municipalities, and qualified nonprofits, such as the Greene Land Trust. Lands with conservation easements remain in private ownership and on the tax rolls. While there is currently only one grassland parcel with an easement (held by Scenic Hudson) in the grassland management focus area, landowners in the Greene County mountaintop area have placed easements on lands designed to preserve farming activities as well as protect water quality in the NYC reservoir watershed system.

Key partners:
Greene Land Trust, DEC Hudson River Estuary Program, Greene Industrial Development Agency, Scenic Hudson, Audubon NY, Greene County Soil & Water Conservation District, NYS Department of Corrections and Community Supervision, Landowners

Strategy 2: State and Federal regulation

Although limited in terms of conserving a large landscape like Greene County's grasslands, state and federal regulations have the potential to contribute to the plan's implementation. The state can ensure that regulations are enforced consistent with landscape conservation goals. Two new regulatory opportunities have recently emerged: the updated New York Endangered Species Regulations and a proposed wetland and grassland bird habitat mitigation bank. The mitigation bank strategy will help to implement Goals 1A and 1B.

New York Endangered Species Regulations

In 2010, the New York State Department of Environmental Conservation (DEC) updated state regulations to strengthen protections for endangered and threatened species and to provide developers, local officials and others with a clear regulatory framework. The adopted regulations can be found here http://www.dec.ny.gov/regs/3932.html. They establish criteria for the listing and de-listing of species and

requirements for restoration and recovery plans. The NYSDEC established timelines, procedures and standards for reviewing applications for construction projects and other projects that might affect endangered and threatened species. A "taking" of a protected species includes the adverse modification of habitat - conforming to interpretation of the term by New York State Courts. The regulations also call for applicants to develop a mitigation plan that results in a net conservation benefit to the listed species. With this update, the NYSDEC codified practices that had been in place for several years because of court decisions over the past decade. While improving the protection of rare species, these revisions will also benefit landowners, developers, local planners and others by providing clear guidance and predictability in planning and designing projects.

The signature birds of the Greene County grasslands, Northern Harrier and Short-eared Owl, are both on the NYS list of Threatened and Endangered Species. The new endangered species regulations will provide clarity and consistency for environmental review and will help implement the plan by protecting and enhancing habitat of these at-risk birds.

Read more about NY's endangered species and the adopted regulations at http://www.dec.ny.gov/animals/68645.html.

Proposed Mitigation Banking

Mitigation is a common tool used to offset impacts to wetlands and habitat. For wetlands, mitigation generally includes both the construction of new "replacement" wetlands, but banks also often include permanent protection for high quality existing wetlands. GCIDA is advocating for the use of mitigation banks in the transportation corridor. Mitigation banks have the potential to conserve large, concentrated areas of important grassland and wetland habitat in addition to providing distinct benefits to local economic development; in particular, by reducing the risk of conducting mitigation activities on a project by project basis. Doing so could contribute to the 1000-acre goal for conserving land for grassland conservation management.

A mitigation bank is the protection, restoration, or enhancement of a wetland, stream, or habitat conservation area which offsets expected adverse impacts to similar nearby ecosystems. Mitigation banks are approved by the US Army Corps of Engineers (ACOE), the Environmental Protection Agency (EPA), and the US Fish and Wildlife Service (USFWS) and have been used to mitigate unavoidable impacts to wetlands, streams, and other habitats. When used to protect federally listed species [*Note: there are no federally endangered species known in the plan focus area*], the USFWS guidelines state "In contrast to [wetland] mitigation banks, an appropriate function of conservation banks is the preservation of existing habitat with long-term conservation value to mitigate loss of other isolated and fragmented habitat that has no long-term value to the species" (USFWS 2003).

"Conservation banking is attractive to landowners and land managers because it allows conservation to be implemented within a market framework, where habitat for listed species is treated as a benefit rather than a liability. From the USFWS perspective, conservation banking reduces the piecemeal approach to conservation efforts that can result from individual projects by establishing larger reserves and enhancing habitat connectivity. From a project applicant's perspective, it saves time and money by identifying pre-approved conservation areas, identifying "willing sellers," increasing flexibility in meeting their conservation needs, and

simplifying the regulatory compliance process and associated paperwork. From the landowner's perspective, it creates an opportunity to generate income from what may have previously been considered a liability (USFWS 2003).

In 2008, ACOE and EPA jointly published in the federal register the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources. Mitigation banking had been growing in popularity for the past 20 years and the 2008 rule firmly established them as the preferred method of offsetting impacts to important natural resources. While the focus is on aquatic resources, the same principles can be applied to terrestrial habitat conservation. Additionally, in the Greene County grassland area, desirable development land often has wet clay meadows, and loss of these wetlands requires mitigation.

The EPA maintains a detailed website with background regarding compensatory mitigation and provides direct access to a wealth of documents that further discuss these activities:
http://water.epa.gov/lawsregs/guidance/wetlands/wetlandsmitigation_index.cfm

Key Partners: Army Corps of Engineers, US Fish and Wildlife Service, NYSDEC, Greene Industrial Development Agency.

Strategy 3: Local Land-Use Planning

Land use has a large impact on natural resources because water and wildlife move across property and political boundaries. Local governments have the right and responsibility to protect the health, safety, and welfare of the community through home rule authority. They also have broad authority to protect the environment in their local land-use laws and policies. This strategy is important for implementing Goals 1B, 3D, 4A, 4B, 4C, 4D, and Goal 5.

The Town and Village of Athens, the Town and Village of Coxsackie, and the Town of New Baltimore all updated their comprehensive land-use plans in 2007 and 2008. Each one identified habitat and open space protection as an important community goal, and some recommendations have already been implemented. The Town and Village of Coxsackie are the only two municipalities to date that have integrated these goals into their local zoning code.

Conserving Natural Areas and Wildlife in Your Community (Strong 2008) is a resource produced by the NYSDEC that can help local governments understand why and how to protect their vital natural resources, including the grassland bird habitat of eastern Greene County. It can be obtained at
http://www.dec.ny.gov/lands/50083.html.

The Challenge:
Local town and planning boards have a great deal of responsibility and have to implement that responsibility with many challenges, including limited funds, frequent changes in leadership, and volunteer planners with differing levels of experience.

The Benefit:

Fortunately, conserving grasslands in eastern Greene County is a win-win. First, according to community surveys completed for local comprehensive plans, it's what the public wants. Second, protecting open spaces like the grasslands can be good for the local economy. Cost of community services studies throughout the Hudson Valley have shown that open space and commercial development cost towns and school districts less in services than they pay in taxes, while single-family detached housing costs towns and school districts more in services than it pays. Locally, in the Town of Coxsackie, open space and working land costs the town and school district $0.30 per tax dollar paid, and commercial and industrial development costs $0.29 per tax dollar paid, residential development costs $1.21 for every tax dollar paid.

A review of studies of the costs and benefits of open space protection conducted by the Office of the State Comptroller finds that:

- Open space supports industries that generate billions of dollars in economic activity annually;
- Open space protection can be financially beneficial to local governments by reducing costs for public infrastructure and programs, lessening the need for property tax increases;
- Open space preservation can support regional economic growth; and
- Well-planned open space protection measures need not conflict with meeting other vital needs, such as economic development, municipal fiscal health, and affordable housing.

Finally, natural areas and wildlife habitat like the eastern Greene County grasslands provide vital natural services, including:

• Keeping a clean and abundant water supply.
• Keeping your family healthy—by cleaning the air and water, lowering stress, and lessening the risk of disease.
• Providing vital recreational opportunities.

Community Interest

In the past decade, all of the municipalities in the grassland target area have undertaken extensive revisions of their community comprehensive plans. In some of the municipalities such as the Town and Village of Coxsackie and the Town of New Baltimore, citizens' interest in protecting the natural environment has been codified in new zoning regulations. Each of these municipalities' resident surveys, public meetings, and other methods of eliciting input into the final comprehensive plan document revealed a very high interest in issues related to protection of the environment and open space. A sampling of goals and strategies from these plans includes:

- Conduct a Natural Resources Inventory.
- Encourage housing developments that preserve open space over those that do not by adopting concepts of smart growth and conservation design.
- Give special attention to appropriately regulating development on lots where sensitive environmental resources exist.

Additional strategies local governments can use to implement this plan:

Municipal planning and land-use tools

- Develop a series of community goals (and strategies) that meet the needs of community residents and grassland bird habitat.
- (Continue to) Implement the recommendations of the comprehensive plan.
- Allow conservation subdivisions and require that they are configured to create habitat across property boundaries.
- Adopt this plan, and pledge to assist in its implementation.
- Allow flexibility within zoning laws to accommodate conservation efforts.
- Review existing land-use regulations to identify and remedy existing obstacles to implementing this plan.

Use Environmental Review to conserve habitat

- Take advantage of opportunities to train staff and volunteer planning and zoning board members.
- Develop or reinvigorate Conservation Advisory Councils to help Planning Boards review habitat impacts for projects and monitor implementation of this plan.
- Refer to this plan when reviewing projects in the focus area

Working together

- Work cooperatively to establish sustainable professional resources to help towns apply these recommendations (e.g., a shared multi-town natural resource planner)
- Support and encourage other efforts to implement the plan – for example, the proposed mitigation bank

Key Partners: The Town and Village of Athens, Town and Village of Coxsackie, and the Town of New Baltimore, DEC Hudson River Estuary Program, Greene Industrial Development Agency, Greene County Planning and Economic Development, Cornell University Department of Natural Resources, Hudsonia Ltd., Pace University Land Use Law Center

Strategy 4: Land Management

With permanent conservation of the 300+ acre Coxsackie Creek Grassland Preserve, serious local grassland protection has been initiated in the county. Management of this land, which is guided by a DEC-approved management plan, is critical to prevent invading trees and herbs from overtaking the grassland habitat.

However, most of the remaining grassland habitat in the county is held in private ownership. Without the stewardship of private grassland landowners, there will not be enough suitable acres of grassland to support local populations of at-risk grassland birds. Private landowner stewardship can be an effective conservation tool for grassland birds, and there are many examples of grassland habitat stewardship from around the country, including elsewhere in New York. GLT is recruiting private landowners to its Community Grassland Stewardship

Program. The New York State Department of Corrections operates two correctional facilities in the middle of the focus area, and they have large grassland acreage which was formerly part of a dairy operation and is now leased to private agricultural operators. Grassland habitat management of these properties has the potential to be a vital link in maintaining the grassland landscape. There are also stewardship opportunities for local businesses owning large acreages. This strategy is essential for implementing Goals 1A, 1B, 3D, and 4C.

Private Landowner Stewardship - Community Grassland Stewardship Project
Engaging local landowners in a conservation effort that involves management of their own property requires consistent education, involvement, and support from the conservation community.

With this in mind, GLT, under a grant from the NYSDEC Hudson River Estuary Program and with the support of the Greene County Habitat Advisory Committee, launched a Community Grassland Stewardship Project. The project includes an incentive-based voluntary landowner stewardship program that provides support and assistance to landowners who pledge to become "Grassland Habitat Stewards".

Interested landowners who sign a voluntary pledge to maintain their existing grasslands for grassland birds will receive attractive property signs and technical assistance with management from GLT, including the development of a Habitat Management Plan for their grasslands. Management practices may be as simple as bi-annual mowing. Working with GCIDA, GLT is seeking additional funding sources to allow for an expansion of the program to include grants to landowners for activities such as keeping fields periodically mowed.

The GLT produced *Conserving Greene County Grassland Habitat: A Landowner's Guide* to support this project. It is a handbook for grassland habitat management to help landowners develop strategies for their properties. It is a valuable resource that explains the history of grasslands in Greene County, the natural history of grassland birds, provides recommended grassland management practices for habitat conservation, and other tools, factsheets, and lists of resources and technical assistance.

What else could be done to support landowner stewardship in the region?

Building on the Community Grassland Stewardship Project and the Grassland Habitat Steward Program, the various agencies and organizations within the county should continue to support local landowners in their stewardship efforts in the long term. GLT is committed to providing the necessary support that landowners need, but could greatly benefit from the additional support of partnering organizations. For example, GCSWCD could provide valuable support by allowing the periodic use of mowers and other equipment for grassland management on private lands. GCSWCD could also provide staff support for site visits and developing habitat management plans for grassland stewards as GLT builds its own staff to effectively handle each private landowner steward. The Agroforestry Resource Center and Audubon New York could be useful partners with a continuing education component, leading educational workshops for grassland stewards about mowing practices, invasive species management, grassland bird identification, etc.

Private landowners should also be invited to participate in grassland bird monitoring activities on their lands. GLT will offer Grassland Habitat Stewards this opportunity when they sign on to the program. Stewards are

asked to observe one point on their property eight times during the year to record grassland bird species and their behaviors. With this monitoring information across the grassland landscape, GLT will learn more about which grassland birds are using the grasslands and where stewardship is having an impact on populations. This citizen monitoring might also point to the need for more rigorous monitoring and study in the future by experts such as the NYSDEC and local colleges and universities.

Key Partners: Private Landowners, Greene Land Trust, New York State Department of Corrections and Community Supervision, Cornell Cooperative Extension, Greene County Soil and Water Conservation District, Scenic Hudson.

Strategy 5: Outreach and Education

This plan will be the most effective if the people of Athens, Coxsackie, and New Baltimore know about their local grasslands and how unique and valuable they are to their communities. The Greene County Soil and Water Conservation District, Cornell Cooperative Extension, Greene Land Trust, Audubon NY, and the DEC Hudson River Estuary Program have organized or presented workshops, public programs, and events to raise awareness. This strategy is essential for all of the goals, but especially Goal 1B, 3D, 4A, 4C, and 5.

The Community Grassland Stewardship Project included extensive public education about the importance of local grassland habitat and at-risk grassland birds – including events, mailings, and articles in the press. A sampling of past events includes Family Owl Night Hike, Summer Songbird Celebration, Ramble Hike and Bird Show, as well as school programs (GCSWCD) and landowner workshops (Cornell Cooperative Extension, DEC Hudson River Estuary Program).

Public education will also need to be extended into the future. Community events at the Coxsackie Creek Grassland Preserve will invite the public to participate in learning about local grasslands and the importance of the Preserve in the context of private landowner stewardship in surrounding areas. The local press should be continually engaged in reporting about local grassland stewards and grassland events so that voluntary stewardship is recognized and appreciated publically. In addition to general education about grassland birds, specific outreach about the plan to stakeholders will be necessary.

Key Partners: Audubon NY, Cornell Cooperative Extension, Greene County Soil and Water Conservation District, DEC Hudson River Estuary Program, Greene Land Trust.

Strategy 6: Research and Monitoring

The ultimate goal of this conservation plan is to provide habitat to the state-threatened Northern Harrier and the state-endangered Short-eared Owl as well as other grassland birds. In order to know if the plan is successful or whether management actions or strategies require adapting, it is necessary to monitor the target bird

populations. This strategy is essential for implementing Goals 1A, 2A-2H, and 3A, 3B, and 3C, all of which identify research and monitoring needs.

To date, DEC has played a lead role in this effort, particularly through the winter Short-eared Owl surveys funded by the State Wildlife Grants program (see Appendix A for methodology and Figures 5-1 and 5-2 for survey observation locations). GCIDA has funded some monitoring on their lands and also provided logistical support to the DEC monitoring effort and the Greene Habitat Advisory Committee has conducted some volunteer monitoring. GCIDA strongly supports these monitoring efforts and has indicated that future large development projects will include consideration of research funding as a component of future mitigation strategies.

Key Partners: DEC, Audubon NY, Cornell University, New York State Museum, Columbia-Greene Community College, University at Albany, Greene Industrial Development Agency, Greene Land Trust

Strategy 7: Partnerships

Many partners contributed to the development of this plan and we need many more to implement it. The key is working together, integrating programs, finding diverse funding sources, and being creative. There is not one single program or entity that will make this plan work. Moving forward, members of the Habitat Advisory Committee will work with the Greene Land Trust, Greene County Soil and Water Conservation District, Greene County Industrial Development Agency, and local municipalities to implement and monitor progress on the plan. Many of these partners have already been involved in the project. Others are considered potential partners and need to be engaged as the plan is implemented. All of the plan's goals will require partnerships. The effectiveness of a close working relationship between the development and environmental communities in Greene County to date is highly unusual and is largely responsible for the success to date.

Greene Habitat Advisory Committee

The Habitat Advisory Committee is an ad hoc group created to advise the Greene County Soil and Water Conservation District and provide input on projects such as the Greene Land Trust's Community Grassland Stewardship Project and other projects that impact and/or protect grassland bird habitat. It is a multi-stakeholder group with representatives from Greene Land Trust, Greene Industrial Development Agency, Greene County Soil and Water Conservation District, New York State Department of Environmental Conservation (DEC), DEC Hudson River Estuary Program, Northern Catskills Audubon Society, Inc., Scenic Hudson, Hudsonia Ltd., Cornell Cooperative Extension of Greene County's Agroforestry Resource Center, Sierra Club, Hudson-Mohawk Group, Coxsackie Planning Board, Hunters and several prominent local birders.

The Greene Habitat Advisory Committee has played an important role in the development of this plan, providing direction and thoughtful comments. Greene Habitat Advisory Committee members have also served as advisors to the Community Grassland Stewardship project that is described earlier in this document.

Key Agencies Responsible for Implementation of this Plan

Greene County Soil and Water Conservation District

The Greene County Soil & Water Conservation District (GCSWCD) is a county agency dedicated to the management of natural resources. Since created in 1961, the GCSWCD has developed a diverse conservation program in response to local needs, and which provides assistance to landowners, local municipalities as well as state and federal agencies.

The SWCD helped to coordinate this plan, works with Greene Land Trust to manage the Grassland Preserve, built an inventory of equipment crucial to cost-effective management of habitat management, and initiated the Greene Habitat Advisory Committee. It will continue to be an important partner for preserve and landowner stewardship, landowner management plans and administrative support.

Greene County Industrial Development Agency

The Greene County Industrial Development Agency (GCIDA) works in partnership with the Greene County Department of Economic Development, Tourism and Planning and Great Northern Catskills Chamber of Commerce to help foster positive economic development. This strategy has been implemented to better address the challenges of attracting business and investment in today's economy and in New York State, a high cost area. These new structures will provide a variety of avenues and strategies to get deals done to reach our ultimate goal of driving economic development.

GCIDA has been a leader in habitat conservation, investing millions of dollars in grassland conservation in this region. It created the Coxsackie Creek Grassland Preserve and supports the Greene Land Trust. It created a community environmental program within the Authority, showing a significant commitment to community development. GCIDA has also provided matching funding for many grants. Going forward, the agriculture incubator project, mitigation banking, and the biomass study are very creative tools that may be a way to conserve larger grassland landscapes. GCIDA could provide funding for studies and monitoring to identify priority species and properties to help stakeholders make better conservation decisions.

Greene Land Trust

The mission of the Greene Land Trust (GLT) is to preserve and protect significant natural and cultural resources in and around Greene County, New York. The land trust's goal is to provide substantial public benefit in identifying and protecting important resources while demonstrating a flexible and exemplary partnership with all stakeholders. GLT did not exist when this project began in 2003, but it has become a key partner in the creation and implementation of the plan. GLT Board members participate in GHAC and a consultant working for GLT coordinated GHAC (for a time). GLT implemented the grassland stewardship project (funded by a New York State Environmental Protection Fund grant through the DEC Hudson River Estuary Program), and will continue to provide technical assistance for landowners of the project. GLT will be a vital partner for land conservation and as owner of the Coxsackie Creek Grassland Preserve is responsible for implementing grassland habitat management goals.

Greene County Agencies and Affiliated Organizations

There are several county agencies and other affiliated entities that have already helped develop and implement this plan. The advantage of having these organizations help implement the plan is that they bring full-time professionals and bring continuity across the county.

Greene County Planning and Economic Development

The Planning section of Greene County Planning and Economic Development performs vital work in the areas of planning, transportation and housing. The section also supports the work of the department's economic development and community development sections and provides staff services to various county-level boards, including the Greene County Planning Board and Agricultural and Farmland Protection Board.

In recent years, in cooperation with the department's economic and community development sections, Greene County Planning and Economic Development completed a Comprehensive Economic Development Plan that creates a clear roadmap for fostering balanced economic growth in Greene County for the next 10 to 20 years. It also spearheaded a Hudson River Corridor Study to create a shared regional vision for the county's seven historic river towns and villages.

To help implement this plan, the County Planning Department has facilitated training, taken the lead on the county open space plan/inventory, and developed a county economic development plan.

Cornell Cooperative Extension of Columbia and Greene Counties

Established by state statute in 1912, county extension associations affiliated with Cornell University provide educational programming to New York residents in areas such as agriculture, youth development, nutrition, environment, and community development. Greene County Cornell Cooperative Extension is at the Agroforestry Resource Center in Acra, with a mission to "sustain the ecological, aesthetic and economic values of the rural landscape".

To support this plan, the main role of Cooperative Extension is for education and outreach, especially for landowners, continue educational programs for public, serve as a link/partner on future research efforts, and participate in the Habitat Advisory Committee.

State Agencies

State Agencies have a role in implementing this plan, primarily as regulators and land managers, as well as a potential funding source and in outreach, education and technical assistance. The agencies most likely to be involved are: NYS Department of Environmental Conservation, NYS Department of Corrections/Office of General Services, NYS Department of Agriculture and Markets, and the NYS Thruway Authority.

New York State Department of Environmental Conservation

The New York State Department of Environmental Conservation (DEC) was created "To conserve, improve and protect New York's natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being."

Significant funding to support grassland conservation in Greene County has come from the NYSDEC. The Hudson River Estuary Program funded the community landowner grasslands project, the Coxsackie Creek wetland acquisition, this plan, and provided technical assistance and training through its partnership with Cornell University. The state wildlife grants program funded a vital project to help us understand Short-eared Owl use of the region. DEC Region 4 Wildlife Staff have provided a great deal of support to the GHAC, including participating in meetings and in the development of this plan, leading monitoring efforts and organizing volunteers. The statewide grassland bird plan (though it doesn't cover this area) as well as DEC's private landowner biologist were very helpful in developing the plan and the landowner program.

Going forward, the new endangered species regulations will play an important role in achieving the goals of this plan. Grassland conservation in Greene County has relied a great deal on funding and technical assistance from the DEC. In the future, continuing to provide resources and expertise for monitoring and conservation planning is vital. Including this area in future NY state grassland bird plans would raise the importance of grassland conservation in this area and help to justify further investment.

New York State Department of Corrections and Community Supervision/Office of General Services

The primary role of these agencies in implementing this plan is compatible land management. The Office of General Services has already completed shoreline land transfers for conservation. The New York State Department of Corrections and Community Supervision (DOCCS) operates Greene and Coxsackie Correctional Facilities in the middle of the focus area, and they have a significant patch of grassland habitat. While DOCCS used to maintain resource management programs, including a dairy farm and milk processing plant at Coxsackie Correctional facility, in 2009 the farming operation was ceased and the open fields are now leased on a year to year basis by local farmers. Initial lessees have continued to use the properties for hay production but there is currently no connection between the use of these properties and good grassland management and in the future potential farming operations could diminish the quality of the habitat (e.g., row crops). Grassland habitat management of these properties will be a vital link in maintaining the grassland landscape.

New York State Thruway Authority

The New York State Thruway (I-87) runs through the grassland focus area and contains exit 21B and the New Baltimore Rest Area. The Authority has an environmental stewardship program, but has not yet been engaged in grassland conservation in this area. While the Thruway has a very limited right of way that is mainly focused on transportation infrastructure, future Thruway expansions such as at the New Baltimore Rest Area should

consider habitat protection, which can be aided by reviewing this plan. There is also an ideal opportunity for public education at the New Baltimore Rest Area, which is located in the grassland focus area.

New York State Department of Agriculture and Markets

The mission of New York State Department of Agriculture and Markets is to foster a competitive food and agriculture industry that benefits producers and consumers alike. Agriculture makes up one-quarter of the State's land area and contributes immensely to the quality of life in New York State by generating economic activity and producing wholesome products to nourish our families. The agency works diligently to promote a viable agricultural industry, foster agricultural environmental stewardship, and safeguard our food supply.

This agency has an important role in conserving farmland, promoting local products, and keep farming viable, all of which are important aspects of implementing this plan. The agency may also be a source of technical expertise on conservation management compatible with agricultural methods. Specific contributions of the agency could be through its farmland protection program as well as its efforts to promote rotational grazing and other grassland management systems

Federal Agencies

Federal Agencies have a role in implementing this plan, primarily as regulators and providers of funding and technical assistance. The agencies most likely to be involved in regulatory issues are: the Army Corps of Engineers, who coordinate with the Environmental Protection Agency and US Fish and Wildlife Service. Those more likely to be involved through funding and technical assistance are the Natural Resources Conservation Service and the Farm Service Agency.

Army Corps of Engineers (coordinating with US Fish and Wildlife Service and Environmental Protection Agency)
The U.S. Army Corps of Engineers (ACOE) has been involved in regulating activities in the nation's waters since 1890. These include issuing permits related to waters of the United States, which are considered to include all surface waters, such as all navigable waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters.

ACOE is a regulatory partner, and has worked cooperatively with GCIDA to establish working models for wetland mitigation and habitat conservation which have been implemented by GCIDA. The 2008 rules on mitigation banking are highly consistent with what GCIDA has done to date to establish habitat protection in the county and will be the basis for GCIDA's plans to develop a comprehensive wetland and habitat mitigation bank as described under Strategy 3 in this plan.

Natural Resources Conservation Service.
The Natural Resources Conservation Service (NRCS) is a federal agency that works with private landowners through conservation planning and assistance designed to benefit the soil, water, air, plants, and animals that result in productive lands and healthy ecosystems.

NRCS can provide technical assistance to help landowners with an agricultural history with habitat management. The *Wildlife Habitat Incentives Program* (WHIP) is a Farm Bill program that provides cost share for habitat management practices such as those promoted by Greene Land Trust's community grassland stewardship program. The program's priorities in New York include "enhancing early successional wildlife habitat with shrubland and establishing and enhancing grassland habitat for declining bird species, pollinators, and other grassland wildlife species." The Wetland Reserve Program is another Farm Bill program that would help maintain and restore grassland bird habitat by funding easements, restoration, and other wetland enhancement activities on agricultural land. To learn more about these and other NRCS programs in New York, visit http://www.ny.nrcs.usda.gov/programs/.

Farm Service Agency

The Farm Service Agency (FSA) provides technical and financial assistance with the business aspects of farming and coordinates the Conservation Reserve Program. The Conservation Reserve Program (CRP) provides technical and financial assistance to farmers/producers to address the agricultural impacts on water quality and to maintain and improve wildlife habitat. CRP practices include the establishment of filter strips, riparian buffers and permanent wildlife habitats.

Conservation Organizations

Conservation organizations include land trusts, advocacy organizations, and sportsmen's groups, who all have a shared interest in conservation. Greene Land Trust's role in plan implementation was described earlier as a key agency responsible for implementation of this plan. Other conservation organizations that may have an important role to play in implementing this plan include:

Audubon NY

Audubon's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity. Audubon has been a critical partner for the duration of the project. Their Conservation and Science Office has provided invaluable information in the NYS Grassland Bird Management Plan, Guidance for Management of Priority Birds in the Hudson River Valley (including fact sheets), and answered numerous requests for information. The Education Coordinator in the area has been a dedicated member of the Greene Habitat Advisory Committee, who not only participates in committee meetings, but provides public education for many of the grassland bird programs.

In the future GHAC will continue to rely on Audubon NY for technical assistance and research on grassland birds.

Scenic Hudson

Scenic Hudson works to protect and restore the Hudson River and its majestic landscape as an irreplaceable national treasure and a vital resource for residents and visitors. Locally, Scenic Hudson has already played an important role in purchasing important Hudson riverfront land (Four Mile Point Preserve, RamsHorn-Livingston Sanctuary, Brandows Point - now owned by DEC), and may continue to play a role in shoreline conservation. Various Scenic Hudson staff members have participated in the Greene Habitat Advisory Committee since 2003, and they may provide technical assistance to riverfront communities for land-use planning.

Open Space Institute

The Open Space Institute (OSI) protects scenic, natural, and historic landscapes to ensure public enjoyment, conserve habitats, and sustain community character. In the focus area, OSI owns the Hannacroix Creek Preserve in New Baltimore that is managed by the New Baltimore Conservancy. OSI provides bridge loans to small land trusts to purchase important conservation land and is an important technical assistance resource.

Columbia-Greene Trout Unlimited Chapter

The mission of Trout Unlimited is "Conserving, protecting, and restoring North America's coldwater fisheries and their watersheds." In the focus area, only portions of Hannacroix Creek are rated TS by the NYSDEC, which indicates it supports trout spawning. There are currently no active projects in the focus area.

Ducks Unlimited

Ducks Unlimited conserves, restores, and manages wetlands and associated habitats for North America's waterfowl. These habitats also benefit other wildlife and people. There are currently no active projects in the focus area, but the organization could get involved with wetland construction and building nest boxes.

Federation of Sportsman's Clubs of Greene County

There is a representative of Hudson River Waterfowl Protection Alliance on the Greene Habitat Advisory Committee. In consultation with GHAC, the Greene Land Trust has established hunting rules for the CCGP which will be protective of the primary use of the preserve for habitat protection. Provided there are effective rules and supervision there is opportunity for the allowance of hunting on wildlife habitat management preserves. The Greene Land Trust has also had numerous discussions with the hunter community about providing labor and other help in managing the grassland (i.e., mowing).

Private landowners

Most of the land in the focus area is private land, and how this land is managed will determine if grassland bird populations will persist in Greene County. Therefore, private landowners, including individuals and businesses, have a very important role in the success of this plan. Strategy 4: Landowner Stewardship outlines in detail what private landowners can do to help conserve grassland habitat.

Businesses with grassland habitat could also participate in the stewardship program, as well as participate in fundraising, sponsorship, or donation to Greene Land Trust and other conservation organizations. Greene Land Trust has developed an acknowledged sponsorship program for businesses with signage.

Recommendations for improved partnerships

A key recommendation for maintaining and improving partnerships is to create an implementation working group within the Habitat Advisory Committee that meets on a quarterly basis. This group will coordinate efforts by Greene Land Trust, Greene Soil and Water, and GCIDA to move this plan forward and will monitor progress toward goals. It will be necessary for this group to reach out to many more potential partners as described in

Strategy 7 of this chapter. The group might consider seeking funding for a coordinator of the working group to ensure ongoing progress.

Next Steps

With this plan complete, the next step for the implementation working group is to develop an implementation timeline and annual or biannual work plans to identify which goals and strategies will be addressed and to set well-defined milestones for success. The work plans can also be used to assess progress of the plan. The working group can seek funding for various projects included in the annual work plans.

One of the first steps, subject to the availability of resources, would be to determine how to effectively conduct outreach about the plan to the various stakeholders identified in Strategy 7. It will be especially important to reach out to the towns and villages and local residents to raise awareness about the value and benefits of local grasslands and to identify synergies between community goals (and strategies) outlined in local comprehensive plans and grassland bird habitat conservation.

A Dynamic Plan

This plan was created with the best scientific information available. As new information becomes available, especially about the local grassland bird populations and habitats, the plan should be updated. The key agencies and working group should consider updating this plan every five years.

References

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

Bock, C.E., K.T. Vierling, S.L. Haire, J.D. Boone, W.M. Merkle. 2002. Patterns of Rodent Abundance on Open-Space Grasslands in Relation to Suburban Edges. Conservation Biology 16(6): 1653-1658.

Bosakowski, T. 1986. Short-eared owl winter roosting strategies. American Birds. 40 (2):237-240.

Broad, W.A. 1993. Greene County Soil Survey. United States Department of Agriculture. Soil Conservation Service in cooperation with Cornell University Agricultural Experiment Station

Collopy, M.W., and K.L. Bildstein 1987. Foraging behavior of northern harriers wintering in southeastern salt and freshwater marshes. Auk 104:11-16.

Clark, R. J. 1975. A field study of the Short-eared Owl, *Asio flammeus,* in North America. Wildlife Monographs 47: 1-67.

Conway, C. J. 2011. Standardized North American Marsh Bird Monitoring Protocol. Waterbirds 34(3): 319-346.

Craighead, J.J. and F.C. Craighead, Jr. 1956. Hawks, owls and wildlife. The Stackpole Company, Harrisburg, Pennsylvania, and the Wildlife Management Institute, Washington, D.C.

Foreman, R.T.T., B. Reineking, and A.M. Hersberger. 2002. Road Traffic and nearby grassland bird patterns in an urbanizing landscape. Environmental Management 29(6): 782-800.

Graves, J.D. 2001. Regional reports, Region 8-Hudson Mohawk. Kingbird 51(2): 630-635.

Herkert, J. R., S. A. Simpson, R. L. Westmeier, T. L. Esker, And J. W. Walk. 1999. Response of Northern Harriers and Short-eared Owls to grassland management in Illinois. Journal of Wildlife Management 63:517–523.

Holt, D. W. and S. M. Leasure. 1993. Short-eared Owl (Asio flammeus). The Birds of North America, No. 62.

Jones, A. J. and P. D. Vickery. 1997a. Conserving grassland birds: Managing agricultural lands including hayfields, crop fields, and pastures for grassland birds. Massachusetts Audubon Society. 15pp.

Jones, A. J. and P. D. Vickery. 1997b. Conserving grassland birds: Managing large grasslands including conservation lands, airports, and landfills over 75 acres for grassland birds. Massachusetts Audubon Society. 17pp.

Jones, A. J. and P. D. Vickery. 1997c. Conserving grassland birds: Managing small grasslands including conservation lands, corporate headquarters, recreation fields, and small landfills for grassland birds. Massachusetts Audubon Society. 16pp.

Kiviat, E., and G. Stevens. 2001. Biodiversity Assessment Manual for the Hudson River Estuary Corridor. New York State Department of Environmental Conservation. Albany, N.Y. 508 pp. www.hudsonia.org

Lazazzero, S. and C. Norment. 2006. A Multi-scale Analysis of Grassland Bird Habitat Relations in the St. Lawrence River Valley. Final Report to The Nature Conservancy and The Research Foundation of the State University of New York.

McGowan, K.J. and K. Corwin, eds. 2008. The Second Atlas of Breeding Birds in New York State: 2000 -2005. Cornell University Press, Ithaca, NY. 688 pp.

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 #C005137. Audubon New York, Ithaca, NY.

National Agricultural Statistics Service. 1994. 1992 Census of Agriculture. United States Department of Agriculture, Washington, DC. Accessed online 24 August 2010 at http://www.agcensus.usda.gov/

National Agricultural Statistics Service. 1999. 1997 Census of Agriculture. United States Department of Agriculture, Washington, DC. Accessed online 24 August 2010 at http://www.agcensus.usda.gov/

National Agricultural Statistics Service. 2004. 2002 Census of Agriculture. United States Department of Agriculture, Washington, DC. Accessed online 24 August 2010 at http://www.agcensus.usda.gov/

National Agricultural Statistics Service. 2009. 2007 Census of Agriculture. United States Department of Agriculture, Washington, DC. Accessed online 24 August 2010 at http://www.agcensus.usda.gov/

National Agricultural Statistics Service. 2014. 2012 Census of Agriculture. United States Department of Agriculture, Washington, DC. Accessed online 8 May 2014 at http://www.agcensus.usda.gov/

National Atmospheric and Oceanic Administration (NOAA). 2007. C-CAP zone 65 2001-2006-Era Land Cover Classification. NOAA's Ocean Service, Coastal Services Center. Accessed online 5 June 2014 at http://www.csc.noaa.gov/ccapatlas/

National Audubon Society. 2010. The Christmas Bird Count Historical Results [Online]. Accessed online 15 January 2011 at http://www.christmasbirdcount.org

New York Natural Heritage Program. 2009a. Online Conservation Guide for *Asio flammeus*. Accessed online 19 March 2009 at http://www.guides.nynhp.org/guide.php?id=6949.

New York Natural Heritage Program. 2009b. Online Conservation Guide for *Circus cyaneus*. Accessed online 19 March 2009 at http://www.guides.nynhp.org/guide.php?id=6812.

New York Natural Heritage Program. 2014. Element occurrence database. Albany, NY.

New York State Department of Environmental Conservation (NYS DEC). 2005. New York State comprehensive wildlife conservation strategy: A strategy for conserving New York's fish and wildlife resources. New York State Department of Environmental Conservation, Albany. 1,569 p. Accessed online 14 March 2011 at http://www.dec.ny.gov/docs/wildlife_pdf/cwcs2005.pdf.

New York State Department of Environmental Conservation (NYS DEC). 2009. Guidelines for conducting bird and bat studies at commercial wind energy projects**.** NYS Department of Environmental Conservation. Division of Fish, Wildlife, and Marine Resources. Albany, NY. 31p.

Norment, C. 2002. On Grassland Bird Conservation in the Northeast. *The Auk* 119(1):271–279.

North American Bird Conservation Initiative, U.S. Committee, 2009. The State of the Birds, United States of America, 2009. U.S. Department of Interior: Washington, DC. 36 p.

North American Bird Conservation Initiative, U.S. Committee, 2010. The State of the Birds, United States of America, 2009. U.S. Department of Interior: Washington, DC.

Ochterski, J. 2005a. Enhancing Pastures for Grassland Bird Habitat. Cornell Cooperative Extension's guidelines for landowners on conserving grassland habitat. Accessed online 2 June 2014 at http://www.nyfoa.org/swg/docs/PasturesGrassland_Bird_2MB.pdf

Ochterski, J. 2005b. Hayfield management and grassland bird conservation. Cornell Cooperative Extension of Schuyler County. Guidelines for landowners on conserving grassland habitat. Accessed online 2 June 2014 at http://www.nyfoa.org/swg/docs/HayfieldsGrassland_Birds_3MB.pdf

Ochterski, J. 2005c. Improving Grassland Bird Habitat in Large Fields and Idle Cropland. Cornell Cooperative Extension of Schuyler County. Guidelines for landowners on conserving grassland habitat.

Penhollow, M. E., P. G. Jensen, and L.A. Zucker. 2006. Wildlife and Habitat Conservation Framework: An Approach for Conserving Biodiversity in the Hudson River Estuary Corridor. New York Cooperative Fish and Wildlife Research Unit, Cornell University and New York State Department of Environmental Conservation, Hudson River Estuary Program, Ithaca, NY.

Post, T. 2008. Northern Harrier. p 190-191 In McGowan, K and Corwin, K, Eds. The Second Atlas of Breeding Birds in New York State: 2000-2005. Cornell University Press, Ithaca, NY.

Ribic, C.A, R.R. Koford, J.R. Herkert, D.H. Johnson, N.D. Niemuth, D.E. Naugle, K.K. Baker, D.W. Sample, R.B. Renfrew. 2009. Area Sensitivity in North American Grassland Birds: Patterns and Processes. The Auk 126(2): 233–244.

Sample, David W., and Michael J. Mossman. 1997. Managing habitat for grassland birds - a guide for Wisconsin. Wisconsin Department of Natural Resources, Madison, WI, PUBL-SS-925-97. 154 pp. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/wiscbird/index.htm (Version 03JUN2002 Accessed online 20 May 2009).

Schneider, K.J. 2003. The status and ecology of the short-eared owl (Asio flammeus) in New York State. The Kingbird 53: 313-330.

Schneider, K. 2008. Short-eared Owl. p 300-301 In McGowan, K. and K. Corwin, Eds. The Second Atlas of Breeding Birds in New York State: 2000-2005. Cornell University Press, Ithaca, NY.

Serrentino, P. 1992. Northern Harrier, Circus cyaneus. In Migratory Nongame Birds of Management Concern in the Northeast, pp. 89-117. K. J. Schneider and D. M. Pence, Eds. U.S. Fish & Wildlife Service, Newton Corner, MA.

Slater, G.L. and C. Rock. 2005. Northern Harrier (Circus cyaneus): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project. Ecostudies Institute, WA.

Smith, Kimberly G., Sara Ress Wittenberg, R. Bruce Macwhirter and Keith L. Bildstein. 2011. Northern Harrier (Circus cyaneus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Accessed online 19 March 2014 at http://bna.birds.cornell.edu/bna/.

Snell, G. 1975. Regional reports, Region 8-Hudson Mohawk. Kingbird 25(2): 108-110.

Snyder, S.A, J.R. Miller, A.M. Skibbe, and R.G. Haight. 2007. Habitat Acquisition Strategies for Grassland Birds in an Urbanizing Landscape. Environmental Management 40: 981-992.

Strong, K. 2008. Conserving Natural Areas and Wildlife in Your Community: Smart Growth Strategies for Protecting the Biological Diversity of New York's Hudson River Valley. New York Cooperative Fish and Wildlife Research Unit, Cornell University, and New York State Department of Environmental Conservation, Hudson River Estuary Program. Ithaca, N.Y. Available online at http://www.dec.ny.gov/lands/50083.html.

Tate, G.R. 1992. Short-eared Owl, Asio flammeus. In Migratory Nongame Birds of Management Concern in the Northeast, pp. 89-117. K. J. Schneider and D. M. Pence, Eds. U.S. Fish & Wildlife Service, Newton Corner, MA.

US Bureau of the Census. 1913. Thirteenth Census of the United States. Volume 7: Agriculture. 1909-

1910 . US Department of Commerce, Washington, DC. Accessed online 24 August 2010 at http://www.agcensus.usda.gov/

US Bureau of the Census. 1952. US Census of Agriculture: 1950. US Department of Commerce, Washington, DC. Accessed online 24 August 2010 at http://www.agcensus.usda.gov/

U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2014. 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: New York. Accessed online 16 June 2014 at http://www.census.gov/prod/2013pubs/fhw11-ny.pdf.

U.S. Fish & Wildlife Service. 2003. Guidance for the Establishment, Use, and Operation of Conservation Banks. Memorandum of May 2, 2003. Accessed online 14 March 2011 at http://www.fws.gov/endangered/esalibrary/pdf/Conservation_Banking_Guidance.pdf.

Vickery, P. M. Hunter, and Effect of S.M. Melvin. 1994. Effects of Habitat Area on the Distribution of Grassland birds in Maine. Conservation Biology 8: 1087-1097.

Winter, M., D. H. Johnson, J. A. Shaffer, T. M. Donovan, and W. D. Svedarsky. 2006. Patch Size and Landscape Effects on Density and Nesting Success of Grassland Birds. Journal of Wildlife Management 70(1): 158–172.

Zuckerberg, B. and P.D. Vickery. 2006. Effects of mowing and burning on shrubland and grassland birds on Nantucket Island, Massachusetts. *The Wilson Journal of Ornithology* 118(3):353–363.

Zweig, B. 2010. Study of the Economic Impact on the Local Economy of Minnewaska State Park Preserve, Mohonk Preserve, and Sam's Point Preserve. Accessed online 16 June 2014 at http://www.shawangunkridge.org/documents/Shawangunk_Full_Report_6_15_10.pdf.

Appendix A. State Wildlife Grant Winter Raptor Monitoring Protocols

Winter 2010-2011

Protocols for Stationary Surveys

These survey protocols were designed to test methodology for a statewide survey of winter raptor "concentration areas" (or "sites") across the state with *previously known use* by Short-eared owls. In some cases, such as at Coxsackie Flats, these "concentration areas" span more several miles of contiguous or fragmented grassland habitat where short-eared owls were previously observed but no roost sites were known, whereas in other cases a "concentration area" may have been identified by a single known roost area with no history of use of surrounding habitat.

Regardless of the size of the site or the breadth of knowledge of site use, surveys are conducted by multiple observers all observing at single separate "stations" on the same night, for the same time period.

Surveys are completed either once per month, from December through March, in the middle of the month, or bi-weekly, once in the first or second week of December and every other week thereafter.

Suitable weather conditions for the surveys should include little to no precipitation and wind speeds less than approximately 12 mph at the start of the survey.

Stationary Survey Protocol

- Participants observe specific, designated areas ("stations") of good open country grassland habitat. Some stations will be at, or near, previously documented roost sites or areas where SEOWs have been previously observed. Participants will be provided with an aerial photograph of their station (or their whole site in case of small sites or more poorly documented "concentration areas). Participants are also provided with a standard data sheet.

- Surveys should take place from **½ hour before sunset to ½ hour after sunset**.

- Scan the areas of suitable habitat in all directions, from your vehicle or by walking short stretches of the roadside, or by a combination of the two, but stay within your designated "station".

- Record the time each raptor, of each species, was first observed and mark the location(s) of these raptors on copies of the aerial photos for the station you are monitoring.

- Identify all raptors observed to species where possible. If you are uncertain of the species you may record "unidentified raptor", although "unidentified buteo" or "unidentified accipiter" would be preferable where possible. Record rough-legged hawks as either light or dark phase. Record northern harriers as male or female/juvenile. If conditions and observer skill are sufficient to separate juvenile from adult female harriers, please do so, but we recognize that this is often difficult.

- Record raptor behavior (perched, foraging, flying, etc.). Where raptors fly into or out of your area of visibility, indicate direction of flight on your maps. This will assist in identifying raptors that may have also been counted by someone observing at a nearby station.

- In some cases, you will observe more individuals of a given species than you can easily keep track of for the entire 1-hour survey period. You may indicate additional times and locations on your maps and data sheets to assist you in keeping track of individuals as they move within your site over the course of the survey period (for example record NOHA 1 and NOHA 2 for 2 different harriers). Regardless of whether you choose to do this, at the close of the survey period, indicate the maximum number of each species of raptor you believe were present at your station during your survey.

- Turn in your completed data sheets and maps following completion of the survey.