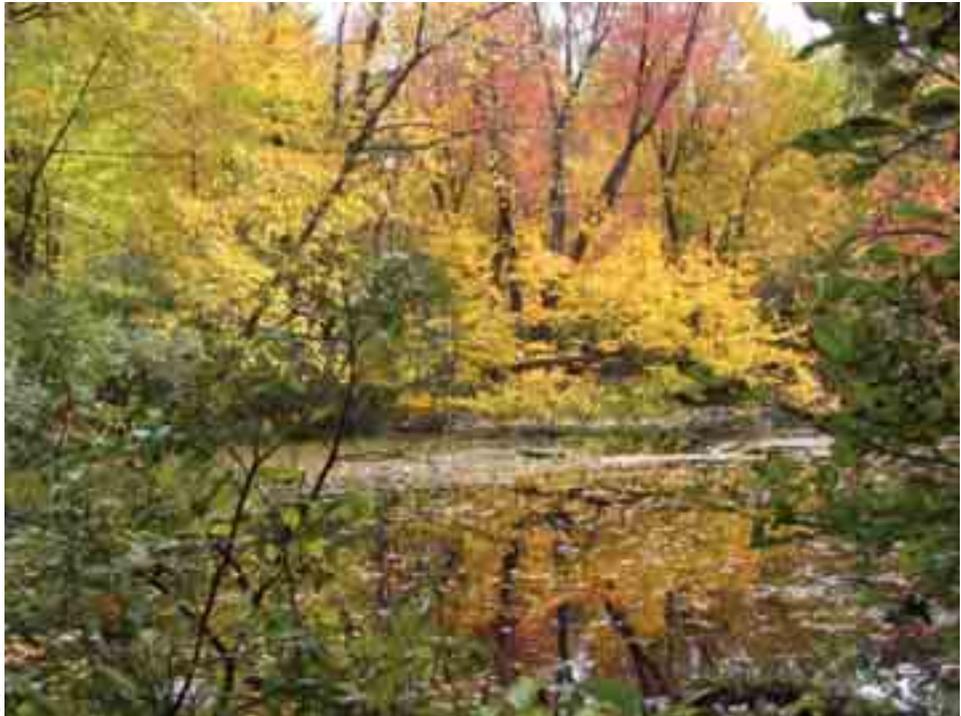


Appendix J



USFWS

Fall colors of the refuge

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

- Introduction
- Potential Resources of Concern for the Missisquoi Refuge
- Priority Resources of Concern
- Adaptive Management
- References

Introduction

The Service is entrusted by Congress to conserve and protect migratory birds and fish, federally listed threatened and endangered species, inter-jurisdictional fishes, wetlands, and certain marine mammals. These are known as “trust resources.” In addition to this Service mandate, each Refuge has one or more purposes for which it was established that guide its management goals and objectives. Further, Refuges support other elements of biological diversity including invertebrates, rare plants, unique natural communities, and ecological processes that contribute to biological diversity, integrity and environmental health at the Refuge, ecosystem, and broader scales (USFWS 1999, 2003).

Given the multitude of purposes, mandates, policies, regional, and national plans that can apply to a Refuge, there is a need to identify the potential resources of concern and then prioritize those resources that the Refuge is best suited to focus on in its management strategies. The following is the process that Missisquoi National Wildlife Refuge (Missisquoi Refuge, the refuge) used to identify priority resources of concern and develop habitat goals, objectives, and strategies to benefit these resources.

The Habitat Management Plan policy (620 FW) defines “resources of concern” as

“All plant and/or animal **species, species groups, or communities** specifically identified in Refuge purpose(s), System mission, or international, national, regional, State, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a Refuge whose purpose is to protect ‘migrating waterfowl and shorebirds.’ Federal or State threatened and endangered species on that same Refuge are also a resource of concern under terms of the respective endangered species acts.”

Resources of concern are synonymous with “conservation targets” and the terms can be used interchangeably.

Potential Resources of Concern for the Missisquoi Refuge

To determine the resources of concern that would guide the management priorities, we examined a multitude of guiding documents and other information sources to develop a matrix of *potential* resources of concern. These documents, plans, or policies typically identify focal species, species groups, or habitats. These sources fall into three categories:

- ❖ Legal Mandates
- ❖ USFWS Trust Resources
- ❖ Biological Integrity, Diversity, and Environmental Health Policy

❖ Legal Mandates

Statutory Authority

The National Wildlife Refuge Improvement Act of 1997 states that each Refuge shall be managed to fulfill the mission of the Refuge System: *“To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”* (Refuge Improvement Act; Public Law 105-57)

Enabling Legislation (Establishing Orders)

The enabling legislation is the legal authority by which the Refuge was initially established and lands acquired within the Refuge.

The Missisquoi refuge was established in 1943 *“for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”* (16 USC 715-71r; 45 Stat. 1222, Migratory Bird Conservation Act).

Refuge Purposes

The National Wildlife Refuge Improvement Act of 1997 also states that each Refuge *“...shall be managed to fulfill...the specific purposes for which the Refuge was established...”* Purposes of a Refuge are those specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a Refuge, Refuge unit, or Refuge sub-unit.

The relationship of the System Mission and the purpose(s) of each Refuge is defined in Section 3 of the FWS Director’s Order No. 132 that states: *“we view the System mission, goals, and unit purpose(s) as symbiotic; however, we give priority to achieving a unit’s purpose(s) when conflicts with the System mission or a specific goal exist.”* Section 13 of this order indicates *“Where a Refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict.”* As stated in Section 14, *“When we acquire an addition to a unit under an authority different from the authority used to establish the original unit, the addition also takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the addition.”*

Missisquoi Refuge was established for the following purposes:

“use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (Migratory Bird Conservation Act).

❖ USFWS Trust Resources

Although the Refuge purposes are the first obligation, managing for trust resources (defined above) is also a priority for the Refuge. Trust resources are further defined as follows:

Migratory Birds: A list of all species of migratory birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703–711) and subject to the regulations on migratory birds are contained in subchapter B of title 50 CFR § 10.13. The Migratory Birds Program also maintains subsets of this list that provide priorities at the national, regional, and ecoregional (bird conservation region) scales.

The primary sources of information that the Refuge used to identify potential migratory birds species of concern included:

- Bird Conservation Region (BCR) 13 Plan
- Continental and Regional Plans for landbirds, waterfowl, shorebirds, and marshbirds
- Rocky Mountain Bird Observatory Species Assessment Database
- USFWS Birds of Conservation Concern
- Federal Threatened and Endangered species
- Status Information from Refuge bird surveys
- Vermont Wildlife Action Plan

Wetlands: The Emergency Wetlands Resources Act of 1986. This Act, Public Law 99-645 (100 Stat. 3582), approved November 10, 1986, authorized the purchase of wetlands from Land and Water Conservation Fund monies, removing a prior prohibition on such acquisitions. It required the Secretary to establish a National Wetlands Priority Conservation Plan, required the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transferred to the Migratory Bird Conservation Fund amounts equal to the import duties on arms and ammunition.

The Missisquoi Refuge was established and priority wetlands were protected before this Act and it has not been used to purchase additional wetlands, to date. The Atlantic Coast Joint Venture identified the Missisquoi National Wildlife Refuge and Lake Champlain as waterfowl focus areas in Vermont (ACJV 20002). The wetlands (hardwood swamps, bogs, and floodplain forests) around Lake Champlain, including the Refuge, are important to waterfowl, wading birds, and shorebirds (ACJV 2005).

Threatened and Endangered Species: The Endangered Species Act (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) states in Sec. 8A.(a) that “*The Secretary of the Interior (hereinafter in this section referred to as the “Secretary”) is designated as the Management Authority and the Scientific Authority for purposes of the Convention and the respective functions of each such Authority shall be carried out through the United States Fish and Wildlife Service.*” The Act also requires all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.

To identify Federal threatened or endangered species of relevance to Missisquoi Refuge we reviewed:

- Federal Threatened and Endangered Species List
- Recovery Plans for Federal-listed species in our region

Biological surveys and records have been reviewed and no Federally threatened or endangered species are known to be on the refuge.

❖ **Biological Integrity, Diversity, and Environmental Health**

The 1997 National Wildlife Refuge System Improvement Act states that in administering the System the Service shall “... ensure that the biological integrity, diversity, and environmental health of the System are maintained...” (601 FW 3; also known as the “Integrity Policy”). The USFWS (2003) defines these terms as:

<i>Biological Diversity</i>	The variety of life and its processes, including the variety of living organisms, the genetic differences between them, and the communities and ecosystems in which they occur.
<i>Biological Integrity</i>	Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.
<i>Environmental Health</i>	Composition, Structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.

Where possible management on the Refuge restores or mimics natural ecosystem processes or functions and thereby maintains biological diversity, integrity, and environmental health. Given the continually changing environmental conditions and landscape patterns of the past and present (e.g., rapid development, climate change, sea level rise), relying on natural processes is not always feasible nor always the best management strategy for conserving wildlife resources. Uncertainty about the future requires that the Refuge manage within a natural range of variability rather than emulating an arbitrary point in time. This maintains mechanisms that allow species, genetic strains, and natural communities to evolve with changing conditions, rather than necessarily trying to maintain stability.

As stated by Meretsky et al. (2006), the Integrity Policy directs Refuges to assess their importance across landscape scales and to “forge solutions to problems arising outside Refuge boundaries.” Some of these regional land use problems include habitat fragmentation/lack of connectivity, high levels of contaminants, and incompatible development or recreational activities.

To assess the historical condition, site capability, current regional landscape conditions, and biological diversity and environmental health of Missisquoi Refuge we used the following resources:

- Maps and associated data on site capability
 - ◆ Kuchler’s (1964) potential natural vegetation
 - ◆ Soils, topography, and hydrology
 - ◆ History of natural disturbance patterns: e.g., fire, storms, flood events
- Map of existing vegetation on the Refuge
- Vermont Nongame and Natural Heritage Program information on rare, declining, or unique natural communities and plant populations
- Vermont Wildlife Action Plan
- Missisquoi Bay Watershed Plan

- Lake Champlain Steering Committee
- Status and Trend Information from Refuge surveys and studies of waterfowl, shorebirds, breeding Neotropical landbirds, marsh and wading birds, rare plants, and vernal pools.

❖ **Summary Table**

Table J.1 is a list of the *potential wildlife species* of concern for Missisquoi Refuge based on the information compiled and analyzed in this section as described under legal mandates, trust resources, and integrity policy. For rare plants and natural communities we were able to directly identify the *priority rare plants and natural communities* since these are more site-specific than wildlife (see table J.2).

Table J.1. Potential Resources of Concern for Missisquoi Refuge

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>WATERBIRDS</u>							
Bittern, American	B		H	b			H
Bittern, Least	B		M	h			H
Grebe, pied-billed	B		M	h			H
Gull, Bonaparte's	M		M	k,l			
Gull, little			H	c			
Heron, great-blue	B						M
Loon, common	M		M	h			H
Loon, red-throated			M	x			
Night-heron, black crowned	M		M	x			M
Rail, king			H	e			
Rail, Virginia	B		M	k,l			
Rail, yellow			M	e			
Sora	B						M
Tern, black	B		M	b		E	H
Tern, common	M		H	b		E	H
<u>WATERFOWL</u>							
American black duck	B, M		HH	a			H
Blue-winged teal	B, M		M	g			M

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>WATERFOWL CONT.</u>							
Canvasback	M		H	c			
Goldeneye, Barrow's			H	b			
Goldeneye, common	B, M		HH	a			
Goose, Canada (Atl/SJB)	M		HH	b			
Goose, greater snow	M		M	x			
Long-tailed duck			HH	a			
Mallard	B, M		M	c			
Merganser, common	M		M	i			
Northern pintail	M		H	g			
Redhead	M		M	h			
Scaup, greater	M		H	b,d			
Scaup, lesser	M		HH	a			
Scoter, white-winged	M		M	h			
Swan, tundra			H	d			
Wood duck	B, M		H	c			
<u>SHOREBIRDS</u>							
Dowitcher, short-billed	M		H	a			
Dunlin	M		M	d			
Godwit, hudsonian	M		M	e			
Godwit, marbled			M	e			
Phalarope, Wilson's			M	e			
Plover, American golden			H	c			
Plover, black-bellied	M		M	g			
Plover, piping		E	HH	a			
Red knot			M	e			
Sanderling	M		M	e			

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>SHOREBIRDS CONT.</u>							
Sandpiper, buff-breasted			H	c			
Sandpiper, least	M		M	d			
Sandpiper, pectoral	M		M	f			
Sandpiper, semipalmated	M		M	g			
Sandpiper, solitary	M		H	c			
Sandpiper, upland			M	e		E	H
Snipe, Wilson's			M	g			
Whimbrel			M	e			
Woodcock, American	B,M		H	c			M
Yellowlegs, greater	M		M	d			
<u>LANDBIRDS</u>							
American kestrel	B,M				RC/MA		M
Bald eagle	M	T				E	H
Baltimore oriole	B		M	i	RC, RS/MA		
Belted kingfisher	B				RC/MA		
Black-billed cuckoo	M		H	c	RC, RS/MA		M
Blackbird, rusty	M		M	g	CC/PR		M
Bobolink	B,M		M	i	RC, RS/MA		M
Brown thrasher	M		H	c	RC/MA		M
Chimney swift	B,M		M	h			M
Common nighthawk	M						H
Eastern kingbird	B				RC/MA		
Eastern meadowlark	B,M		M	f	RC/MA		M
Eastern towhee	M				RC/MA		H
Eastern wood-pewee	B,M				RC/MA		
Flycatcher, olive-sided	B,M						M

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>LANDBIRDS CONT.</u>							
Flycatcher, willow	B,M		M	j	CC/PR		
Grouse, ruffed	B,YR						M
Grouse, spruce						E	H
Hawk, Cooper's	M						M
Hawk, red-shouldered	B,M						M
Loggerhead shrike			M	e		E	
Louisiana waterthrush	M						
Osprey	B,M						M
Owl, barn							M
Owl, long-eared							M
Owl, short-eared	M		M	e	CC/PR		M
Northern bobwhite			M	e			
Northern flicker	B,M		M	f	RC/MA		
Northern goshawk	M						M
Northern harrier	B,M		M	f	RC/MA		H
Peregrine falcon	M	E					H
Purple martin	B,M						H
Rose-breasted grosbeak	B,M		M	k	RS/PR		
Scarlet tanager	M		M	h			
Sparrow, field	B,M		H	c	RC/MA		M
Sparrow, grasshopper	M		M	e		T	H
Sparrow, Henslow's			HH	a	CC, RC/IM	E	M
Sparrow, savannah	B				RC/MA		
Sparrow, song	B,M		M	i			
Sparrow, vesper							H
Swallow, barn	B,M		M				
Swallow, bank			M	i			

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>LANDBIRDS CONT.</u>							
Thrush, Bicknell's							H
Thrush, wood	B,M		H	c	CC, RC/MA		M
Veery	B,M						M
Warbler, bay-breasted	M		M	g	CC/PR		M
Warbler, blackpoll	M						M
Warbler, black-throated-blue	M		M	h			M
Warbler, blue-winged			H	c	CC/PR		M
Warbler, Canada	M		M	e	CC, RC/MA		H
Warbler, cerulean			HH	a	CC, RC/MA		M
Warbler, chestnut-sided	M						M
Warbler, golden-winged			HH	a	CC, RC/MA		H
Warbler, prairie			M	g	CC/PR		M
Warbler, prothonotary			M	g			
Warbler, worm-eating			M	g	CC/PR		
Whip-poor-will	M				RC/MA		H
Woodpecker, black-backed							M
Woodpecker, red-headed	B,M		M	e	CC, RC/IM		
Wren, sedge						E	H
<u>MAMMALS</u>							
Bat, big brown	X						M
Bat, red	X						H
Bat, hoary	X						H
Bat, Indiana		T				E	H
Bat, little brown	X						M
Bat, northern long-eared	X						M
Bat, silver-haired	X						H

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>MAMMALS CONT.</u>							
Bat, eastern small-footed	X					T	H
Black bear							M
Bobcat							M
Bog lemming, northern	X						H
Bog lemming, southern	X						H
Eastern pipistelle	X						H
Flying squirrel, northern	X						M
Flying squirrel, southern							M
Fox, gray	X						M
Lynx						E	H
Marten, American						E	H
Mink	X						M
Mole, hairy-tailed	X						M
Mountain lion						E	M
Muskrat	X						M
New England cottontail	X						H
River otter	X						M
Shrew, long-tailed	X						H
Shrew, masked	X						M
Shrew, pygmy	X						H
Shrew, smoky	X						M
Shrew, water	X						H
Vole, rock	X						H
Vole, woodland	X						H
Weasel, long-tailed	X						M
Wolf, gray							M

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>AMPHIBIANS</u>							
Common mudpuppy	X						H
Fowler's toad							H
Salamander, blue-spotted	X						M
Salamander, four-toed							M
Salamander, Jefferson							H
Salamander, spotted	X						M
Western chorus frog						E	H
<u>REPTILES</u>							
Brown snake	X						M
Eastern racer						T	H
Eastern ratsnake						T	H
Eastern ribbon snake	X						H
Five-lined skink						E	H
Northern water snake	X						M
Smooth green snake	X						M
Timber rattlesnake						E	H
Turtle, common musk							M
Turtle, spiny softshell	X					T	H
Turtle, spotted						E	H
Turtle, wood							H
<u>FISH</u>							
American eel	X						H
American brook lamprey						T	H
American shad							M

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>FISH CONT.</u>							
Arctic char							H
Atlantic salmon-landlocked	X						M
Blackchin shiner	X						H
Blacknose shiner	X						H
Brassy minnow							H
Bridle shiner							H
Channel darter						E	H
Cisco							M
Eastern sand darter	X					T	H
Lake sturgeon	X					E	H
Lake whitefish							M
Mooneye							M
Mottled sculpin							M
Muskellunge	X						H
Northern brook lamprey						E	H
Quillback							H
Redbreast sunfish	X						M
Redfin pickerel							M
Round whitefish							M
Sauger	X						H
Greater redhorse	X						H
Shorthead redhorse	X						M
Silver redhorse							H
Silver lamprey	X						M
Stonecat							H

Species	Seasons on Refuge ¹	Federal T&E Species ²	BCR 13 Tier ³	BCR 13 Rule ⁴	Partners in Flight ⁵ (Level of Concern/ Conservation Action)	Vermont T&E Species ⁶	Vermont Wildlife Action Plan ⁷
<u>MOLLUSCS</u>							
Alewife floater							X
Black sandshell	X					E	X
Brook floater						T	X
Creek heelsplitter							X
Cylindrical papershell	X					E	X
Dwarf wedgemussel		E				E	X
Eastern pearlshell						T	X
Elktoe							X
Fluted-shell	X					E	X
Fragile papershell	X					E	X
Giant floater	X					T	X
Pink heelsplitter	X					E	X
Pocketbook	X					E	X

* Grayed species are priority species of concern identified in the habitat objectives

¹ Seasons on the Refuge: B=Breeding, W=Wintering, M=Migration, YR=Year-Round, X=Present

² Federal T&E = Federal Endangered Species List: T=Threatened, E=Endangered

³ BCR 13 – Bird Conservation Region 13 Tier: HH=Highest, H=High, M=Medium

⁴ BCR 13 – Bird Conservation Region 13 Rule:

Process to Determine Priority Resources of Concern Leading to Development of Refuge Habitat Goals and Objectives

<u>PriorityTier</u>	<u>Continental Concern</u>	<u>BCR Responsibility</u>	<u>BCR Concern</u>	<u>New Rule</u>
Highest	HIGH	HIGH or MOD	HIGH	a
High	MODERATE	HIGH or MOD	HIGH	b
	HIGH	HIGH or MOD	MODERATE	c
	MODERATE	HIGH	MODERATE	d
Medium (stewardship)	HIGH or MOD	LOW *	HIGH	e
	LOW	HIGH or MOD	HIGH	f
	HIGH	LOW *	MODERATE	g
	MODERATE	MODERATE	MODERATE	h
	LOW	HIGH	MODERATE	i
	HIGH	HIGH or MOD	LOW	j
	MODERATE	HIGH	LOW	k
	LOW	HIGH **	LOW	l

⁵ Partners in Flight (Level of Concern/ Conservation Action): CC=continental concern, RC=regional concern, RS=regional stewardship CR=critical recovery, IM=immediate management, MA=management attention, PR=planning and responsibility (From Rocky Mountain Bird Observatory, www.rmbo.org)

⁶ State T&E= Vermont Threatened and Endangered Species: T=Threatened, E=Endangered

⁷ Vermont Wildlife Action Plan: H=High Priority, M=Medium Priority, X=Priority

Table J.2. Rare Plants and Exemplary Natural Communities on Missisquoi Refuge

Species	Srank ¹	Grank ²	State Status ⁴
Small Bidens <i>Bidens discoidea</i>	S2S3	G5	
Prickly Hornwort <i>Ceratophyllum echinatum</i>	S1	G4	
Lance-leaved Loosestrife <i>Lysimachia hybrida</i>	S1	G5	
Black Gum or Tupelo <i>Nyssa sylvatica</i>	S2	G5	
Yellow Water-crowfoot <i>Ranunculus flabellaris</i>	S2	G4	
Bristly Crowfoot <i>Ranunculus pensylvanicus</i>	S3	G5	
Narrow Blue-eyed Grass <i>Sisyrinchium angustifolium</i>	S2	G5	
Virginia Chain-fern <i>Woodwardia virginica</i>	S1	G5	T
Exemplary Natural Communities		Condition³	
Buttonbush Swamp	S2	B	
Deep Bulrush Marsh	S4	A	
Dwarf Shrub Bog	S3	A	
Lake Sand Beach	S2	C	
Lakeside Floodplain Forest	S3	A	
Pitch Pine Woodland Bog	S1	Not Ranked	
Red or Silver Maple-Green Ash Swamp	S3	A	
Silver Maple-Sensitive Fern Riverine Floodplain Forest	S3	A	
Sweet Gale Shoreline Swamp	S3	A	

¹ Srank=State Rarity Ranks

S1 Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.

S2 Imperiled in Maine because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.

S3 Rare in Maine (on the order of 20-100 occurrences).

S4 Apparently secure in Maine.

S5 Demonstrably secure in Maine.

SH Occurred historically in Maine, and could be rediscovered; not known to have been extirpated.

SU Possibly in peril in Maine, but status uncertain; need more information.

SX Apparently extirpated in Maine (historically occurring species for which habitat no longer exists in Maine).

Note: State Ranks determined by the Maine Natural Areas Program.

² Grank=Global Rarity Ranks

G1 Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.

G2 Globally imperiled because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.

G3 Globally rare (on the order of 20-100 occurrences).

G4 Apparently secure globally.

G5 Demonstrably secure globally.

³ Condition

A = excellent; B = very good; C = good; D = fair

⁴ State Status=State of Vermont Threatened and Endangered Species List: T=Threatened, E=Endangered, SC=Special Concern

Priority Resources of Concern

The potential resources of concern table (J.1) that was developed in Section II contains a large number of species with a broad array of habitat needs. The Refuge needs to prioritize these species and their associated habitats to determine what the Refuge is best suited to focus on in its management strategies. To guide us in prioritizing this list, we considered the following concepts:

- Achieving Refuge purposes, and managing for trust resources as well as biological diversity, integrity, and environmental health can be addressed through the habitat requirements of "focal species" or species that may represent guilds that are highly associated with important attributes or conditions within habitat types. The use of focal species is particularly valuable when addressing USFWS trust resources such as migratory birds.
- The Bird Conservation Region (BCR) plans are increasing their effectiveness at ranking and prioritizing those migratory birds most in need of management and conservation focus. Although all species that make it to a ranked BCR priority list are in need of conservation attention, we selected **focal species** that were ranked High or Moderate in Continental concern with a High to Moderate BCR Responsibility. (See www.abcbirds.org/nabci) for BCR rules used to rank birds).
- Focal species selected which were not birds (i.e. eastern spiny softshell turtle, freshwater mussels) were identified as resources of concern due to rangewide concern over their population status.
-
- Habitat conditions on or surrounding the Refuge may limit the Refuge's capability to support or manage for a potential species of concern. The following site-specific factors were evaluated:
 - ◆ Patch size requirements
 - ◆ Habitat connectivity
 - ◆ Incompatibility surrounding land uses
 - ◆ Environmental conditions: soils, hydrology, disturbance patterns, contaminants, predation, invasive species
 - ◆ Specific life history needs
- The ability to rely on natural processes to maintain habitat conditions within a natural range of variability suitable to the focal species.
- The ability to use adaptive management (flexibility and responsiveness of the Refuge and the habitats) in the face of changing environmental conditions (e.g., climate change).

High and Moderate Priority Habitat Types

Refuge management is most often focused on restoring, managing, or maintaining habitats or certain habitat conditions to benefit a suite of focal species or a suite of plants and animals associated with a particular habitat. Missisquoi Refuge identified the high and moderate priority habitats on the Refuge based on information compiled in Section I (e.g., site capability, historic condition, current vegetation, conservation needs of wildlife associates). As part of this process we identified any limiting factors that affect the Refuge's ability to maintain these habitats (see table J.3).

Table J.3. High and Moderate Priority Habitats on Missisquoi Refuge

High Priority Habitat Types	Reason for Selecting as High Priority	Limiting Factors for Maintaining this Habitat
Silver Maple-Sensitive Fern Floodplain Forest	Purposes: Migratory Birds Trust Resources (multiple focal species) BIDEH* (river delta ecosystem)	Invasive species, contaminants
Lakeshore and Rivershore Wetlands	Purposes: Migratory birds (waterfowl, black tern); Trust Resources (multiple focal species) BIDEH (river delta ecosystem)	Invasive species, contaminants, siltation, water quality and quality
Managed Wetlands	Purposes: Migratory Birds (waterfowl, marsh birds), Trust Resources (multiple focal species) BIDEH (river delta ecosystem)	Invasive species, contaminants, siltation, water quantity and quality
Rivers and Creeks	BIDEH (river delta ecosystem)	Invasive species, contamination, siltation, water quantity and quality, recreational use
Open Waters and Bays	Purposes: Migratory Birds (waterfowl) Trust Resources (waterfowl)	Invasive species, water quality
Scrub-Shrub	Purposes: Migratory Birds (landbirds), Trust Resources (breeding focal landbirds)	Invasive species, succession
Moderate Priority Habitat Types	Reason for Selecting as a Moderate Priority	Limiting Factors for Maintaining this Habitat
Red Maple-Green Ash Swamp	BIDEH (rare plant communities)	Limited knowledge of maintaining this natural community type in conjunction with early successional forest management
Maquam Bog	BIDEH (rare plant communities)	Invasive species, hydrologic pattern, succession, few management options
Oak Upland Forest	Minimal habitat available on Refuge	Invasive species, regeneration
Northern Hardwood Forest	Minimal habitat available on Refuge	Invasive species, forest fragmentation
Grasslands	Fewer priority species	Invasive species, succession, management intensive, area sensitive species affected by landscape conditions

* Biological Integrity, Diversity and Environmental Health Policy (BIDEH)

Based on the habitat types identified on the Refuge as described in table J-3, we then developed a table of the priority species of concern with their associated habitat types (table J-4). This table also describes the habitat structured required by each priority or “**focal species**” and identifies other species that would benefit from the same or similar habitat conditions.

Table J.4. Priority Resources of Concern, Habitat Structure, and Other Benefiting Species on Missisquoi Refuge

Priority Resources of Concern		Habitat Structure/Condition	Other Benefiting Species
Species or Species Group	Habitat Type		
Wood duck	Silver Maple-Sensitive Fern Floodplain Forest	Cavities in mature, living (sometimes dead) trees, greater than 18 inches d.b.h. within 1.2 miles of water; broken limbs for perching.	Common Goldeneye, hooded merganser, black duck, cerulean warbler, rose-breasted grosbeak, spotted and blue-spotted salamander
Baltimore Oriole		Tall, large deciduous trees, prefers silver maple when elm is not available.	
Great Blue Herons		Trees that can support nests at the height of 30 m or higher within 2.3 to 6.5 km from principal feeding sites.	
Migrating Waterfowl	Lakeshore and Rivershore Wetlands	A combination of open water and emergent vegetation with water depths < 16 in. and the presence of wild rice.	Marsh birds, fish, migrating shorebirds
American Bittern		Large cattail or other freshwater wetlands with tall, dense emergent vegetation with water depth < 4 in. Prefers impoundments and beaver-created wetlands. Inhabits wetlands <2.5 to 62.5 acres, but are more abundant in larger wetlands.	
Black Tern		Riparian marshlands of inland lakes with about 50% cover of emergent vegetation, such as cattails, rushes, and burreed.	
Migrating Waterfowl	Managed Wetlands	See above.	Virginia rail, sora, common moorhen
Pied-billed Grebe		Fresh marshes greater than 12.5 acres. Nests over shallow water anchored to stems of emergent vegetation, less often located in shrubs such as sweet gale and buttonbush.	
Freshwater Mussels	Rivers and Creeks	Medium to large rivers with a bottom of sand, mud or fine gravel with slow to moderate water flow. Sensitive to contaminants and zebra mussels.	lake sturgeon, eastern sand darter
Spiny Softshell Turtle		Rivers, lakes or impoundments with sand or mud bottom. with little vegetation. Bask on downed logs or banks.	

Priority Resources of Concern		Habitat Structure/Condition	Other Benefiting Species
Species or Species Group	Habitat Type		
Migrating Waterfowl	Open Waters and Bays	Beds of native aquatic vegetation and associated vertebrates and invertebrates.	Common merganser, lesser and greater scaup, common goldeneye, snow goose, common loons, common tern
Significant Natural Community	Red Maple-Green Ash Swamp	Canopy dominated by red maple and green ash; dense shrub layer of winterberry, red osier dogwood, nannyberry, high bush blueberry; long periods of spring flooding and saturated soils (a portion maintained in early successional stage)	American woodcock, brown thrasher, rose-breasted grosbeak, black-billed cuckoo, spotted and blue-spotted salamander
Significant Natural Community	Maquam Bog	Shrub-sedge ombrotrophic (rain-fed) bog with scattered individual pitch pine trees and small groups of 10 to 20 trees. Surrounded by a shrub dominated zone of sheep laurel and leatherleaf. Surrounded by a second high shrub zone of huckleberry, highbush blueberry, rhodora and mountain holly.	Virginia chain fern pitch pine, rhodora, northern harrier, short-eared owl
Willow flycatcher	Scrub-Shrub	Breeding: Fairly open areas with scattered shrubs or forest edges; moist or wet shrubby areas; dense stands of shrubs > 2.1 m in height; nest is ~1.2 m off the ground. Territory size 2.6 to 4.5 acres	Sedge wren, field sparrow, golden-winged warbler, migrating songbirds
American Woodcock		Moist, rich soil dominated by dense shrub cover (75-90%); alder is ideal. In close proximity to one another: clearings, large openings for roosting, young second growth hardwood (15-30 yrs) for nesting and brood-rearing, and shrub foraging areas.	
Black-billed cuckoo		Breeding: Shrublands, thickets, and other woodlands with dense, shrubby vegetation; Numbers fluctuate with caterpillar outbreaks	
Oak Upland Forest	Oak Upland Forest	Mature and regenerating oak with mass crop production	Scarlet tanager, rose-breasted grosbeak, white-tailed deer, ruffed grouse
Black-billed cuckoo	Northern Hardwood Forest	Breeding: Shrublands, thickets, and other woodlands with dense, shrubby vegetation; Numbers fluctuate with caterpillar outbreaks	Eastern wood-pewee, veery, song sparrow, wood thrush
American Woodcock		See above.	

Priority Resources of Concern		Habitat Structure/Condition	Other Benefiting Species
Species or Species Group	Habitat Type		
Bobolink	Grassland	Breeding: Prefers a mixture of grasses and broad-leaved forbs with high grass-forb ratio. Densities significantly higher in fields with relatively low amounts of total vegetative cover, low alfalfa cover, and low total legume cover. These vegetative characteristics occur in hay fields ≥ 8 yr old. Fields > 10 ha (~25 acres) preferred	Savannah Sparrow, Northern Harrier
Eastern Meadowlark		Sparse to dense grass-dominated cover (10-20 in.), preferably in low-lying areas with damp soils, thick layer of dead grass, scattered shrubs and tall forbs (1-15 in.) for song perches; prefer mixed grass fields to alfalfa.	

Adaptive Management

The priority resources of concern and their respective habitat attributes were used to develop specific habitat objectives. Refuge habitat management objectives must be achievable. Many factors, such as lack of resources, existing habitat conditions, species response to habitat manipulations, climatic changes, contaminants or invasive species, may reduce or eliminate the ability of the Refuge to achieve objectives. Although these limiting factors were considered during the development of Refuge objectives, conditions may and are likely to change over the next 15 years and beyond.

The Refuge will use adaptive management to respond to changing conditions that impair our ability to measure and achieve the habitat objectives. This requires that we establish and maintain a monitoring program to ensure that we can detect and respond to changing conditions.

References

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