

Vermont Grassland Bird Management and Recovery Plan

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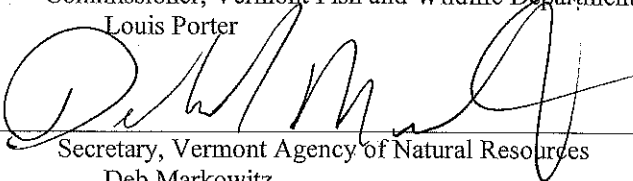
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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY.....	5
2. BACKGROUND	
2.1 The Problem.....	6
2.2 Population Trends.....	6
2.3 Justification of Management and Recovery Plan.....	7
2.4 Historic and Current Grassland Habitats in Vermont.....	7
3. THREATS AND LIMITING FACTORS	
3.1 Habitat Loss.....	8
3.2 Other Limiting Factors.....	10
4. MONITORING AND MANAGEMENT	
4.1 Monitoring.....	10
4.2 Management Techniques and Considerations.....	11
4.3 Current Management Efforts in Vermont.....	13
5. STRATEGIES AND RECOMMENDATIONS FOR THE MANAGEMENT AND RECOVERY OF ALL GRASSLAND BIRDS IN VERMONT	
5.1 Management and Recovery Plan Goal.....	13
5.2 Management and Recovery Plan Objectives.....	13
5.3 Justification of Management Plan Goal and Objectives.....	13
5.4 Recommended Management and Recovery Actions.....	15
5.41 Priority Actions.....	15
5.42 Research and Management.....	15
5.43 Education and Outreach.....	17
5.44 Partnerships.....	17
5.45 Fundraising.....	18
5.5 Factors potentially Limiting Management and Recover Efforts...	18

SPECIES RECOVERY PLANS

UPLAND SANDPIPER

1. Background	
1.1 Introduction.....	20
1.2 Distribution in Vermont.....	20
2. Monitoring and Management.....	20
3. Threats.....	21
4. Strategies and Recommendations for the Recovery of Upland Sandpiper in Vermont.....	21

4.1 Recommended Management and Recovery Plan Goal and Objectives.....	21
4.2 Justification of Recommended Management and Recovery Plan Goals and Objectives.....	22
4.3 Recommended Management and Recovery Actions.....	22
4.31 Priority Actions.....	22
4.32 Research and Management.....	23
4.33 Education and Outreach.....	24
4.34 Partnerships.....	25
4.35 Fundraising.....	25
4.4 Factors Potentially Limiting Upland Sandpiper Management and Recovery Efforts.....	26

GRASSHOPPER SPARROW

1. Background	
1.1 Introduction.....	27
1.2 Distribution in Vermont.....	27
2. Monitoring and Management.....	27
3. Threats.....	28
4. Strategies and Recommendations for the Management and Recovery of Grasshopper Sparrows in Vermont.....	28
4.1 Recommended Management and Recovery Plan Goal and Objectives.....	28
4.2 Justification of Recommended Management and Recovery Plan Goal Objectives.....	29
4.3 Recommended Management and Recovery Actions.....	29
4.31 Priority Actions.....	29
4.32 Research and Management.....	29
4.33 Education and Outreach.....	31
4.34 Partnerships.....	31
4.35 Fundraising.....	32
4.4 Factors Potentially Limiting Grasshopper Sparrow Management and Recovery Efforts.....	32

SEDGE WREN

1. Background	
1.1 Introduction.....	33
1.2 Distribution in Vermont.....	33
2. Monitoring and Management.....	33
3. Threats.....	33
4. Strategies and Recommendations for the Management and Recovery of Sedge Wren in Vermont.....	34
4.1 Recommended Management and Recovery Plan Goal and Objectives.....	34

4.2	Justification of Recovery Plan Goal and Objectives.....	34
4.3	Recommended Management and Recovery Actions.....	35
4.31	Priority Actions.....	35
4.32	Research and Management.....	35
4.33	Education and Outreach.....	36
4.34	Partnerships.....	36
4.35	Fundraising.....	36
4.4	Factors Potentially Limiting Sedge Wren Management and Recovery Efforts.....	36

HENSLOW’S SPARROW

1.	Background.....	
1.1	Introduction.....	38
1.2	Distribution in Vermont.....	38
2.	Monitoring and Management.....	38
3.	Threats.....	39
4.	Strategies and Recommendations for the Recovery of Grasshopper Sparrows in Vermont.....	39
4.1	Recommended Management and Recovery Plan Goal and Objectives.....	39
4.2	Justification of Recommended Recovery Plan Goal and Objectives.....	39
4.3	Recommended Management and Recovery Actions.....	39
4.31	Priority Actions.....	39
4.32	Research and Management.....	40
4.33	Education and Outreach.....	40
4.34	Partnerships.....	40
4.35	Fundraising.....	40
4.4	Factors Potentially Limiting Grasshopper Sparrow Management and Recovery Efforts.....	40

LITERATURE CITED.....	41
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TABLES.....	44
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APPENDIX 1.....	50
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1. EXECUTIVE SUMMARY

The primary purpose of the Vermont Grassland Bird Management and Recovery Plan is to address the management requirements needed for the recovery of four grassland species that are currently listed on the Vermont Endangered and Threatened Species List. Three of these species, Henslow's Sparrow (*Ammodramus henslowii*), Sedge Wren, (*Cistothorus platensis*) and Upland Sandpiper (*Bartramia longicuda*) are listed as endangered and the fourth species, Grasshopper Sparrow (*Ammodramus savannarum*), is listed as threatened.

A secondary purpose of this plan is to focus attention on a number of other grassland dependent species that are declining, in many cases, due to the same factors that are negatively impacting the species mentioned above. These species include Vesper Sparrow* (*Pooecetes gramineus*), Savannah Sparrow (*Passerculus sandwichensis*), Bobolink* (*Dolichonyx oryzivourus*), Eastern Meadowlark* (*Sturnella magna*), Horned Lark (*Eremophila alpestris*), Northern Harrier* (*Circus cyaneus*), American Kestrel* (*Falco sparverius*) and Short-eared Owl (*Asio flammeus*).

This document is comprised of 5 major components. The first focuses on a management plan for the entire suite of grassland species mentioned above. The remaining components are dedicated to recommended management and recovery goals and actions for each of the endangered and threatened species. This differs from other plans that focus solely on single species recovery efforts. The document is designed to allow it to be considered as a whole or in its component parts. As such, justifications and actions which cover the breadth of the suite of species are found in both the larger management plan and individual species management plans.

Detailed life history descriptions for the suite of species can be found in a number of publications (Appendix 1) and will not be discussed in this document; however, life history information for the 4 endangered and threatened species will be discussed in greater detail in the recovery plan components.

Vermont supports extensive acreage of grasslands, the majority (146,000 ha) occurring in the Champlain Valley biophysical region, all with varying degrees of agricultural management, forest encroachment and development pressure. This, coupled with the different habitat requirements of individual grassland bird species, makes the identification of specific areas within which to concentrate conservation efforts critical to the success this plan. As a result, an underlying management theme in this document is the development of focal areas. This concept is based in part on the delineation of avian focus areas within Bird Conservation Regions for the North American Bird Conservation Initiative (NABCI).

Due to the diverse nature of Vermont's grasslands, focal areas will differ in size and shape depending on the species of birds they support, the composition of grasslands within them, current and future land use practices and the juxtaposition of these grasslands in the larger landscape. They may range in size from a cluster of fields that support a pair or several

* *Vermont Species of Special Concern*

pairs of an endangered or threatened species to hundreds of acres that support a number grassland bird species. Each should ideally be composed of core habitat that has some form of protection and can be managed to protect or promote grassland bird species, surrounded by buffer habitat to accommodate a range of shifting ownership and land use changes. Focal areas should have significance to population stability, long-term land use potential and feasibility of implementing management techniques to maintain appropriate habitat structure. By focusing conservation efforts on specific areas rather than all of the grassland habitat found in Vermont we hope to achieve the greatest conservation outcome for this suite of species.

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2. BACKGROUND

2.1 The Problem

The common denominator for this suite of species is their dependence on grassland habitat for significant portions of their life cycles, in particular reproduction. The grassland habitat types and structure required vary among species, but in general, represent ecosystems in which grasses, sedges and forbs dominate, with little encroachment by woody plants.

Grassland birds migrate each spring from their wintering grounds in the southern U.S. and Central and South America to their breeding grounds in Vermont. These breeding grounds are almost exclusively agricultural fields or other human-altered grassland habitats. However each year there are fewer of these habitats available to them. Grasslands to which they once returned have become overgrown with woody vegetation, converted to row crops such as corn and legumes or developed into housing.

Grassland birds returning from their wintering grounds each spring establish territories, build nests and begin incubation. Unfortunately a significant proportion of these birds are never able to complete the nesting cycle. The cycle is often disrupted by management practices such as early mowing for hay or intensive livestock grazing (Perlut et al. 2006). Birds choosing non-agricultural areas such as airports often meet the same fate as these grasslands are often mowed albeit for different purposes (e.g. Federal Aviation Administration regulations) Although these birds may attempt to re-nest the recent intensification of mowing practices (fields mowed earlier and more frequently during the summer) often prohibits successful reproduction. Certainly some birds manage to fledge young (Perlut et al. 2006), but a substantial proportion will fail to successfully reproduce.

As a result there has been an overall population decline for most grassland bird species in addition to the loss of grassland habitat.

2.2 Population Trends

Grassland birds, including the suite of species covered in this recovery plan, have declined steadily throughout their range (Table 1). Results from the U.S. Fish and Wildlife Service Breeding Bird Survey show that declines of grassland birds have been consistently steeper and more widespread than any other assemblage of birds (Askins 1993, Sauer et al. 2011). In Vermont, most grassland bird species occupy fewer blocks in the second compared to the first Breeding Bird Atlas (Renfrew 2013). For example Upland Sandpipers appeared in 85 percent fewer blocks in the second breeding bird atlas and Grasshopper Sparrows and Sedge Wrens remained rare (Renfrew 2013, Laughlin and Kibbe 1985, Record of Vermont Birds). Henslow's Sparrow populations have declined to where they may no longer breed in the state. Other obligate grassland species (i.e., Bobolink and Eastern Meadowlark), although relatively more abundant, have also shown significant declines in recent years (Table 1).

These declines are attributed to the loss and modification of grassland habitat both from a long term (direct loss of habitat) and short-term perspective (i.e. mowing practices which negatively affect reproduction). Loss of grassland habitat has resulted from several factors including; historic conversion of native grasslands to agriculture, reforestation of farmland in the Northeast, agricultural intensification and conversion of farmland to suburban and urban development (Askins 1999, NASS 1999, Norment 2002 and Troy et al. 2005). The influence of these factors on Vermont's grassland bird populations will be discussed in greater depth later in this plan.

2.3 Justification of Management Plan

Although native grasslands in the Northeast were historically limited in size and scope when compared to the grasslands of the Midwest, the large-scale land clearing that occurred during the past century created extensive grassland habitat throughout the region. As more grassland habitat was created, the number and abundance of grassland bird species in the region increased. As native grasslands diminished in the Midwest due to intensive agriculture [more than 99% of native tallgrass prairies of the Midwest have been lost (Whitney, 1994)], the importance of the northeastern grasslands to grassland bird species rose significantly (Bollinger 1991, Noss et al. 1995, Askins 1997). It has also been suggested that the highly productive grasslands of the Northeast may contribute to a higher breeding density of grassland birds compared to the Midwest (Bollinger 1995). As grassland bird populations continue to decline, the importance of grasslands in the Northeast remains today and is reflected in the Partners In Flight (PIF) and North American Bird Conservation Initiative (NABCI) priority species lists for several of the northeastern PIF Physiographic Areas and NABCI Bird Conservation Regions (BCR). This includes BCR 13, which encompasses the Champlain Valley. All of the focus species in this plan are listed as priority species for BCR 13. The Nature Conservancy has also

designated conservation efforts for grassland bird species in several of their conservation matrix blocks in the Champlain Valley (R. Paul pers. comm.).

The decline of grassland bird populations and the loss of available grassland habitat has led the Vermont Fish and Wildlife Department and its partners to work together to try to ensure the availability of this habitat for breeding grassland birds. This is especially important to the four birds now listed as endangered or threatened. Grassland bird species have been prioritized as part of the Vermont Comprehensive Wildlife Action Plan [www.vtfishandwildlife.com/swg_cwcs_report.cfm] and work is being conducted to map and delineate areas within the state that are especially important to grassland bird species.

2.4 Historic and Current Grassland Habitats in Vermont

Grasslands have been part of the natural landscapes of the Northeast since pre-colonial times. Helinski (2001) estimated that more than 9% of the Northeast was in grassland before European settlement. Most grasslands were situated along coastal plains, seasonally flooded areas adjacent to large rivers, beaver meadows, and naturally occurring sandplain ecosystems. Other grasslands resulted from natural and Native American-induced fire events that maintained grassland habitat.

Beaver flowages and fire associated grasslands probably made up the bulk of grasslands in Vermont although there are little data to support this. One can only speculate as to the number and size of different grassland types and as a result, the number of grassland species and their abundance in Vermont during pre-colonial times. However, the land-clearing and subsequent small-scale agricultural practices that occurred in Vermont during the 19th century created an abundance of grasslands of varying types and sizes. Even throughout the later part of the 19th century and the beginning of the 20th century, when agricultural land was abandoned and reforestation was in progress, Vermont's landscape was a patchwork of large and small grassland and early successional habitats. These habitats possibly supported an array of grassland bird species.

Today, most of Vermont's grassland habitats occur in the Champlain Valley and to a lesser extent the Connecticut River Valley and around Lake Memphremagog. There are also numerous grasslands of various types and sizes scattered across the rest of the state. Most grasslands are associated with current or past agricultural practices. There are, however, grasslands that are the result of other human activities and are maintained for specific purposes. These include grasslands associated with airports (commercial and private), landfills, fairgrounds, and industrial complexes (e.g., IBM, Husky, etc.). Most of Vermont's grasslands are in private ownership, although the state and federal governments own and manage some of these lands.

Grassland habitats in Vermont currently range in size and structure, and their use by specific grassland species is directly dependent on these attributes. In general they are composed of grasses, sedges and forbs with minimal intrusion by woody plants. They can be mesic or xeric depending on soil structure and topography and often include a combination of vegetation and open ground. Vegetation can include native and non-native

species such as warm season grasses, introduced cold season grasses, various species of forbs or combinations of the above. Table 2 shows vegetation types and area requirements for different grassland bird species.

3. THREATS AND LIMITING FACTORS

3.1 Habitat Loss and Decreased Habitat Quality

Direct loss of grassland habitat and decreased habitat quality are the primary threat to grassland birds. Habitat loss and degradation have resulted from past agricultural practices, changes in current agriculture practices, and urban and suburban development.

Conversion of Great Plains tallgrass prairie to agricultural grain fields during the past century coupled with forest expansion has resulted in native grasslands being considered by many to be North America's most endangered ecosystem (Vickery et al. 1995). Less than 1% of the tallgrass prairie present prior to European settlement remains today (Noss et al. 1995).

Large-scale forest clearing in the Northeast allowed grassland species to expand into areas not previously available to them (Hurley and Franks 1976). However, reforestation of agricultural lands, conversion to other uses and intensification of agricultural practices over the past century has reduced grassland availability, use and quality in the Northeast. These recent changes in land use and agriculture have directly impacted grassland bird populations (Andrle and Carroll 1998, Askins 1997, Vickery and Dunwiddie 1997).

In Vermont roughly 70% of the state was cleared during the latter half of the 19th century (Johnson 1980), currently approximately 74% of the state is forested, 15% in agriculture and 5% is developed (USDA 2009). The reforestation of Vermont, as is the case with other northeastern states, has led to the loss of a large portion of the breeding habitat available to grassland bird species. It has also fragmented and isolated grasslands, conditions which negatively affect grassland bird species (Vickery et al. 1994). Today, most of the grasslands are restricted to a much smaller portion of the state, usually areas with high concentrations of land in agricultural use. Statewide, agriculture accounts for 15% of the land cover (USDA 2009). The counties with the highest percentages of land in agriculture are Addison (35.5%), Franklin (29.5%), Grand Isle (25%) and Orleans (22%, primarily in the area surrounding Lake Memphremagog (Vermont Department of Agriculture 1998).

Although agriculture practices create and maintain valuable grassland habitat, recent intensification of these practices has had negative impacts on their quality and availability. Small diversified farming which provided a range of suitable habitat types has given way to larger, more intensively managed farms as a result of improved agricultural techniques. Advances in equipment, fertilizers and extensive use of potent pesticides and herbicides have resulted in greater management of hayfields (early and frequent cutting which disrupts nesting activity), conversion of hayfields to row crops or legumes, and intensive grazing (Bollinger 1991, Corwin 1992, Swanson 1996). Based on a 2002 survey of Vermont dairy farmers, 54% of farmers were cutting hay earlier than they did 10 years

earlier and 47% of farmers were cutting hay more frequently than 10 years earlier (Troy et al. 2005).

In 2002, researchers at the University of Vermont began long-term studies of grassland birds to address the effect of management intensification on their population. Savannah Sparrows and Bobolinks were color-banded and nests were monitored at a variety of sites in the Champlain Valley. Their research found that agricultural management activities had significant effects on birth rates (Perlut et al. 2006) and survival rates (Perlut et al. 2008a) with a consistent, management-based gradient in habitat quality. At the low end were early hayed fields (cut prior to 11 June and again in early- to mid-July) and rotationally grazed pastures (21-30 days between grazing events). Middle-hayed fields (cut once between 21 June and 10 July) provided intermediate levels of habitat quality and late-hayed fields (cut after 1 August) provided the best habitat for grassland birds.

Urban and suburban development has also resulted in a loss of habitat. This loss comes in two forms, the direct loss of habitat as structures and lawns replace fields, and fragmentation of large grassland areas into smaller parcels. Grassland birds are often area-sensitive (e.g. Upland Sandpiper) meaning that the size of a grassland and its juxtaposition within the surrounding landscape are important to these birds when choosing breeding locations. As larger contiguous grasslands are fragmented, their ability to support area-sensitive species diminishes. In Vermont, the area of developed land increased by 60 percent from 1982 to 2003 (VDFPR 2010). The urban and suburban growth of Chittenden County is expanding into Franklin and Grand Isle counties to the north and Addison County to the south. As a result there is increasing fragmentation of agricultural lands important to grassland species. This fragmentation can have effects on settlement patterns of grassland birds. At the level of the individual field, both Savannah Sparrows and Bobolinks avoided nesting within 50 m of a grassland edges in Vermont (Keyel et al. in press, Perkins et al. in review). At the scale of the Champlain Valley, Savannah Sparrows and Bobolinks, used landscape-level features to make habitat selection decisions. For Bobolinks, the “openness” (no trees, no development) of the surrounding 2,500 m was an important factor in settlement. Savannah Sparrows were more likely to settle in landscape in which 500 m surrounding the fields was open (Shustack et al. 2010).

Other factors contributing to loss of habitat quality include incompatible management of grasslands in non-agricultural settings such as airports. Although airport construction and management has provided suitable habitat for grassland species, mowing regimes, many of which are required by the Federal Aviation Administration (FAA) often disturb nesting activity. Also, a lack of airport expansion planning (new hangers, airplane parking, etc.) which takes into account grassland bird species has led to the loss of important grassland habitat at these sites.

3.2 Other Limiting Factors

Other potential limiting factors include habitat loss on the wintering grounds, agricultural pesticides, and the pet trade industry. Although much less is known about the wintering ecology of grassland species, land use changes may alter wintering habits (Osborne and

Peterson 1984) and reduce survivorship. Pesticides and herbicides applied to agricultural fields may also affect survivorship and the proper development of young.

4. MONITORING AND MANAGEMENT

4.1 Monitoring

There are a number of past and ongoing projects that have attempted to provide information about the status of grassland bird breeding populations. The U.S. Fish and Wildlife Service's Breeding Bird Survey has collected information on grassland species since 1966. This information has shown declines in a number of grassland species in the Northeast (Sauer et. al. 2011).

In 1997-1999 the Center for Biological Conservation at the Massachusetts Audubon Society coordinated a regional grassland bird survey focusing on eight grassland species. Of the 1,118 sites surveyed throughout the Northeast (including New York), 109 sites were located in Vermont. Six of the 8 species were documented in Vermont in various concentrations and locations. These included Bobolink, Eastern Meadowlark, Savannah Sparrow, Grasshopper Sparrow, Vesper Sparrow and Upland Sandpiper.

In Vermont, grassland bird monitoring efforts include the Vermont Breeding Bird Atlas (1976-1981 and 2003-2007), annual surveys for Upland Sandpipers, grassland bird surveys at state airports, dedicated surveys for Grasshopper Sparrows and Sedge Wren, grassland surveys at Missisquoi National Wildlife Refuge and Camp Johnson, and research conducted by the University of Vermont (UVM). Details and results of these surveys can be found in Table 3.

Although these projects provide valuable data, they are limited in many respects. First, data needed to determine abundance trends are lacking for Vermont. Second, not all grassland habitats are surveyed, providing an incomplete and inadequate picture of status and distribution. Lastly, only the work being done by UVM is attempting to determine demographic (survivorship and productivity) information about these species in relation to agricultural management practices. These researchers used demographic data collected in the Champlain Valley, surveys of management activities on fields, and point count data on habitat preferences to develop a population model for both Bobolinks and Savannah Sparrows. Using this model, researchers determined that both species were most sensitive to low productivity and survival on early-hayed fields, despite the fact that early-hayed fields comprise only 18% of grasslands (Perlut et al. 2008b).

4.2 Management Techniques and Considerations

The vast majority of grasslands in the Northeast are early successional habitats that require periodic disturbance to prevent woody re-growth. There are a number of techniques used to create and maintain grassland habitat. These include mowing, grazing, tilling and burning. Mitchell et al. (2000) described the benefits of these practices for different grassland bird species and provides recommendations for grassland habitat maintenance in the Northeast.

Grassland bird management is also spatial in nature, meaning that managing for large areas or complexes of grasslands is better than managing for numerous smaller distinct and separate parcels even though the total acreage may be the same (Sample and Mossman 1997). Larger areas or complexes also have the benefit of providing enough area for species that have large area requirements as well as those that do not. Not only is size important but so is shape, thus “blocks” of grasslands serve grassland birds much better than linear strips (Sample and Mossman 1997).

In Vermont, the viability of grassland bird populations and availability of grassland habitats are inexorably tied to agriculture. As a result, a direct working relationship with the agricultural community is required if grasslands are to be effectively managed for grassland species. Management efforts focusing on larger areas of grasslands will have to take into account multiple landowners, municipalities, government agencies and non-governmental organizations (e.g., land trusts), varying management and agricultural activities, and current and future pressures on agriculture as a whole. A key component of any statewide management plan will be educating private landowners about grassland birds and the technical assistance and incentive programs available to them (e.g., Wildlife Habitat Incentive Program and Grassland Reserve Program).

In addition to agricultural grasslands, other anthropogenic grasslands provide key habitat for grassland birds in Vermont, including two species on the Vermont Endangered and Threatened Species list. In particular, these include the state airports and lands owned and managed by the federal government at Camp Johnson. Significant populations of Grasshopper Sparrow occur at Camp Johnson and two state airports. Upland Sandpipers have also been documented at three airports (Allen 1999). Efforts and agreements to manage areas not under government and FAA regulations, primarily through delayed mowing regimes, have successfully maintained viable populations at these sites. In 2003, however, the Vermont Department of Transportation, the state agency managing state airports, terminated its management agreement with Audubon Vermont highlighting the fragile nature of these agreements and the need for long-term management plans including commitments to adhere to these plans.

Another important consideration is that grassland bird management activities may directly contradict other statewide conservation efforts that work to protect the ecological integrity of important habitats and natural communities. These efforts often have conservation outcomes that differ substantially from those of grassland bird management. For example, efforts are currently underway to restore Clayplain Forest in the Champlain Valley. This rare natural community type occurs (or could potentially occur) in some of the same areas that are priority habitats for grassland bird conservation. Effort will need to be taken to work within the larger statewide conservation framework to ensure the success of all conservation projects within any given area.

4.3 Current Management Efforts in Vermont

There is a need for more focused and coordinated management activity to enhance grasslands for birds in Vermont. This is a challenge due in part to the complex nature of managing grasslands, the vast majority of which are in private ownership and are being managed for other purposes (e.g., agriculture). Current management activities include delayed mowing of some hayfields on federal and state owned land, cooperative efforts to maintain grasslands known to be used by breeding grassland birds (Camp Johnson), delayed mowing at some state airports by Vermont Agency of Transportation (VTrans) and numerous private landowners who have enrolled in federally-funded projects designed to maintain grasslands.

Researchers at UVM have explored management practices designed to give farmers alternatives to simply delaying harvest until the end of the nesting season. Delayed second cuts in which a first cut prior to 1 June is followed by a 65 day delay in cutting showed similar fledging rates to fields cut after the nesting season (Perlut et al. 2011a). In rotationally grazed pastures in which paddocks are grazed early in the nesting season (June), resting paddocks for 42–50 days after grazing can increase nesting success (Perlut et al. 2011b). Waiting to harvest or graze fields until after the nesting season will have limited appeal to dairy farmers. Although these management practices may be more appealing, additional financial incentives (e.g., Farm Bill programs) may be necessary prior to adoption.

Efforts are underway to identify specific areas within the Champlain Valley that are important to grassland birds. The Vermont Important Bird Areas (IBA) Program has designated several sites as IBAs, due in part to the presence of grassland bird populations, and is assisting in conservation efforts at these sites. These include Dead Creek Wildlife Management Area, Missisquoi National Wildlife Refuge, and Franklin County Airport.

Larger landscape level delineation to develop focal areas is also underway. The Vermont Department of Fish and Wildlife and Audubon Vermont have worked on delineation of focal areas for NABCI. In addition a cooperative effort between Audubon Vermont and UVM has developed a geographic information system (GIS) model for identifying priority grassland habitat for the Vermont IBA Program (Puryear 2004, Sutti 2009).

5. STRATEGIES AND RECOMMENDATIONS FOR THE MANAGEMENT OF ALL GRASSLAND BIRDS IN VERMONT.

5.1 Management and Recovery Plan Primary Goal

The primary goal of this management plan is to maintain and enhance populations of grassland birds in Vermont while considering the ecological integrity of other important habitats and natural communities.

5.2 Management and Recovery Plan Secondary Goals

The 2 secondary goals for this plan are:

- Goal 1. Promote recovery of grassland species listed on the Vermont Endangered and Threatened Species list (see individual species sections).
- Goal 2. Maintain and enhance grassland habitats to perpetuate viable breeding populations of grassland birds in Vermont with the goal of keeping additional grassland bird species off the Vermont Endangered and Threatened Species list.

5.3 Justification of Management Plan Goal and Objectives

The management plan goal and objectives are based on 2 factors:

- 1) During the past century Vermont has supported the entire suite of grassland bird species mentioned in this document. Although some of these species may not have been present prior to European contact, they colonized Vermont during the period of land alteration that occurred in Vermont in the 1800 and 1900's. Most of these species are currently declining throughout their range. As a result, Vermont has an opportunity to work to conserve grasslands within the state to maintain and enhance viable populations of grassland bird species, thus contributing to the population stability of this suite of species across North America. The goals and objectives of this management and recovery plan are also part of large-scale bird conservation efforts that are being developed throughout North America in cooperation with NABCI and PIF. These efforts look to prioritize species, habitat types, and specific regions where bird conservation can be most effectively achieved. In addition these grassland species are also listed in the Vermont Wildlife Action Plan as Species of Greatest Conservation Need.
- 2) The four endangered and threatened species covered in this document currently do not have state recovery plans that outline recovery objectives and actions. Without plans in place, conservation efforts will remain unfocused. As part of this overarching grassland bird plan, specific recovery sections for listed species are included. These sections fit within the framework of the larger grassland bird management plan.

5.4 Recommended Management Actions

These recommended actions focus on the entire suite of grassland bird species. Specific recommendations and strategies for the recovery of the 4 endangered and threatened species can be found in the attached management plans for each species.

5.41 Priority Actions

1. Delineate focal areas within which to concentrate conservation efforts such as monitoring, management, land acquisition and research.
2. Determine appropriate management practices for Vermont and focal areas that will provide the greatest benefit to the suite of grassland bird species with an emphasis on endangered, threatened and priority species.
3. Develop education and outreach program to provide information about grassland bird species and management options to enhance their populations in Vermont.
4. Develop partnerships between government agencies, non-governmental organizations, landowners and private individuals so that recovery goals can be achieved.

5.42 Research and Management

1. Locate and monitor grassland bird populations in Vermont.
 - 1.1 Continue to monitor known populations of endangered, threatened and priority grassland bird species in Vermont.
 - 1.11 Continue to monitor Vermont's airports for grassland birds using protocols developed in the Vermont Airport Bird Survey Program.
 - 1.12 Monitor other known locations of grassland birds (e.g., Camp Johnson, Dead Creek Wildlife Management Area)
 - 1.2 Develop monitoring efforts to locate new populations of grassland birds.
 - 1.21 Work cooperatively with other avian monitoring projects (e.g., Vermont Important Bird Areas Program, Vermont Breeding Bird Atlas) to collect status and distribution information on grassland birds.
 - 1.22 Work with the birding community through such connections as VTBird Listserv and eBird to annually locate grassland birds, especially endangered, threatened and priority species, throughout Vermont.

2. Locate, assess and monitor grassland habitat in Vermont.
 - 2.1 Locate and map all grassland habitat in Vermont.
 - 2.11 Use geographic information system (GIS) technologies locate and map grassland habitats (Completed for Champlain Valley).
 - 2.12 Ground truth GIS maps to determine grassland habitat type (i.e. hayfield, pasture, etc.) and presence of grassland bird species.
 - 2.13 Identify areas within the state with the largest matrix of grassland habitat for inclusion in focal areas.
 - 2.2 Assess the quality of grassland habitats for grassland birds.
 - 2.21 Determine the habitat requirements for grassland bird species in Vermont. In particular evaluate minimum patch size, landscape attributes, and vegetation structure.
 - 2.22 Identify areas of high quality grassland habitat in Vermont.
 - 2.23 Determine current use of grassland habitats (e.g., agriculture, fallow field, etc.).
 - 2.3 Monitor use patterns and changes in Vermont's grasslands.
 - 2.31 Compile current information on agricultural practices on Vermont's grasslands.
 - 2.32 Compile current information on the impacts of development on the loss and fragmentation of grasslands.
 - 2.33 Monitor changes in use patterns of Vermont grasslands by both birds and humans.
3. Manage grasslands to provide available high quality habitat for grassland birds in Vermont.
 - 3.1 Continue current grassland management activities that benefit grassland birds.
 - 3.11 Continue working with VTrans to use appropriate mowing protocols at the state airports and develop wildlife conservation plans that include grassland birds.
 - 3.12 Continue to work with Vermont National Guard staff at Camp Johnson to

manage grassland habitat to benefit grassland birds.

- 3.13 Maintain and manage quality grassland habitat on state and federal lands (wildlife management areas, state parks, National Wildlife Refuges) to benefit grassland birds.
- 3.2 Use current population and habitat data to determine focus areas for future management activities and develop management guidelines and recommendations for these areas taking into consideration the integrity of other important habitats and natural communities.
 - 3.21 Determine and delineate where management activities are most needed and will be most effective.
 - 3.22 Map and assess current grassland management projects throughout the state.
 - 3.23 Prioritize current and future management needs and implement management actions.
- 3.3 Conduct intensive research to better understand the demographics of grassland bird populations in Vermont.
 - 3.31 Support current efforts and develop new efforts to study distribution, productivity, and survivorship of grassland bird species in Vermont.
 - 3.32 Support studies that lead to a better understanding of the habitat requirements of grassland birds in Vermont.
 - 3.33 Research the effect of land use patterns to determine future conservation needs.

5.43 Education and Outreach

1. Educate the public, especially the agricultural community, about grassland bird conservation by developing a comprehensive outreach campaign.
 - 1.1 Create a resource document that can be distributed to public and private landowners that educates them about grassland bird conservation. The document would include management strategies as well as references to the various incentives program available to them.
 - 1.2 Work with the Natural Resources Conservation Service and the U.S. Fish and Wildlife Service to increase participation in habitat improvement programs such as Environmental Quality Incentives Program (EQIP), Landowner Incentives Program (LIP), and Grasslands Reserve Program (GRP).

- 1.3 Develop demonstration sites that use appropriate management protocols to demonstrate the benefits of management activities to individuals, municipalities and the agricultural community.
- 1.4 Work one on one with individual landowners in focal areas to effectively manage grasslands.
- 1.5 Work with public and private landowners to create a matrix of grassland habitats within the focal areas.
- 1.6 Provide expertise for farm program legislation that provide landowners financial incentives to manage land in ways that benefit grassland birds.

5.44 Partnerships

1. Develop partnerships with public and private organizations to promote grassland bird conservation and grassland habitat protection.
 - 1.1 Create a Vermont Grassland Bird Working Group to enhance partnerships and implement management and recovery strategies.
 - 1.2 Develop and expand partnerships with public and private landowners and the organizations and agencies that represent them to aid in the distribution of information and coordination of grassland management activities. Partners could include agricultural agencies, VTrans, Partners in Wildlife, Wildlife Services, U.S. Fish and Wildlife Service, the Vermont Land Trust, other local land trusts and private landowners.
 - 1.3 Develop partnerships within NABCI and other international groups in order to integrate management activities in Vermont into larger landscape level grassland bird conservation efforts.

5.45 Fundraising

1. Develop a comprehensive approach to funding grassland bird conservation efforts in Vermont.
 - 1.1 Work with state agencies to obtain funds for grassland bird conservation.
 - 1.12 Develop proposals to obtain funds through the Nongame Wildlife Fund and State Wildlife Grants Program.
 - 1.23 Work with the Vermont Agency of Agriculture, Food and Markets to look into funding options for grassland bird conservation efforts including ways to effectively distribute management information

- 1.2 Work with federal agencies to obtain funds for grassland bird conservation.
 - 1.21 Work with the Natural Resource Conservation Service to secure funding for grassland bird management through USDA Farm Bill programs (e.g.EQIP)
 - 1.22 Research other federal funding that might be available.
- 1.3 Work with local municipalities, conservation commissions, NGO's, land trusts and private individuals to secure funds for grassland bird conservation efforts.

5.5 Factors potentially limiting management and recovery efforts

There are several factors that may potentially limit management and recovery efforts. Recent trends in agricultural practices plus economic pressures currently facing farmers in Vermont, make even the simplest of the management activities (delayed mowing) difficult to implement. These same economic pressures have also lead to the loss of grassland habitat to development as farmers are forced to sell of all or portions of their land. Also, the complex nature of grassland birds including individual species-specific habitat requirements may complicate recovery efforts for the entire suite of species.

One other potential limiting factor is the current debate on management for species that require human-altered habitats. Much of the grassland areas in Vermont occur on what was once Clayplain Forest. This natural community type is increasingly rare in the state due to agricultural and other human centered activities (e.g., development). Efforts to restore portions of the Clayplain Forest community may compete with grassland management efforts. As a result any grassland bird conservation efforts will need to take into consideration the larger landscape level picture which includes other important habitat types and natural communities.

Upland Sandpiper (*Bartramia longicauda*)

1. Background

1.1 Introduction

Upland Sandpipers are large shorebirds in the family Scolopacidae that utilize upland habitats. The breeding range of the species extends from Alaska, through the Canadian prairie provinces and across the northern tier of the United States. Upland Sandpipers are long distance migrants and winter on the Argentinean pampas. A detailed physical description and current range of the species can be found in Houston et al. (2011). Widely abundant in the Northeast during the land-clearing period of the mid-1800's, this species steadily declined during the 1900's (Carter 1992) and currently breeds in limited numbers throughout its former range. As of 2000, the species was listed as endangered or threatened in 11 states in the Northeast. Currently listed as endangered in Vermont.

Upland Sandpipers prefer extensive open grassland for breeding (Carter 1992), but have also been reported breeding in blueberry barrens (Table 2). Upland Sandpipers require a mosaic of grassland habitat types for breeding. Areas of short grass are used for feeding and brood rearing while areas of taller grass (4-12 inches) are used for nesting. Upland Sandpipers arrive in Vermont in late April. Nesting occurs in May and early June with chicks present by late June and early July. Both parents incubate a clutch of about 4 eggs. Usually rearing only one brood, this species begins migrating in August.

1.2 Distribution in Vermont

In Vermont, Upland Sandpipers are thought to have been more widely distributed across the state during the 1800's when most of the state was cleared. The Champlain Valley and the area around Lake Memphremagog probably supported the highest concentrations of this species. Upland Sandpipers were likely a common breeder and viable populations of this species are thought to have existed in these areas, although numbers may have been kept low due to hunting pressure (Laughlin and Kibbe 1985). By the end of the 1900's, Upland Sandpipers occurred primarily in the Champlain Valley.

2. Monitoring and Management

Prior to 1989, no systematic survey had been conducted on the abundance of Upland Sandpiper in Vermont, although distribution of the species was documented during the first Vermont Breeding Bird Atlas Project. Concerns over the apparent decline of Upland Sandpipers in Vermont prompted dedicated surveys for this species in 1989-1992 (Peterson 1999). Increases in adult numbers and the number of nesting sites during this period were documented; however, these increases were attributed to refinement of survey techniques as opposed to actual population increases. Highest counts during this period were 126 individuals located at 47 sites with a suspected stable population of 80-100 pairs (Peterson 1993). Another set of surveys was conducted in 1998 and 1999. The 1998 survey showed a 60% decline in numbers (50 individuals at 22 sites). The 1999 survey showed a

decline of 78% in 1999 with only 28 individuals at 15 sites. Subsequent, but more limited, surveys in 2000-2002 showed findings similar to 1999 (Peterson pers. comm.). The second Vermont Breeding Bird Atlas showed an 85% decline in the number of blocks occupied by Upland Sandpiper. The limited Vermont population showed a change in location: Upland Sandpiper was confirmed in only 2 Champlain Valley blocks, whereas the majority of documented breeding occurred in Franklin and Grand Isle counties. Breeding was also reported at two locations in Washington County, including the Knapp Airport in Berlin (Renfrew 2013). Further evidence of the scarcity of this species was collected in 2004–5: in 774 point counts in 199 hayfields and 18 pastures encompassing 1325 hectares (3273 acres) throughout Chittenden, Franklin, and Addison counties, only two Upland Sandpipers were found (Perlut et al. 2008b). A social attraction system using Upland Sandpiper decoys and sound were deployed in 2010-2012, but did not attract any birds (A. Strong pers. com).

To date there have been limited management efforts to protect Upland Sandpipers. Delayed mowing management practices were implemented with some success at the state airports in Berlin (Knapp Airport) and in Highgate (Franklin Co. Airport). The US Department of Agriculture's Wildlife Habitat Incentives Program and Environmental Quality Incentives Program, have financially supported delayed mowing at various places across the state but has not done so in a systematic fashion that would benefit Upland Sandpipers.

3. Threats

Current threats to Upland Sandpiper populations center primarily around loss and degradation of breeding habitat. Intensification of agricultural management practices and conversion of extensive grasslands to row crops pose the greatest threats. Development of agricultural lands for housing and industry, and changes in agricultural practices on wintering grounds (Calme and Haddad 1996) also contribute to habitat loss.

Other threats include disturbance of nesting pairs and destruction of nests due to early season haying and mowing activities. This results in lowered reproductive success and reduces the viability of populations in areas where appropriate habitat continues to exist. Also, little is known about the effect of agricultural pesticides and herbicides on Upland Sandpipers.

4. Strategies and Recommendations for the Management and Recovery of Upland Sandpiper in Vermont

4.1 Recommended Management and Recovery Plan Goal and Objectives:

The primary goal of this management and recovery plan is to establish and maintain a self-sustaining population of Upland Sandpipers in Vermont.

Objective 1. A minimum five-year average of 125 adult Upland Sandpipers (or 40 breeding pairs) in Vermont. This would allow consideration of this species for downlisting from endangered to threatened on the Vermont Endangered and Threatened Species List.

Objective 2. A minimum five year average of 180 birds (or 75 breeding pairs) in at least two geographically separate locations. The relatively large grassland size requirements for this species make more than 2 locations less realistic compared to other grassland bird species in this plan. This would allow consideration of this species for delisting from Vermont Endangered and Threatened Species List.

4.2 Justification of Recommended Management and Recovery Plan Goal and Objectives:

The large-scale forest clearing during the 1800-1900's in the Northeast and the subsequent increase in farming resulted in the colonization of newly created grassland habitats by grassland bird species. As grasslands in the Midwest were and continue to be lost due primarily to intensification of farming practices, the grasslands of the Northeast have become increasingly important to continental grassland bird populations.

The recommended recovery plan objectives are based on the fact that Vermont has historically supported and currently supports Upland Sandpipers. It is assumed that this species was a common to uncommon breeder from the time of major land clearing in Vermont through the mid-1900's. Surveys conducted in the early 1990's suggested a population of 80-100 pairs. These numbers, however, are thought to be lower than population numbers in the 1800's and early 1900's.

A significant decline in sandpiper numbers in Vermont in the 1990's, during a time of increased agricultural intensification and development, suggest that these factors contributed both directly and indirectly to this decline. As a result, a return to slightly higher population sizes than those documented in the late 1980's and early 1990's, is deemed necessary for downlisting this species to state threatened status. Removal of this species from the Vermont Endangered and Threatened species list will require substantially higher numbers represented by at least two geographically separate populations. The need for two separate geographic populations is deemed necessary in order to prevent the possibility of a catastrophic event at a single geographic location that may result in extirpation of the species.

4.3 Recommended Management and Recovery Actions

4.31 Priority Actions

1. Accurately determine current population size and breeding locations of Upland Sandpipers in Vermont.

2. Determine areas of high grassland bird concentrations with potential for successful long-term management efforts and organize them into focal areas to coordinate future management efforts.
3. Develop management plans for focal areas, incorporating current and future management incentive programs, as well as landowner education.

4.32 Research and Management

1. Determine current population size and breeding locations of Upland Sandpipers in Vermont.
 - 1.1 Replicate intensive surveys similar to those conducted in 1991-1992 and compile Second Vermont Breeding Bird Atlas data to determine current Upland Sandpiper population size.
 - 1.2 Map, using GIS technologies, all current Upland Sandpiper locations.
 - 1.3 Collect information on habitat structure and land-use patterns at each location as well as for properties that surround each site.
2. Compile data on historic sites used by Upland Sandpipers with special attention given to sites used since 1980.
 - 2.1 Compile information collected during the first Vermont Breeding Bird Atlas, earlier Upland Sandpiper surveys and the Vermont Airport Survey Project.
 - 2.2 Compile information on sightings recorded in the Record of Vermont Birds.
 - 2.3 Organize and compile anecdotal sighting information from other sources such as the VTBird listserv.
3. Analyze current and historical information to determine focal areas for Upland Sandpiper in Vermont.
 - 3.1 Using current and historical information, determine primary nesting areas within Vermont.
 - 3.2 Using VT Department of Agriculture data and GIS technologies, determine potential Upland Sandpiper nesting habitat.
 - 3.3 Combine primary and potential nesting habitat information to delineate focal areas for Upland Sandpiper in Vermont.
4. Prioritize focal areas for conservation efforts and protection.

- 4.1 Determine relative significance of each focal area to overall population stability.
- 4.2 Prioritize focal areas using the following criteria; significance to population stability, long-term land use potential and feasibility of implementing management techniques to maintain appropriate habitat structure.
5. Develop strategies to manage and protect focal areas as well as other potential Upland Sandpiper habitat.
 - 5.1 Identify management requirements needed to maintain and/or enhance each focal area and determine appropriate management techniques.
 - 5.2 Ensure protection of focal areas via acquisition of conservation easements, management leases and fee title acquisition.
 - 5.3 Identify habitat that has potential for Upland Sandpiper use and pursue management options that would make the habitat suitable for sandpipers.
6. Regularly monitor population size of Upland Sandpipers in Vermont focusing on the focal areas.
 - 6.1 Determine regularity of monitoring efforts (i.e. annually vs. every other year).
 - 6.2 Determine appropriate population monitoring techniques.
 - 6.3 Annually map known locations of Upland Sandpiper sightings using GIS technologies.
 - 6.4 If possible, determine nesting success and number of young produced at known nesting locations.

4.33 Education and Outreach

1. Educate the public, especially the agricultural community, about Upland Sandpiper conservation by developing a comprehensive outreach campaign.
 - 1.1 Include Upland Sandpiper in a grassland bird resource document that can be distributed to public and private landowners that educates them about grassland bird conservation. The document would include management strategies as well as references to the various incentives program available to them.
 - 1.2 Work with the Natural Resources Conservation Service and the U.S. Fish and Wildlife Service to increase participation in habitat improvement programs such as Environmental Quality Incentives Program (EQIP) within the focal areas.

- 1.3 Develop demonstration sites within the focal areas that use appropriate management protocols to demonstrate the benefits of management activities to individuals, municipalities and the agricultural community.
- 1.4 Work one on one with individual landowners in focal areas to effectively manage and protect larger grasslands.
- 1.5 Work with public and private landowners to create a matrix of grassland habitats within the focal areas.

4.34 Partnerships

1. Develop partnerships with public and private organizations to promote Upland Sandpiper conservation and grassland habitat protection.
 - 1.1 Develop and expand partnerships with public and private landowners and the organizations and agencies that represent them to aid in the distribution of information and coordination of Upland Sandpiper management activities. Partners would include agricultural agencies, VTrans, Wildlife Services, U.S. Fish and Wildlife Service, land trusts and private landowners.
 - 1.2 Develop partnerships with national and international groups in order to integrate management activities in Vermont into larger landscape level grassland bird conservation efforts such as the Important Bird Areas Program, NABCI and PIF.

4.35 Fundraising

1. Develop a comprehensive approach to determine funding needs of Upland Sandpiper conservation efforts in Vermont.
 - 1.1 Work with state agencies to determine funding needs and obtain funds for Upland Sandpiper conservation.
 - 1.11 Develop proposals to obtain funds through the Nongame Wildlife Fund, State Wildlife Grants Program, and Pittman-Robertson. Ensure that Upland Sandpiper conservation is included in the Vermont Comprehensive Wildlife Conservation Strategy.
 - 1.23 Work with the Vermont Department of Agriculture to look into funding options for Upland Sandpiper conservation efforts including ways to effectively distribute management information.
 - 1.2 Work with federal agencies to obtain funds for Upland Sandpiper conservation.
 - 1.21 Work with the Natural Resource Conservation Service to secure funding for

Upland Sandpiper management through USDA Farm Bill programs (i.e.EQIP).

1.22 Research other federal funding that might be available.

4.4 Factors potentially limiting Upland Sandpiper management and recovery efforts.

There are several factors that may potentially limit management and recovery efforts. The current scarcity of Upland Sandpipers in Vermont makes reaching recovery goals extremely challenging. Recent trends in agricultural practices, plus economic pressures currently facing farmers in Vermont, make even the simplest of the management activities (delayed mowing) difficult to implement. Also, the complex nature of Upland Sandpiper habitat requirements, especially the need for large grasslands, may complicate recovery efforts. Potential conflicts might arise with management efforts to restore habitat for other priority species including those species dependent on shrubland and forest habitat types (i.e. Golden-winged Warbler (*Vermivora chrysoptera*) and American Woodcock (*Scolopax minor*)).

Another potential limiting factor is the current debate on management for species that require man-altered habitats. Much of the grassland areas in Vermont occur on what was once Clayplain and Sandplain forests. This natural community type is increasingly rare in the state due to agricultural and other human centered activities (e.g., development). Efforts to restore portions of the Clayplain Forest community may compete with Upland Sandpiper recovery efforts. As a result any Upland Sandpiper conservation efforts will need to take into consideration the larger landscape level picture which includes other important habitat types and natural communities.

Grasshopper Sparrow (*Ammodramus savannarum*)

1. Background

1.1 Introduction

Grasshopper Sparrows are small, secretive birds usually found in relatively sparse and patchy grassland with low vegetation height. Their breeding range extends from California, north to the southern edge of the Canadian pothole region and east from the southern U.S. to northern New England. They winter from the southern U.S. to northern South America. Detailed physical description and current range can be found in Sibley (2001) and the Birds of North America (1996). Once considered abundant in lower elevations in the Northeast (Jones and Vickery 1997) the species has declined due to habitat loss, primarily the result of reforestation of agricultural lands, agricultural intensification and urban development (Salzman and Smith 1998). Grasshopper Sparrows are currently listed as threatened in Vermont and are considered endangered in 4 other New England states.

Breeding habitat for Grasshopper sparrows includes lightly to moderately grazed pastures, reclaimed surface mines, coastal grassland barrens and airfields (Table 2). The presence of song perches seems to be another important habitat feature (Ellison 1986). In Vermont, Grasshopper Sparrows can be found at state airports, military facilities and agricultural lands. Grasshopper Sparrows arrive in Vermont in early May and are thought to begin their southward migration in September. Nesting occurs from May to August with the female incubating a clutch of about 4-5 eggs. Two broods are common.

1.2 Distribution in Vermont

With Vermont being on the northern periphery of their range, Grasshopper Sparrows were never considered abundant with reports suggesting they were limited to southern and western Vermont (Fortner et al. 1933). The first and second Vermont Breeding Bird Atlases documented individuals in the Champlain Valley (Laughlin and Kibbe 1986, Renfrew 2013). The first atlas also documented an individual along the Connecticut River, and the second atlas documented one in Windsor County. Currently the largest concentrations of Grasshopper Sparrows are found in the Champlain Valley at the Franklin County Airport in Highgate, at Camp Johnson in Colchester, and in the agricultural lands surrounding Dead Creek in Addison. They had been breeding at the Ethan Allen Firing Range, but were not found when playback tapes were used in 2013. Regular sightings of individuals have also been documented at other locations in the Champlain Valley and along the Connecticut River near Springfield (Hartness Airport).

2. Monitoring and Management

Surveys at Franklin County Airport and Camp Johnson have been conducted annually since 1998. These sites now harbor two of the more stable populations in the state. Data from these surveys show roughly 5-10 individuals at these sites in any given year. Four other state airports, Rutland, Knapp (Berlin), Hartness (Springfield) and Newport were

also surveyed annually between 1998 and 2004 with Grasshopper Sparrows being located regularly only at Hartness (1-4 individuals annually). BBS style surveys were also conducted in the mid 1990's in Addison County (J. Peterson, pers. comm.). Statewide occurrence data were collected during the first and second Vermont Breeding Bird Atlas Project in 1977-1981 and 2003-2007. Dedicated surveys conducted in 2002 focused on areas where Grasshopper Sparrows had been previously documented and at state airports. Grasshopper Sparrows were also surveyed in 2002 as part of an initial study of grassland birds conducted by UVM. Although this work did not focus on Grasshopper Sparrows, their presence or absence was documented for each of the more than 70 points surveyed in the Champlain Valley. Further illustrating this species' rarity, 774 point counts conducted in 199 hayfields and 18 pastures (totaling 1325 hectares [3273 acres]) throughout Chittenden, Franklin, and Addison counties from 2004 to 2005 yielded only 4 Grasshopper Sparrows (Perlut et al. 2008b). Surveys for Grasshopper Sparrows conducted at the Ethan Allan Firing Range in 2012 locate 3 singing males, but none were detected in 2013. This information shows that Franklin County Airport, Camp Johnson, Ethan Allen Firing Range and agricultural lands surrounding Dead Creek (Addison) are the only known locations supporting multiple individuals of this species in Vermont in some years.

Current management efforts include delayed mowing at Franklin County Airport and Camp Johnson, through verbal agreements between Audubon Vermont, the VTrans, the Vermont Department of Fish and Wildlife and the staff at Camp Johnson to limit disturbance at the known nesting location.

3. Threats

Current threats are similar to other grassland species (see Upland Sandpiper). In addition, planned construction at the Franklin Country Airport and lack of permanent protection of the site at Camp Johnson jeopardize the long-term viability of this species in Vermont.

4. Strategies and Recommendations for the Management and Recovery of Grasshopper Sparrows in Vermont

4.1 Recommended Management and Recovery Plan Goal and Objective: The primary goal of this management and recovery plan is to establish and maintain a breeding population of Grasshopper Sparrows at a minimum of 3 geographically distinct sites in Vermont.

Objective: The permanent protection and long-term management over 5 years of focal areas that represent 3 geographically distinct populations (with at least one in the Connecticut River Valley) of Grasshopper Sparrows that annually support at least 10 active pairs each or 6 geographically distinct populations (with at least 2 in the Connecticut River Valley) that annually support at least 5 active pairs each. This would allow this species to be removed from the Vermont Endangered and Threatened Species List

4.2 Justification of Recommended Management and Recovery Plan Goal:

The management and recovery plan goal is based on the fact that Vermont historically supported, and currently supports, breeding Grasshopper Sparrows. It is assumed that this species has always been an uncommon breeder in Vermont and has been restricted to the Lake Champlain and Connecticut River Valleys. As a result, the recovery plan goal attempts to replicate the historical distribution of this species and maintain adequate population numbers to sustain this species in Vermont. The need for at least 3 separate geographic populations is also deemed necessary in order to prevent the possibility of a catastrophic event at a single geographic location that may result in extirpation of the species.

4.3 Recommended Management and Recovery Actions

1.31 Priority Actions

1. Accurately determine current population size and breeding locations of Grasshopper Sparrows in Vermont.
2. Determine areas of high grassland bird concentrations with potential for successful long-term management, and organize them into focal areas to coordinate future management efforts.
3. Develop management plans for each focal area, incorporating current and future management incentive programs and landowner education.

4.32 Research and Management

1. Determine current population size and breeding locations of Grasshopper Sparrows in Vermont.

1.32 Survey known and potential Grasshopper Sparrow nesting habitat to determine current population size and nesting locations.

1.33 Map, using GIS technologies, all Grasshopper sparrow locations.

1.3 Collect information on habitat structure and land-use patterns at each location as well as for properties that surround each site.

2. Compile data on historic sites used by Grasshopper Sparrows.

2.1 Compile information collected during the first and second Vermont Breeding Bird Atlas and the Vermont Airport Survey Project.

2.2 Compile information on sightings recorded in the Record of Vermont Birds.

- 2.3 Organize and compile anecdotal sighting information from other sources such as the VTBird listserv.
- 3 Combine current and historical information to determine core Grasshopper Sparrow habitat in Vermont.
 - 3.1 Using current and historical information, determine primary nesting areas within Vermont.
 - 3.2 Using VT Department of Agriculture data and GIS technologies determine potential Grasshopper Sparrow nesting habitat.
 - 3.3 Combine primary and potential nesting habitat information to determine focal areas for Grasshopper Sparrow.
- 4. Prioritize focal areas for conservation efforts and protection.
 - 4.1 Determine relative significance of each focus area to overall population stability.
 - 4.2 Prioritize focal areas using the following criteria; significance to population stability, long-term land use potential and feasibility of implementing management techniques to maintain appropriate habitat structure.
 - 4.3 Determine number and location of focal areas (depending on the number of potential individuals expected at each site) needed for delisting.
- 5. Develop strategies to manage and protect focal areas as well as other potential Grasshopper Sparrow habitat.
 - 5.1 Identify management requirements needed to maintain and/or enhance each focal area and determine appropriate management techniques.
 - 5.2 Ensure protection of focal areas via acquisition of conservation easements, management leases and fee title acquisition.
 - 5.3 Identify habitat that has potential for Grasshopper Sparrow use and pursue management options that would make the habitat suitable for sandpipers.
- 6. Regularly monitor population size of Grasshopper Sparrow in Vermont focusing on the focal areas .
 - 6.1 Determine regularity of monitoring efforts (i.e. annually vs. every other year).
 - 6.2 Determine appropriate population monitoring techniques.
 - 6.5 Annually map known locations of Grasshopper Sparrow sightings using GIS

technologies.

6.6 If possible, determine nesting success and number of young produced at known locations.

7. Explore feasibility of conducting a population viability assessment for Grasshopper Sparrow in Vermont.

4.33 Education and Outreach

1. Educate the public, especially the agricultural community, about Grasshopper Sparrow conservation by developing a comprehensive outreach campaign.

1.34 Include Grasshopper Sparrow in a grassland bird resource document that can be distributed to public and private landowners that educates them about grassland bird conservation. The document would include management strategies as well as references to the various incentives program available to them.

1.35 Work with the Natural Resources Conservation Service and the U.S. Fish and Wildlife Service to increase participation in habitat improvement programs such as Environmental Quality Incentives Program (EQIP), Landowner Incentives Program (LIP) and Grasslands Reserve Program (GRP) within the Grasshopper Sparrow focus areas.

1.36 Develop demonstration sites within the Grasshopper Sparrow focal area that use appropriate management protocols to demonstrate the benefits of management activities to individuals, municipalities and the agricultural community.

1.37 Work one on one with individual landowners in the focal areas to effectively manage and protect larger grasslands.

1.7 Work with public and private landowners to create a matrix of grassland habitats within the focal areas .

4.34 Partnerships

1. Develop and expand partnerships with public and private landowners and the organizations and agencies that represent them to aid in the distribution of information and coordination of Grasshopper Sparrow management activities. Partners would include agricultural agencies, VTrans, Partners in Wildlife, Wildlife Services, U.S. Fish and Wildlife Service, land trusts and private landowners.

2. Develop partnerships with national and international groups in order to integrate management activities in Vermont into larger landscape level grassland bird conservation efforts such as the Important Bird Areas Program, NABCI and PIF.

4.35 Fundraising

1. Develop a comprehensive approach to funding Grasshopper Sparrow conservation efforts in Vermont.
 - 1.1 Work with state agencies to obtain funds for Grasshopper Sparrow conservation.
 - 1.11 Develop proposals to obtain funds through the Nongame Wildlife Fund, State Wildlife Grants Program and Pittman-Robertson. Ensure that Grasshopper Sparrow conservation is included in the Vermont Comprehensive Wildlife Conservation Strategy .
 - 1.12 Work with the Vermont Department of Agriculture to look into funding options for Grasshopper Sparrow conservation efforts including ways to effectively distribute management information.
 - 1.2 Work with federal agencies to obtain funds for Grasshopper Sparrow conservation.
 - 1.21 Work with the Natural Resource Conservation Service to secure funding for Grasshopper Sparrow management through USDA Farm Bill programs (i.e.EQIP).
 - 1.22 Research other federal funding that might be available.

4.4 Factors potentially limiting Grasshopper Sparrow management and recovery efforts.

There are several factors that may potentially limit management and recovery efforts. Recent trends in agricultural practices plus, economic pressures currently facing farmers in Vermont, make even the simplest of the management activities (delayed mowing) difficult to implement. The lack of conservation plans and formal agreements at state airports and other non-agricultural lands may also result in the loss of critical habitat.

One other potential limiting factor is the current debate on management for species that require man-altered habitats. Much of the grassland areas in Vermont occur on what was once Clayplain Forest. This natural community type is increasingly rare in the state due to agricultural and other human centered activities (e.g., development). Efforts to restore portions of the Clayplain Forest community may compete with Grasshopper Sparrow recovery efforts. As a result, any Grasshopper Sparrow conservation efforts will need to take into consideration the larger landscape level picture which includes other important habitat types and natural communities.

Sedge Wren (*Cistothorus platensis*)

1. Background

1.1 Introduction

The Sedge Wren is the rarest of the 5 species of wren that currently breed in the state. The primary breeding range of the species extends from the prairie regions of Canada, east to the Appalachian Mountains and south to Missouri and Kentucky. This species, however, has been documented occurring throughout the Northeast and as far west as California. Detailed physical description and range of this species can be found in Sibley (2001) and *Birds of North America* (1996). Sedge Wren has never been common in Vermont (Forbush 1925), although it was likely more common during the major land clearing period of the late 1800's. The species is currently listed as endangered in Vermont.

Sedge Wrens prefer wet meadows and drier marshes dominated by dense grasses and sedges (Table 2) Sedge Wrens maintain loose breeding colonies with little nest-site tenacity from year to year. This nesting strategy combined with their secretive nature makes the Sedge Wren one of the more difficult birds to detect. Sedge Wrens arrive in Vermont from late May through June and July. Breeding strategies include both seasonal monogamy and polygamy. Males build multiple nests, one of which is selected by the female. The female does most of the incubation and brood rearing of the rather large (up to 7 eggs) clutch and may successfully bring off 2 clutches. Little is known about the fall departure date in Vermont for this species. Sedge Wrens winter from the southern U.S. to central Mexico. Sedge Wren habitat does not seem to be a limiting factor in Vermont. Although habitat exists, the number of documented sightings remains low with limited data as to whether or not this species continues to breed in the state.

1.2 Distribution in Vermont

At the time of the first Breeding Bird Atlas, the Sedge Wren was considered one of the rarest regular breeding birds in the state (Laughlin and Kibbe 1986). Wrens were located in the Champlain Valley as well as other suitable locations scattered across the state. Surveys conducted in 2002 resulted in only 2 documented sightings, both in the Champlain Valley. Suitable habitat currently exists throughout the state especially along the marshes and wetlands of Lake Champlain.

2. Monitoring and Management

The distribution of Sedge Wren was first documented in 1976-1981 during the first Vermont Breeding Bird Atlas (Laughlin and Kibbe 1986). Since then, documentation of this species has been limited to scattered reports. Surveys of historical locations as well as other appropriate habitat in the Champlain Valley were conducted during the summer of 2002 and individuals were found in Addison and Swanton. During the second atlas, all nine Sedge Wren records came from the Champlain Valley, with two confirmed breeding (Renfrew 2013). Additional evidence of the scarcity of this species was collected from

2004 to 2005: in a tally of 774 point counts in 199 hayfields and 18 pastures covering 1325 hectares (3273 acres) throughout Chittenden, Franklin and Addison counties, only two Sedge Wrens were detected (Perlut et al. 2008b). To date there has been no direct management for this species although available habitat has been maintained through protection of wetlands in Vermont.

3. Threats

Although habitat loss has been implicated in the decline of other grassland species, the presence of large areas of suitable habitat within the state make it difficult to pinpoint the overarching threats to Sedge Wrens. Mowing and haying of areas with nesting birds could directly impact this species. There is some information that suggests Sedge Wrens seen late in the breeding season may have already nested further north and are re-nesting in Vermont. As such “late mowing” may have a higher impact on Sedge Wren nesting success, unlike other grassland birds which are impacted by earlier mowing regimes. Although some known nesting habitat has been lost to changes in the vegetative structure (R. Pilcher pers. comm.), habitat can be ephemeral based on annual climatic variation, and new habitat may be available in certain years, for example when rainfall is high. These, however, are highly localized and although they can impact small populations in any given year they should have limited impacts if suitable habitat persists. Threats to this species may be due more to declines in the central portion of their breeding range which may have made colonization on the periphery of the range (i.e., Vermont) less successful and sustainable.

4. Strategies and Recommendations for the Management and Recovery of Sedge Wren in Vermont

4.1 Recommended Management and Recovery Plan Goal

The primary goal of this management and recovery plan is to annually document presence and absence of Sedge Wren in Vermont. If and when individuals and pairs are located, efforts should be made to protect the birds and the habitat supporting them. Secondly efforts should be made to establish and maintain necessary breeding habitat within the context of the larger Grassland Bird Management Plan.

4.2 Justification of Recommended Management and Recovery Plan Goal

The management and recovery plan goal is based on the fact that Vermont historically supported and currently supports Sedge Wren. It is assumed that this species has always been an uncommon breeder in Vermont and has been restricted to the Lake Champlain and Connecticut River Valleys. As a result, the recovery plan goal attempts to replicate the distribution of this species by maintaining suitable habitat and documenting occurrence. The goal does not include a specific number of individuals or pairs due to the fact that current numbers remain exceedingly small even with seemingly abundant available habitat. This suggests that factors outside of Vermont are having greater impacts on this species across its range than loss of habitat in Vermont. As a result the primary goal is to locate

and protect individuals, pairs and colonies as well as the habitat they need to breed and determine if regular actions outside monitoring and site protection are viable. Little is known about the species' population in Vermont. If and when documented Sedge Wren numbers increase, numerical recovery goals will need to be determined for down listing and de-listing purposes.

4.3 Recommended Management and Recovery Actions

4.31 Priority Actions

1. Annually determine presence or absence of Sedge Wren in Vermont and protect these locations from disturbance.
2. Determine areas of current and potential Sedge Wren habitat and work to protect these habitats.

4.32 Research and Monitoring

1. Determine current population size and breeding locations of Sedge Wren in Vermont.
 - 1.1 Survey known and potential Sedge Wren nesting habitat to determine current population size and nesting locations.
 - 1.2 Map, using GIS technologies, all Sedge Wren locations.
 - 1.3 Collect information on habitat structure and land-use patterns at each location as well as for properties that surround each site.
2. Compile data on historic sites used by Sedge Wren.
 - 2.1 Compile information on sightings recorded in the Record of Vermont Birds.
 - 2.2 Organize and compile anecdotal sighting information from other sources such as the VTBird listserv.
3. Combine current and historical information to determine Sedge Wren habitat in Vermont.
 - 3.1 Using current and historical information, determine primary habitat within Vermont.
 - 3.2 Using VT Department of Agriculture data and GIS technologies determine potential Sedge Wren habitat.
 - 3.3 Combine primary and potential nesting habitat information to determine available nesting habitat in Vermont.

4. Regularly monitor population size of Sedge Wren in Vermont.
 - 4.1 Determine regularity of monitoring efforts (i.e. annually vs. every other year).
 - 4.2 Determine appropriate population monitoring techniques.
 - 4.3 Annually map known locations of Sedge Wren sightings using GIS technologies.
5. Determine if management actions are feasible and if so develop strategies to manage and protect potential Sedge Wren habitat.
 - 5.1 Identify management requirements needed to maintain and/or enhance habitat in Vermont.
 - 5.2 Determine if management actions are desirable for this species outside the greater grassland bird management plan.

4.33 Education and Outreach

1. Educate the public, especially the agricultural community, about Sedge Wren conservation by developing a comprehensive outreach campaign.
 - 1.1 Include Sedge Wren in a grassland bird resource document that can be distributed to public and private landowners that educates them about grassland bird conservation. The document would include management strategies as well as references to the various incentives program available to them.
 - 1.2 Work with the Natural Resources Conservation Service and the U.S. Fish and Wildlife Service to increase participation in habitat improvement programs, such as the Wildlife Habitat Incentives Program (WHIP), within the grassland bird focus areas.

4.34 Partnerships

Partnerships should be done in the context of the larger Grassland Bird Management and Recovery Plan and in conjunction with other species recovery and management efforts.

4.35 Fundraising

Fundraising should be done in the context of the larger Grassland Bird Management and Recovery Plan and in conjunction with other species recovery and management efforts.

4.4 Factors potentially limiting Sedge Wren management and recovery efforts.

There are a number of factors that may potentially limit management and recovery efforts. Recent trends in agricultural practices plus, economic pressures currently facing farmers in Vermont, make even the simplest of the management activities (delayed mowing) difficult to implement. A fundamental issue may be that we do not understand why most Sedge Wrens do not select nesting locations in Vermont even though we have what appears to be suitable habitat. As a result efforts to maintain or increase population numbers may be not be feasible.

Henslow's Sparrow (*Ammodramus henslowii*)

1. Background

1.1 Introduction

Henslow's Sparrows are secretive grassland birds whose distribution ranges from northeastern Oklahoma east and north to the Great Lakes states and eastern New York then south to northern Tennessee. Henslow's Sparrows are short distance migrants that winter in the southern U.S. Detailed physical description and current range for this species can be found in Sibley (2001). This species, like many other grassland species, expanded its range into the Northeast during the land-clearing period in the 1800's. However populations in the Northeast (eastern subspecies) have declined with the loss of grassland habitats. As a result, Henslow's Sparrow is currently listed as endangered in Vermont.

Henslow's Sparrows prefer large grasslands in later seral stages. Habitat types include old fields and pastures that have not been cultivated for several years, wet meadows, fields and swales and abandoned strip mines. Habitat structure often includes tall forbs and residual dead vegetation with some woody vegetation present. Table 2 describes documented habitat requirements for this species.

1.2 Distribution in Vermont

Little is known about the historic distribution of Henslow's Sparrow in Vermont. Potter (1915) described their preferred habitat in the state as "moist upland meadows, not under the plow, grown up to clumps of ferns, tall meadow rue, and scattered shrubbery". The species has been documented breeding in West Clarendon, Pownel, Bennington, Wells River and Saxton's River (Laughlin and Kibbe 1985). Individuals were located in Quechee and Clarendon during the first Vermont Breeding Bird Atlas, when the species was already in decline in the state (Laughlin and Kibbe 1985). There have been no records during the breeding season in Vermont since the mid-1980s, including during the second atlas (Renfrew 2013). The species was considered extirpated from New England by the mid-1990s (Pruitt 1996).

2. Monitoring and Management

Other than the sporadic records from the first half of the 1900's little information has been collected concerning Henslow's Sparrow. It was reported from 2 locations during the first Vermont Breeding Bird Atlas Project but later surveys of these sites did not produce any birds. In 2002, as part of grassland bird surveys coordinated by Audubon Vermont for the Vermont Fish and Wildlife Department the species was included as a priority species but was not located in Vermont. There is some speculation that the species may be extirpated from the state. No management actions have been taken for this species.

3. Threats

Habitat loss is the primary concern throughout this species' range. The fact that this species may no longer be present in Vermont suggests population declines in the core of its range may have a stronger influence on its presence in Vermont than the lack of appropriate habitat.

4. Strategies and Recommendations for the Management and Recovery of Henslow's Sparrow in Vermont

4.1 Recommended Management and Recovery Plan Goal

The primary goal of this recovery plan is to annually document presence or absence of Henslow's Sparrow in Vermont. If and when individuals and pairs are located, efforts should be made to protect the birds and the habitat supporting them. Secondly efforts should be made to establish and maintain necessary breeding habitat within the context of the larger Grassland Bird Management Plan.

4.2 Justification of Management and Recovery Plan Goal

The management and recovery plan goal is based on the fact that Vermont historically supported Henslow's Sparrow, although it was not considered a common breeder. Henslow's Sparrow, however, has not been documented as a breeder in the state for more than two decades. As a result, the recovery plan goal is to maintain suitable habitat as part of the larger Grassland Bird Management Plan. The goal does not include a specific number of individuals or pairs due to the fact that there are currently no known breeding pairs of Henslow's Sparrows in the state even though some available habitat does exist. This suggests that factors outside of Vermont are having greater impacts on this species across its range than loss of habitat in Vermont. As a result the primary goal is to locate and protect individuals, pairs and colonies as well as the habitat they need to breed and determine if regular actions outside monitoring and site protection are desirable. If and when Henslow's Sparrow numbers increase, numerical recovery goals will need to be determined for down listing and de-listing purposes.

4.3 Recommended Management and Recovery Actions

4.31 Priority Actions

1. Annually document presence or absence of Henslow's Sparrow in the state.
2. Determine areas of current and potential Henslow's Sparrow habitat and work to protect these habitats in the context of the larger Grassland Bird Management Plan.
3. Reassess Henslow's Sparrow status on the Vermont Endangered and Threatened Species list and determine if recovery actions are viable.

4.32 Research and Management

There are no research or management plans for this species other than documenting presence or absence within the state. If individuals or pairs are located then the birds and the habitat that supports them should be protected.

4.33 Education and Outreach

All education and outreach efforts will be done in the context of the larger Grassland Bird and Recovery Management Plan.

4.34 Partnerships

All partnerships will be developed in the context of the larger Grassland Bird Management and Recovery Plan.

4.35 Fundraising

All fundraising efforts will be done in the context of the larger Grassland Bird Management and Recovery Plan.

4.4 Factors limiting Henslow's Sparrow Management and recovery efforts.

The fact that Henslow's Sparrow has not been documented as a breeding species in Vermont for more than two decades suggests the species is probably extirpated from the state. This is thought to be the result declines at the core of this species range. With no current breeding population in Vermont and no plans for intensive reintroduction efforts, the likelihood of this species becoming a regular breeder is almost non-existent.

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Table 1. North American Breeding Bird Survey precision-adjusted trend estimates for surveys conducted between 1966- 2010 for 10 grassland bird species (Sauer et al. 2011) including status of these species in Vermont.

Species	Eastern BBS Region	US	US and Canada	Vermont	Vermont Status
Northern Harrier	-2.0*	0.0	-0.8*	No data	Special concern
Upland Sandpiper	-3.3*	0.7*	0.5	No data	Endangered
Horned Lark	-2.8*	-1.7*	-2.2*	No data	None
Sedge Wren	-0.1	2.0*	1.3	No data	Endangered
Vesper Sparrow	-2.6*	-1.1*	-0.8*	-10.2*	Special Concern
Savannah Sparrow	-2.1*	-1.0*	-1.1*	1.4	None
Grasshopper Sparrow	-4.7*	-2.4*	-2.3*	No data	Threatened
Henslow's Sparrow	-3.2*	-0.6	-0.7	No data	Endangered
Bobolink	-3.5*	-1.2*	-2.2*	-2.2*	Special Concern
Eastern Meadowlark	-3.5*	-1.2*	-1.0*	-7.3*	Special Concern

Species	FWS Region 5	Eastern BBS Region	US	US and Canada	VT	Vermont Status
Upland Sandpiper	-0.68	0.4	0.61	0.05	No data	Endangered
Sedge Wren	0.47	1.32 *	1.85 *	1.81*	No data	Endangered
Vesper Sparrow	-5.4*	-3.15*	-1.4*	-1.01 *	-7.54*	Species of Special Concern
Savannah Sparrow	-2.3 *	-1.96 *	-1.01*	-0.94 *	-0.18	None
Grasshopper Sparrow	-5.17*	-5.76 *	-3.76 *	-3.78 *	-8.99*	Threatened
Henslow's Sparrow	-12.57 *	-10.17 *	-7.95*	-7.90*	No data	Endangered
Bobolink	-0.28	-2.08*	-0.83*	-1.78*	-3.18*	None
Eastern Meadowlark	-4.28 *	-3.18*	-2.87 *	-2.86 *	-3.25 *	None

* significant trends (P less than 0.1)

Table 2. Area and habitat requirements of 8 grassland bird species*.

Species	Minimum Area, ha/ Acres (Jones and Vickery, 1997, unless otherwise noted.)	Territory Size, ha/ Acres (Jones and Vickery, 1997, unless otherwise noted.)	Vegetation Type (Jones and Vickery, 1997, unless otherwise noted.)	Grassland Type (Jones and Vickery, 1997, unless otherwise noted.)
Upland Sandpiper	50 ha/123 acres	8-12 ha/20-30 acres	Mixture of short and tall (ht 24") grass interspersed with patches of bare ground and some tall singing perches; avoids fields with uniform grass and legumes and dense litter layer.	Upland meadow/pasture, old field, sandplain grassland (e.g., pastures, old hayfields, dry meadows, airfields, blueberry barrens, and extensive mixed agricultural areas).
Sedge Wren	In Illinois native and restored prairies and tame grasslands, area was not as important as vegetation structure in predicting Sedge Wren occurrence; Sedge Wrens were present on tallgrass prairie <10 ha (Dechant et al., 2001b)	NA	Tall dense grassland vegetation including , big bluestem <i>Andropogon gerardii</i>) or indiangrass (<i>Sorghastrum nutans</i>) and other tall cover. Suitable habitat also may be provided by areas dominated by reed canary grass (<i>Phalaris arundinacea</i>) and switchgrass (<i>Panicum virgatum</i>), if wet-prairie or sedge-meadow habitats are not available. Rushes (<i>Juncus</i>), sedges, and cattails. (Dechant et al. 2001b)	Areas of tall, dense planted cover; in tallgrass prairie with areas of tall cover; wet-prairie and sedge-meadow habitats.
Vesper Sparrow	In Illinois, Vesper Sparrows were encountered on small (<10 ha) sites. (Dechant et al. 2001c)	0.29-8.19 ha/ 0.72 – 20.22 acres (Dechant et al. 2001c)	Sparse grassland Vegetation with intermixed with suitable singing perches. (Dechant et al. 2001c)	Dry, open areas with short, sparse and patchy vegetation. (Dechant et al., 2001c) In New Jersey, utilizes grassy patches at edges of agricultural fields.

Savannah Sparrow	8-16 ha/ 20-40 acres	0.4-0.8 ha/ 1-2 acres	Dense ground vegetation with mixture of short and tall grasses (ht: 1-25") in moist habitat with thick layer of dead grass, scattered saplings, shrubs and forbs (ht: 1-10"); use fields of all ages from alfalfa to grass.	Upland meadow/pasture, old field, sandplain grasslands, salt meadow (e.g., cultivated fields, hayfields, pastures, successional fields, blueberry barrens, coastal grasslands, airports)
Grasshopper Sparrow	12 ha/ 30 acres	0.8-1.6 ha/ 2-4 acres	Short bunch grasses (ht: 4-14") with minimal litter and grass cover, patches of bare ground, scattered tall forbs (ht: 8-25") with scattered, low, lightly wooded vegetation (ht: 1-8") for song perches. [e.g. tall herbaceous vegetation such as common mullein (<i>Verbascum thapsus L</i>), curled dock (<i>Rumex crispus</i>) or low growing shrubs and such as lowbush blueberry (<i>Vaccinium angustifolium</i>) or sweetfern (<i>Comptonia peregrina</i>)]; favors well-drained upland sites; absent from fields with >35% shrubs.	Upland meadow/pasture, old field, sandplain grassland (e.g. pastures, old hayfields, dry meadows, airfields, blueberry barrens, extensive mixed agricultural areas, cultivated grasslands, capped landfills).
Henslow's Sparrow	NA	0.3-0.8 ha/ 0.74-2 acres	Tall, dense grassy vegetation with scattered, tall forbs, and residual dead vegetation.	Grassy meadows, wet meadows, grassy edges of wetlands, and shrub-sprinkled, grassy uplands

Bobolink	2-4 ha/ 5-10 acres	0.4-2.4 ha/ 1-6 acres	Mixed grass (ht: 8-12") old hayfields > 8 years old with relatively sparse ground cover, usually in lowlands with moist soil; prefer mosaic of grasses, sedges and scattered broad-leaved forbs with <25% shrub cover; use shrubs, posts, small trees as song perches.	Upland meadow/pasture, wet meadow, old field (e.g., old hayfields, reclaimed grasslands, capped landfills)
Eastern Meadowlark	6-8 ha/15-20 acres	2.4-3.2 ha/ 6-8 acres	Sparse to dense grass-dominated cover (ht:10-20"), preferable in low-lying areas with damp soils, thick layer of dead grass, scattered shrubs (ht.:1-8"), and tall forbs (ht.:1-15") for song perches; prefer mixed grass fields to alfalfa.	Upland meadow/pasture, old field (e.g., hayfields, croplands, reclaimed grasslands and capped landfills, airports, shrubby overgrown fields)

*Modified from Comins, P. 2002. *Connecticut's Grasslands: A Report of the Connecticut Grasslands Working Group*, April, 2002.

Table 3. Survey, monitoring, and research projects for grassland birds in Vermont.

Project	Year	Location	Species	Methods	Results
Vermont Breeding Bird Atlas	1976-1981 2003-2007 Ongoing	Statewide	All avian species	177 priority blocks were surveyed over 6 years using area search techniques to determine distribution of avian species throughout VT.	1976-1981 Baseline data collected for all grassland species. Bobolink, E. Meadowlark, Savannah Sparrow well distributed throughout state. Upland Sandpiper, Vesper Sparrow, Grasshopper Sparrow limited to Champlain and CT River valleys. Henslow's Sparrow and Sedge Wren observed in very limited numbers. 2003-2007 declines in all grassland bird species documented.
Vermont Upland Sandpiper Survey	1988-1992, 1998-2004	Champlain Valley, Newport, Berlin	Upland Sandpiper	Surveys by road and foot using broadcast/callback techniques.	Sandpiper numbers increased from 1988-1992 due primarily to improved survey techniques (Peterson 1999). Declined more than 70% by 2001.
Vermont Airport Grassland Bird Survey	1998-2012	Statewide	All grassland species	Point count surveys	Grassland birds reported at all 7 airports surveyed between 1998-2005. Bobolinks located at 6 airports, E. Meadowlarks at 2, Grasshopper Sparrows at 3, Upland Sandpipers at 2, and Vesper Sparrows at 1. Franklin Co. Airport only airport surveyed annually since 2005
Camp Johnson Grassland Bird Survey	1998 -2006	Camp Johnson, Colchester	Grasshopper Sparrow	Point counts	Annual monitoring of Grasshopper, and Savannah sparrows, E. Meadowlark and Bobolink.. One of largest population of Grasshopper Sparrow in state.
2002 Grassland Bird Survey	2002	Statewide	Sedge Wren Grasshopper Sparrow Henslow's Sparrow	Area searches of known sighting locations.	Two Sedge Wrens located, 1 at Missisquoi NWR, the other at Dead Creek WMA
UVM Grassland Bird Research	2002-2012	Champlain Valley	All grassland species, focus on Bobolink, Savannah Sparrow	Point counts, area and nest searches used to determine impacts of agricultural practices on nesting grassland birds	Agricultural practices including mowing regimes and grazing extremely detrimental breeding grassland birds, especially Bobolink. Surveys located Upland Sandpipers in 2002 and 2003 and Sedge Wren in 2004

Table 3. Survey, monitoring and research projects for grassland birds in Vermont (con't)

Project	Year	Location	Species	Methods	Results
Missisquoi National Wildlife Refuge	1998-2003	Swanton	All grassland bird species	Point counts	Annual monitoring of grassland bird species at National Wildlife Refuge. Sedge Wren observed in 2000 and 2002
Vermont Important Bird Areas Project	2003-2004	Champlain Valley	All grassland bird species	Point counts, behavioral observations and GIS modeling	Supported work that timing of mowing important to breeding success of Bobolink. Sedge Wren and Upland Sandpipers documented in 2003. Developed GIS model for determining largest grasslands in southern Champlain Valley

Appendix 1. Grassland bird life history and habitat management resources.

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