Appendix N

USFWS

American woodcock

Process for Establishing Alternative B Focal Species

Process for Establishing Refuge Focal Species and Priority Habitats for Management Under Alternative B

Introduction and Background

Biological goals and objectives for managing species and habitats serve as the foundation for developing respective refuge comprehensive conservation plans (CCPs) and habitat management plans (HMPs). What follows is the description of a process the Lake Umbagog NWR CCP planning team used to determine which species and associated habitats should be a management priority on this refuge.

The Service is entrusted by Congress to conserve and protect migratory birds and fish, Federal-listed threatened and endangered species, inter-jurisdictional fish, wetlands, and certain marine mammals. These are collectively and individually referred to as Federal trust resources. In addition to this mission to protect and conserve Federal trust resources, each refuge has one or more purposes for which it was established that further guide its management goals and objectives. Finally, there are also a multitude of laws, mandates, policies, and conservation plans at various geographic scales, which influence refuge management priorities.

During the Lake Umbagog National Wildlife Refuge (NWR) CCP process, the planning team identified which species of conservation concern and associated habitats should be a focus for refuge management. In making this determination, the team considered the factors noted above, as well as the refuge's geographic location, local site capabilities, species' relative abundance and distribution, respective species status in national and regional conservation plans, and a determination of what the most important and effective ecological contribution the refuge could make to the Northern Forest ecosystem and the National Wildlife Refuge System. Lastly, species were selected because their habitat needs broadly represent the habitat requirements for many other native wildlife dependent on these same habitat types, including other Federal trust resources. The selected species are referred to herein, and in the CCP, as "refuge focal species."

The following details the process the planning team used to identify priority resources of concern, and ultimately, the refuge focal species and the habitat management priorities to benefit these resources. For each step, a brief synopsis is given, followed by a discussion of the details of each step.

1.0) Collect Information and Data
- 1.1) Legal Mandates, Policies and Establishing Purposes of the Refuge
- 1.2) Matrix of Potential Resources of Concern Based on National, Regional, State and Local Plans
- 1.3) Gather Expert Opinion
- 1.4) Develop Maps
- 1.5) Conduct Baseline Wildlife Surveys

2.0) Identify Potential Resources of Concern

3.0) Associate Priority Resources of Concern with Refuge Habitat Types
- 3.1) Wetland Habitats
  - 3.1 a) Mandates and Plans
  - 3.1 b) Wetland Habitats and Priority Resources of Concern
- 3.2) Upland Habitats
  - 3.2 a) Scale of Assessment for Refuges
  - 3.2 b) Application of Species Ranks in Bird Plans
  - 3.2 c) Application of Breeding Bird Survey Data to Determine Areas of Concentration
  - 3.2 d) Assess Current and Potential Vegetation
  - 3.2 e) Desired Future Habitat Conditions and Priority Resources of Concern

4.0) Select Lake Umbagog Refuge Focal Species
- 4.1) Habitat Relationships

5.0) Common Goals with Partners

1.0) Collect Information and Data

1.1) Legal Mandates, Policies and Establishing Purpose of the Refuge

Legal mandates for the National Wildlife Refuge System along with a refuge's establishing legislation and U.S. Fish and Wildlife Service (FWS) policies guide the process for selecting resources of concern. Lake Umbagog NWR was established under the Emergency Wetlands Resource Act, Migratory Bird Conservation Act and the Fish and Wildlife Act. The Environmental Assessment, used to establish the refuge, states that the purpose of the refuge is to ensure the long-term protection of unique wetland habitat and to protect habitat for bald eagle, black duck, and common loon.

Supporting Discussion:

Legal Mandates:

The establishing authorities allowing purchase of lands for Lake Umbagog NWR are:
1. The Emergency Wetlands Resources Act of 1986 (16 U.S. C. 3901 (b)):

"...for the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions."

2. The Migratory Bird Conservation Act (16 U.S.C. 715d):

"...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds."

3. Fish and Wildlife Act of 1956 (16 U.S.C. 742 f(a)(4)):

"...for the development, advancement, management, conservation, and protection of fish and wildlife resources...."

4. Fish and Wildlife Act of 1956 (16 U.S.C. 742 f(b)(1)):

"...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude…"

The 1991 Environmental Assessment (EA) for establishing Lake Umbagog NWR states,

"The purpose of the Lake Umbagog National Wildlife Refuge is to ensure the long-term protection of unique wetland habitats adjacent to Lake Umbagog, on the northern New Hampshire/Maine border. These extensive wetlands serve as important breeding and migration habitat for many wetland-dependant migratory wildlife species of current concern to the Service. The refuge includes wetlands and portions of associated surrounding uplands, and would protect habitat for the endangered bald eagle and peregrine falcon, waterfowl species of priority such as the declining black duck, and many species of federal and state management concern including the common loon, northern harrier, American woodcock, and others. The Refuge will serve to protect unique habitats that support a variety of migratory bird and resident mammal, fish, reptile, amphibian, invertebrate, and rare plant species and will thereby contribute to the conservation of biological diversity in the northeastern United States." (USFWS 1991)

FWS Policies:

Section 4(a)(3) of the Refuge System Improvement Act (Improvement Act) states, *"(A) each refuge shall be managed to fulfill the Mission of the System, as well as the specific purposes for which that refuge was established….."*

The Improvement Act further states, *"In administering the System, the Secretary shall….ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans….."* To meet this mandate the Service, developed a Biological Integrity, Diversity and Environmental Health Policy (Integrity Policy) to provide implementation guidance (601 FW 3). The Integrity Policy uses historical conditions and the evaluation of a refuge at various landscape scales, including refuge, ecosystem, national and international scales, to determine the integrity and environmental health of a refuge's lands and its contribution to biological diversity.

1. 2) Matrix of *Potential* Resources of Concern Based on National, Regional, State and Local Conservation Plans

An overall list of "Species and Habitats of Conservation Concern Known or Suspected on the Refuge," which includes species and plant communities, was generated by the CCP planning team using national, regional, state and local conservation plans. This list can be found in Appendix B of the CCP. In addition to the species specific conservation plans, and respective state Wildlife Comprehensive Wildlife Conservation Plans and Natural Heritage Program lists used to develop Appendix B, information from the Federal Energy Regulatory Commission (FERC) license for the Errol Dam was also used.

Supporting Discussion:

Sources used to compile the list of resources of concern included:

- Bird Conservation Region (BCR) 14 – Atlantic Northern Forest
- Partners in Flight (PIF) Physiographic Area 28
- North American Waterfowl Management Plan
- Federal Threatened and Endangered Species
- U.S. Shorebird Conservation Plan
- North American Waterbird Conservation Plan
- Maine Natural Areas Program - State Threatened and Endangered Species
- New Hampshire Natural Heritage Bureau – State Threatened and Endangered Species

- Northeast States Non-game Technical Committee
- Maine and New Hampshire State Comprehensive Wildlife Conservation Plans
- New Hampshire Natural Heritage Inventory
- USFWS Birds of Conservation Concern – Region 5
- FERC Errol Dam License
- Eastern Brook Trout Joint Venture Plan

1.3) Gather Expert Opinion

Wetland Meeting

The core planning team met with freshwater wetland experts, Ron Davis (Univ. of Maine), Curtis Bohlen (Bates College) and Jerry Longcore (USGS) during development of the CCP. The significance of the refuge's wetlands within the broader landscape was emphasized. The unique flat topography of the area, large shallow lake, large rivers with many meanders and oxbows, creates an area with a high diversity of nesting waterfowl, wading and marshbirds. These wetlands encompass a number of rare wetland communities, including an unusual circumneutral patterned fen, silver maple floodplain forest and large exemplary peatlands. It was noted that the Dead Cambridge River system was unique in that it is complete and one of the only undammed systems in this region of New Hampshire and Maine.

The hydrological and flooding regimes were discussed in relationship to management, restoration, and research. It was felt that the mimicking of a natural flood regime would tend to convert the fens to open emergent plant communities. It was recommended to conduct studies of the Umbagog system hydrology and current conditions to determine the best water level management.

Forest Ecology Meeting

The core planning team met with forest management and bird conservation subject matter experts from academic institutions and state and federal agencies during development of the CCP to determine potential management options for refuge species and habitats of conservation concern. The group discussed management of forest habitat types based on site capability, managing for structural components necessary for wildlife habitat, managing to provide habitat components that are underrepresented in the industrial forest landscape and managing for the long term. Specific resources of concern that were discussed were early successional forests, including the aspen-birch community type, older aged softwoods, riparian forests, and both young and mature/over mature ages classes in all forest types. It was the opinion of the group that PIF and BCR species of concern should reflect the both the natural capability of the land to produce a given habitat type and under-represented habitat components at the watershed, statewide and Northern Forest levels.

Site Visit with Forest Ecologists

U.S. Forest Service ecologists Bill Leak and Steve Fay, and USDA- Natural Resource Conservation Service soil scientist Joe Homer (USDA), accompanied the core planning team to sites with various forest conditions on the refuge. At each site, current conditions and projected successional paths were discussing in relationship to forest management techniques. It was noted that at many of the sites a higher component of hardwood species were present than the soils and site conditions represented.

1.4) Develop Maps

Maps were developed to assist with determining priority habitats and focal species. The following is a list of maps used through out the CCP process.

Current Vegetation Map – National Vegetation Classification System
Forest Stand Map – Society of American Foresters classification
Soils Map – USDA Natural Resources Conservation Service Soil Types National Wetlands Inventory Map
Ecological Land Units Map
Landbird Species Distribution and Breeding Bird Survey Relative Abundance Maps

1.5) Conduct Baseline Wildlife Surveys

Baseline wildlife surveys were conducted to assist with determining species presence and abundance on the refuge. The following is a list of surveys which contributed to the selection of priority habitats and focal species.

Anuran Call Counts
This survey was part of a U.S. Fish and Wildlife Service Region 5 Regional amphibian monitoring effort. Four point count routes with 5-10 survey points per route (total of 28 points) were surveyed 3 times/ yr. in the spring

Marshbirds
This survey is part of a national marshbird monitoring effort, using a point count-call playback methodology. Points are surveyed 3 times/ year in the spring. Three point count routes with 4-12 survey points per route (total of 24 points), were surveyed.

Waterfowl
A migratory waterfowl survey was carried out during the fall, 2000 season. The objective of this survey was to gather additional information about waterfowl use of the refuge just prior to and during hunting season. Surveys of the entire lake, Magalloway River, and upper Androscoggin River (including Harper's Meadow and Sweat Meadow) were carried out by boat between September- November

Shorebirds
A shorebird survey was carried out in Spring, 2000, following the standard Manomet Bird Observatory shorebird protocol. Three boat surveys were carried out during May and early June.

Wetland Vegetation
An intensive vegetation survey of the Refuge's largest peatlands was carried out in 2002-2004. Permanent vegetation monitoring plots were established in each peatland. Peat depths, water levels and pH were also measured. Vegetation data are also collected around each marshbird survey point, annually.

Aquatic Macroinvertebrates
Aquatic macroinvertebrates were sampled at 20 sites on Umbagog Lake and the Magalloway River in 2003.

Terrestrial Amphibians and Small Mammals
Pitfall traps, coverboards, and funnel traps were used to survey terrestrial amphibians and small mammals in different habitat types over a 4 year period.

Bats
Bat surveys were carried out using mist-nets at various Refuge locations in 2000, 2001.

Vernal Pool Amphibians and Stream Salamanders
Vernal pools amphibians and stream salamanders were surveyed from 2001-2004, using national protocols.

Landbirds
Landbirds have been surveyed annually using point count methodology from 1999-2005, following a Regional protocol. Sixteen transect routes are surveyed in a wide variety of habitat types. Detail vegetation structure data have been collected at each survey point.

Mid-sized Carnivores
Baited remote camera stations are set-up during the winter months at various locations on the Refuge to help survey for carnivores. Snow tracking surveys are carried out concurrently.

Forest Inventory
Approximately 400 points distributed in 200m x 200m grid were surveyed for forest stand characteristics in 2005.

Eagles, Osprey and Loon Monitoring
Ongoing monitoring to determine breeding success of these species is conducted in cooperation with New Hampshire Audubon and the Loon Preservation Committee.

2.0) Identify Potential Resources of Concern

Potential resources of concern including birds, mammals, fish, invertebrates, plants and plant communities were compiled from the plans listed in section 1.2 above and the refuge's establishing EA. CCP planning team representatives from Maine and New Hampshire identified state resources of concern that occur in the refuge area. See CCP Appendix B for the compilation of species and plant communities of conservation concern known or suspected on the refuge.

3.0) Select Priority Resources of Concern by Refuge Habitat Types

3.1) Wetland Habitat

3.1 a) Mandates and Plans

In 1990, the Service's Northeast Region developed a Regional Wetlands Concept Plan. This plan complements the National Wetlands Priority Conservation Plan required under the Emergency Wetlands Resources Act of 1986 (public law 99-645). The regional plan provides more specific information about the wetland resources of the northeastern and mid-Atlantic U.S. Lake Umbagog is specifically mentioned in this plan as a wetland of importance, citing its function and values to wildlife, fisheries, outdoor recreation, and other areas of concern.

Other plans consulted include the North American Waterfowl Management Plan, Atlantic Coast Joint Venture, the North Atlantic Regional Shorebird Plan, the Bird Conservation Region 14 Blueprint, and Service recovery plans, as well as the refuge's establishing EA.

3.1 b) Wetland Habitats and Priority Resources of Concern

Based on the refuge's establishing purpose, conservation plans, and expert opinion, the CCP planning team determined that the conservation of wetlands was the highest priority for this refuge. They chose the following priority resources of concern for the freshwater wetlands from the compiled matrix of potential species and habitats of conservation concern (table N.1):

Table N.1. Priority Resources of Concern for Wetland Habitat

Wetland Habitat	Priority Resources of Concern
Fen and Flooded Meadow	American Black Duck Ring-necked Duck Common Loon Waterfowl and Shorebirds during migration
Boreal Fen and Bog	Floating Island National Natural Landmark Circumneutral Pattern Fen Rare Peatland Plants
Northern White Cedar Swamp	Rare Plant Community
Shrub-Scrub Wetland	American Black Duck Canada warbler American woodcock
Wooded Floodplain	American Black Duck Cavity Nesting Waterfowl Northern Parula American woodcock
Open Water	Native Brook Trout Common Loon Eagle and Osprey Waterfowl during migration

Supporting Discussion:

Umbagog Lake is identified as one of three waterfowl focus areas in New Hampshire under the North American Waterfowl Management Plan, Atlantic Coast Joint Venture (NAWMP; ACJV, unpublished data). The refuge supports the highest concentrations of nesting black duck in New Hampshire (USFWS 1991). The black duck is a species of concern in the NAWMP because of the historic decline in their population, with habitat loss an important contributing factor. The regional importance of Umbagog Lake to the black duck was one of the primary reasons the refuge was established. Although black duck populations are stable or increasing, they are listed as a species of highest priority for conservation in BCR 14 (Dettmers 2006).

The waters of Umbagog Lake are impounded by a hydropower dam and water levels are manipulated by a private power company. Common loons have been used in the past as indicators for monitoring water level impacts to the wetlands and other wildlife as required by agreements in the FERC license. The planning team intends to expand the indicator species monitoring program for the lake to include other waterbirds that nest earlier than common loons, nest close to the water, and are affected by water level changes. For example, ring-necked ducks were identified. Umbagog Lake has the highest nesting concentration of ring-necked ducks in New Hampshire (USFWS 1991). Ring-

necked ducks build floating nests over shallow water in the emergent vegetation. For these reasons, ring-necked duck is a priority species of concern.

Within the Refuge System, Lake Umbagog NWR is one of only three national wildlife refuges in the lower 48 states that support a significant number of breeding common loon. The common loon is listed as a species of management concern for the northeast (Schneider 1992). It is also listed as a high priority for conservation in BCR 14 (Dettmers 2006). One of the key reasons for establishing the refuge was to permanently protect this common loon breeding area, therefore making it a focal species for the CCP.

The bald eagle is listed as a threatened species under the Federal Endangered Species Act and is state-listed as endangered in New Hampshire and threatened in Maine. The refuge was established, in part, to protect bald eagle and osprey, thus justifying these species as priority species of concern. These species are both dependant on aquatic and upland habitats and serve as good indicators of the environmental health.

The Integrity Policy requires the inclusion of plant communities that contribute to biological diversity. The Lake Umbagog NWR has several rare and unique plant communities which contribute to the native biological diversity of this area. These communities include: a 750-acre "Floating Island" designated as a National Natural Landmark; 870-acre peatland complex (Nazaire 2003); a rare circumneutral-patterned fen of high regional significance (Dan Sperduto, NHNHP, unpublished data); 1,031-acre northern white cedar swamp, a 'signature community' of the northern woods (Sperduto and Engstrom 1998) and several peatlands such as black spruce bog, spruce-fir swamp, and shrub fens. Those reasons support the identification of these wetland plant communities as priority resources of concern.

It was previously mentioned that, consistent with meeting refuge purposes, protecting and conserving Federal trust resources is part of the Service mission. Eastern brook trout are a Federal trust species. The Eastern Brook Trout Joint Venture Plan identifies native brook trout as a high priority species for this area. For Lake Umbagog NWR, this species is identified as a priority species of concern since a native brook trout population relies on Umbagog Lake and its main tributary the Magalloway River as wintering habitat (Diane Emerson, NHFG, pers. comm.).

3.2) Upland Habitats and Priority Resources of Concern

To guide the determination of which landbird species and associated upland habitats should be a management priority, the planning team consulted the previously mentioned bird conservation plans, the refuge's purposes, and the Integrity Policy. In addition, the team used breeding bird survey data for the area, and analyzed current and potential natural vegetation and desired future conditions, and evaluated the habitat needs of each of the priority species.

Many conservation projects are applying landbird plans to planning areas using computer modeling to determine areas of high importance for species or groups of species. This approach identifies

geographic locations that benefit the most species or benefit a high priority single species, allowing for proactive, focused conservation efforts in those areas. However, if a refuge falls outside of these designated high priority areas, the process does not contribute to establishing priorities for that refuge (Ralph and Rich 2002; Ford and Roedel 2004; Mueller 2000; Probst and Thompson 1996; Rosenberg and Wells 2000b). In those situations, a different process is needed, centered on a given location such as a refuge, to determine how it can best contribute to the priorities for the planning area. This process identifies the habitats that are most beneficial to priority landbirds based on species distributions, refuge site capabilities, and the refuge's location within the planning area.

3.2 a) Scale of Landbird Assessment for Refuges

The Integrity Policy clearly requires managers to look at the refuge at multiple scales, from local to regional to national, when evaluating any refuge's contribution to integrity, diversity and health (Scott 2004). When determining the role of a particular refuge in an ecosystem, Schroeder et al. (2004) poses the question, "What is the appropriate landscape scale to assess the importance of this refuge's resources?" The scale of analysis becomes dependant upon the priority resources being assessed. When determining a specific refuge's contribution to certain landbirds which occur within multiple bird conservation regions, the continental scale is a more appropriate scale of assessment (Freemark 1992)

Supporting Discussion:

Determining which scale and hierarchical context for analyzing a refuge's potential to contribute to priority resources is needed to ensure the goals at various spatial scales are compatible, significant, and relative to the resource. It is also necessary to understand the scale in which other conservation partners are operating within the larger regional planning area, local planning area, state or bird conservation region (Sportza 1999; Freemark 1993). Refuges are often unique within cooperative regional conservation planning efforts. They are one of the few conservation entities that need to consider their role at the continental scale as part of the National Wildlife Refuge System. While it may seem counter-intuitive, incorporating large-scale perspectives can assist in narrowing the focus in deciding management priorities within certain management units (Knopf 1994). In fact, a refuge's highest priority may be decided based on its contribution to priority resources at the continental scale.

3.2 b) Application of Species Ranks in Bird Conservation Plans

The PIF Area 28 and BCR 14 species assessment identify species ranks as a means to measure conservation need and identify geographic areas of greatest importance to the long-term conservation of that species (table N.2). The planning team used these plan's rankings to select a sub-set of species which are a national concern, as well as have a high proportion of their population within BCR 14. By first developing this sub-set of species and identifying their associated habitats, the team could then evaluate, given the geographic location of the refuge within the continent and BCR 14, which species' could be impacted the most through refuge management.

A sub-set of 32 species were selected from the PIF Area 28 and BCR 14 plans to assess Lake Umbagog NWR's potential contribution to their conservation. The 32 species, and their PIF and BCR rank, are listed at the end of this Appendix in table N.7.

Table N.2. The combination of Continental Concern, BCR Responsibility, and BCR Concern define the species Tier ranks of "Highest", "High" or "Medium". There is also the corresponding PIF Tier of similar definition. Species with ranks that are shaded formed the sub-set of species for refuge analysis

BCR Tier	Continental Concern	BCR Responsibility	BCR Concern	BCR Rank	Corresponding PIF Tier
Highest	High	High or Moderate	High	A	1a
High	Moderate	High or Moderate	High	B	2a
	High	High or Moderate	Moderate	C	1a
	Moderate	High	Moderate	D	2a
Medium	High or Moderate	Low	High	E	1b or 2c
	Low	High or Moderate	High	F	2a
	High	Low	Moderate	G	1b
	Moderate	Moderate	Moderate	H	-
	Low	High	Moderate	I	-
	High	High or Moderate	Low	J	-
	Moderate	High	Low	K	-
	Low	High	Low	L	-

Supporting Discussion:

Partners In Flight (PIF) assessments for Physiographic Areas, and Bird Conservation Regions (BCRs) have incorporated the regional as well as the continental scale into their species ranks (Rosenberg 1995; 2000a; 2000b; Panjabi 2001), providing a starting point for selecting priority species for a refuge. Rosenberg and Wells used PIF scores, along with Breeding Bird Survey and Breeding Bird Atlas data to identify species that are 'high-priority' for the Northeast Region for two different reasons. Land managers are 'responsible' for selected species based on their ability to affect a portion of the species population and contribute to long term population stability, and because of their geographic location (regional or BCR responsibility). Land managers need to also be 'concerned' about a suite of species who are experiencing long-term declines, threats to their habitat, or threats from other factors that could limit the species' long-term viability within their region (regional or BCR concern).

Prioritization of species in need of immediate management action or long-term responsibility based on the level of contribution due to geographic location, has been conducted at the continental scale (Rich et al. 2004), the USFWS regional scale (Rosenberg and Wells 2000b), the PIF Physiographic scale, and is now being incorporated into BCR plans (draft BCR landbird analysis rules, R. Dettmers, pers comm)
The PIF/BCR tiering allows for prioritizing landbird conservation efforts at different scales. The role of refuges is to address the habitats of species of high continental concern

and species that have a high proportion of their population in a BCR. This will allow an individual refuge to have the greatest effect nationally and regionally, while contributing to BCR goals. By first looking at the habitats of selected species, we maximize the efforts of the Refuge System by managing for the habitats with the highest ranking species, which typically represent the habitats unique to that portion of the continent.

There have been a number of conservation planning projects in Canada and the U.S., in which PIF scoring and the identification of centers of abundance for species and species assemblages within the planning unit have been used to determine priority areas (Ford 2004; Dunn 1999; Probst 1996)

The level of concern identified for a species in one BCR plan may not be consistent with the level of concern in another BCR plan. With refuges located in every state, a species may be of a lower continental concern on one refuge in a certain BCR and a high continental concern on another refuge in another BCR. Refuge management for a particular species should concentrate only where it can make an important contribution within the species range.

In summary, different areas of the country (and, hence the Refuge System) have varying potentials to make a significant contribution to the conservation of a species. This can be demonstrated below by the PIF Tiers for the olive-sided flycatcher. The PIF areas that contain the majority of this species' population concentration (western U.S. and Canada) are ranked high continental concern (Tier 1a), while the eastern PIF areas have a lower population concentration, and hence a lower level of conservation responsibility (Tier 1b). Depending on where a refuge is located, this information has implications to refuge planning and the development of habitat goals and objectives.

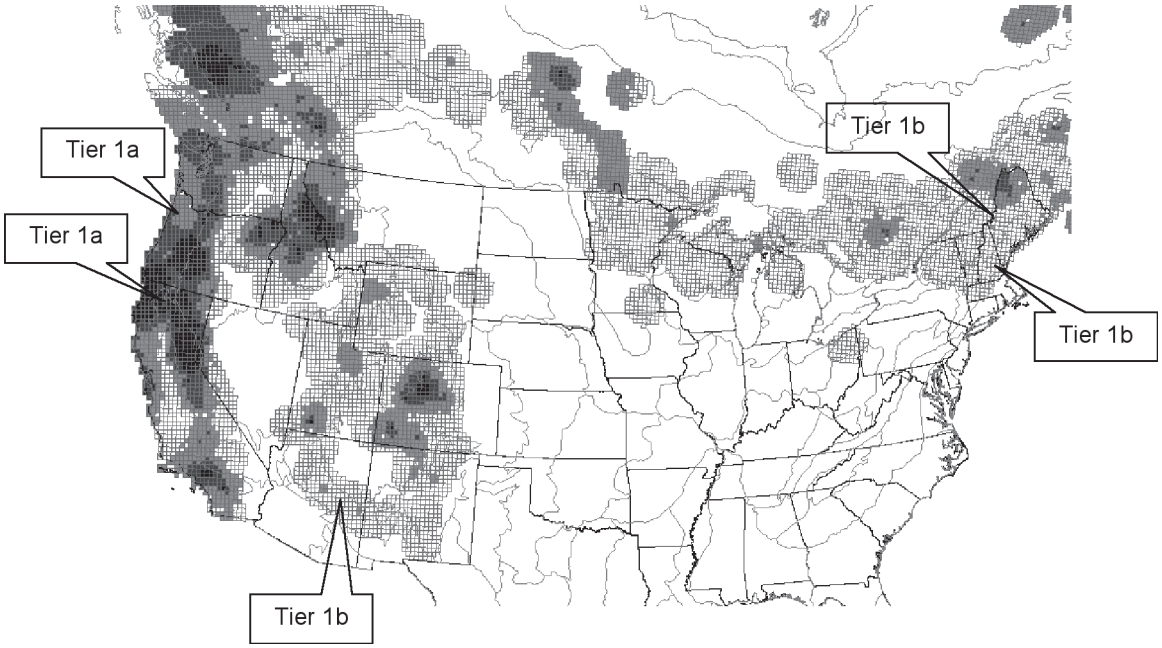

Figure N.1. Olive-sided flycatcher distribution, and relative abundance based on Breeding Bird Survey data. The darkest area has the highest concentration; the lightest areas are the lowest concentration for this species. The gray lines delineate PIF physiographic areas.

3.2 c) Application of Breeding Bird Survey Data to Determine Areas of Concentration

Breeding Bird Survey (BBS) data was used to display the relative abundance for selected bird species, species were grouped by their primary breeding habitat. Thirty-two species were selected based on their PIF/BCR Tier, and relative abundance was compared in relationship to the refuge's location, the remaining BCR 14 and FWS Region 5. Table N.2 has the results of this analysis.

Table N.3 list which species showed a high relative abundance in the vicinity of Lake Umbagog NWR:

Table N.3. Species with a High Relative Abundance for Lake Umbagog NWR

Selected Species	BBS Relative Abundance Code *	Primary Habitat
Blackburnian Warbler	5	Mixed and Conifer Forest
Black-throated Green Warbler	4	Mixed and Conifer Forest
Canada Warbler	4	Mixed Forest and Shrub-Scrub Wetland
Black-throated Blue Warbler	4	Hardwood Forest
Northern Parula	4	Wooded Floodplain
American Woodcock	4	Shrub-scrub Wetland

* Relative abundance is displayed in a range of 1 to 5, one indicating the areas of lowest concentration; 5 indicating the area of highest concentration.

Supporting Discussion:

An ArcView Geographic Information System (GIS) project was developed to display relative abundance from the Breeding Bird Survey data for 32 species. Each species' relative abundance at the refuge's location was assessed with the relative abundance within the rest of BCR 14. Relative abundance is displayed in a range of 1 to 5, one indicating the areas of lowest concentration, 5 indicating the area of highest concentration. Sauer (2004) cautions against using BBS data to assess management actions at the local scale based on trends, and acknowledges its usefulness at providing a large-scale view of bird populations, setting a regional context for evaluation (Sauer 2004). We used the Breeding Bird Survey data at the regional, BCR scale.

Many of the selected species, although they are of high conservation concern for BCR 14, did not occur in the vicinity of the refuge or were at the edge of the species range. In order for management efforts to be most effective, it is best to target areas of high existing or predicted concentrations. Table N.7, at the end of this Appendix, lists the relative abundance for the selected species.

Species preferring the spruce fir/northern hardwood mixed forest, including Canada warbler, blackburnian warbler, black-throated green warbler, and northern parula, occurred at the highest relative abundances (4 and 5) in the vicinity of the refuge. This is also reflected in refuge survey data, blackburnian warblers and northern parula are among the most frequently detected species. In the PIF Eastern Spruce-Hardwood Physiographic Area 28 Plan, the mixed forest is identified as a high priority habitat that is critical for 'long-term planning to conserve regionally important bird populations' (Rosenberg and Hodgeman 2000).

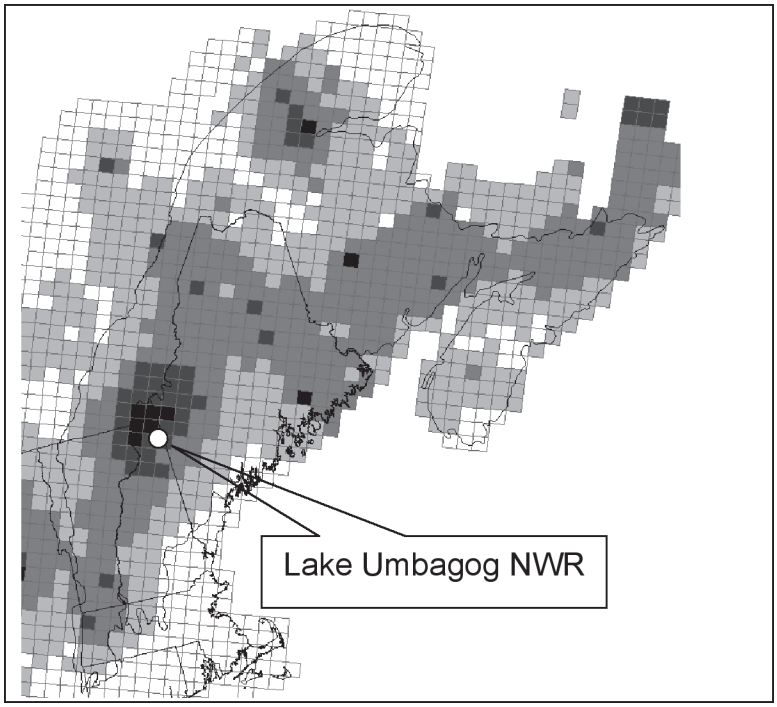

Figure N.2. Blackburnian warbler relative abundance based on Breeding Bird Survey data. Lake Umbagog NWR is in an area of the highest concentration for BCR 14.

Species preferring hardwood forests, including wood thrush, black-throated blue warbler, American redstart and veery, showed relative abundances of 2 to 4. A notable exception was the high relative abundance for American woodcock (4), which is dependant upon early successional and aspen/birch habitat in conjunction with moist soil areas (the riparian areas at Lake Umbagog). Relative abundance for American woodcock was obtained through summarized Woodcock Survey data (Sauer, USGS, Patuxent Wildlife Research Center, MD, unpublished data). The American woodcock is a species of highest concern for BCR 14 and showed a relative abundance of 4 in the vicinity of the refuge.

While species dependant on coniferous forest, boreal chickadee, bay-breasted and Cape May warblers are of high and highest concern in BCR 14, they showed the lowest relative abundances of 1 and 2. Refuge survey data reflect this low abundance as well, where

only one Cape May and four bay-breasted warblers were detected in 2005. Higher concentrations of these species occur in northern Maine and New Brunswick where extensive areas of conifer forest are more prevalent.

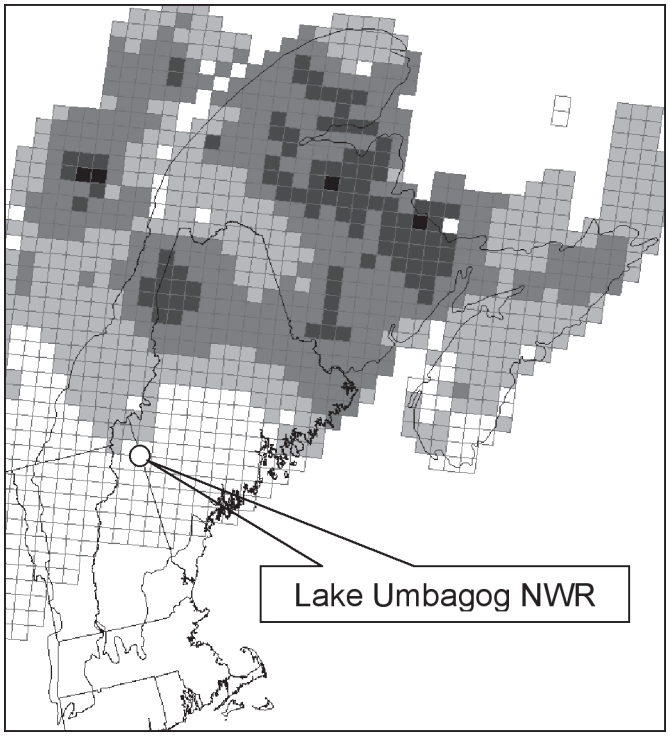

Figure N.3. Bay-breasted warbler relative abundance based on Breeding Bird Survey data. Lake Umbagog NWR is not in an area of the highest concentration for BCR 14.

3.2 d) Assessing Current and Potential Vegetation

Current and potential vegetation was assessed using national landcover data and predicted vegetation based on computer modeled ecological land units (ELUs). The results of the analysis showed a smaller existing softwood component in the current landscape, than predicted by ELUs. Cogbill (pers. comm., 2004) also found the historic forest to include more conifer, particularly in the lowlands, than exists today. Current conditions most likely reflect past logging practices that selected softwoods, resulting in a higher presence of hardwood species.

Supporting Discussion:

During the conservation planning process, habitat and therefore vegetation, becomes a key element in evaluating a planning units contribution to conservation targets. Not only is it necessary to know the current vegetation within the planning unit, it may also be necessary

to know the potential vegetation that could occur in the future. Past and current harvesting have influenced the species composition and do not necessarily represent the vegetation that would naturally occur at a given site. It is most efficient to manage for the species that naturally occur at a site.

The Integrity Policy describes environmental health to be a composition, structure and functioning of soil, water, air and other abiotic features comparable with historic conditions. A spatial analysis was conducted using the geographic information system (GIS) ArcMap9 to determine sites with favorable conditions for naturally growing hardwood, softwood and mixed wood, and therefore environmental health. A base layer of ecological land units (ELUs), a composite of broad abiotic data displayed in 30 meter pixels developed by the Nature Conservancy (Mark Anderson, TNC Eastern Resource Office, Boston, MA), was overlaid with more site specific data to assign conifer, mixed and hardwood habitat types to ELUs. This analysis is outlined in Appendix L.

3.2 e) Desired Future Habitat Conditions and Priority Resources of Concern

After conducting the above species and landscape analysis, the refuge planning team determined that sustaining the mixed spruce-fir/northern hardwood forest, was the most important and efficient ecological contribution the refuge could make through management to the Upper Androscoggin River watershed, BCR 14, and the National Wildlife Refuge System. The priority species chosen as refuge focal species for this habitat are the blackburnian, black-throated green, and Canada warblers (table N.4). Refuge management will strive to promote the conifer component in the mixed forest landscape to benefit the focal species,which were selected in part, because they have a higher relative abundances in this landscape and they generally represent habitats with the highest site capability. Secondary benefactors of an increased conifer component will be the bay-breasted and Cape May warblers, which are both species of highest concern for BCR 14.

American woodcock was chosen as a refuge focal species for early successional habitat in close proximity to aspen/birch and riparian habitat. The northern parula was also chosen as a refuge focal species for riparian habitat (table N.4).

Table N.4. Refuge Focal Species for Upland Habitat Types

Upland Habitat	Refuge Focal Species
Mixed Spruce-Fir/Northern Hardwood Forest	Canada Warbler Blackburnian Warbler Black-throated Green Warbler American Woodcock
Lakeshore Pine Hemlock	Bald Eagle Osprey Landbirds during migration
Early Successional	American Woodcock

Supporting Discussion:

The species that showed the highest relative abundances within the Upper Androscoggin River watershed basin are those of the mixed spruce-fir/northern hardwood forest. As mentioned earlier, this mixed forest is the past, current, and potential future, dominant landscape forest, despite decades of manipulation. It is the anticipated climax forest condition that would naturally occur.

The blackburnian, black-throated green, and Canada warblers were selected as refuge focal species because of the refuge's location within the areas of high concentration for these species, and because of the refuge's site capabilities and its extensive, existing and sustainable mixed spruce-fir/northern hardwood forest landscape. Managing in areas of high concentration within priority species' ranges, which also represent the habitat that would naturally occur in that location, maximizes refuge efforts and is most efficient. The planning team has determined that maintaining the mixed forest, with emphasis on managing for these focal species, is the highest and best contribution Lake Umbagog NWR can make within the northern New Hampshire and western Maine conservation estate as well as the National Wildlife Refuge System.

While we would emphasize the mixed forest with a high conifer component, and associated focal species for the reasons noted above, this should not be construed that we would ignore other important species of conservation concern. The BCR 14 conservation plan identifies Cape May and bay-breasted warblers among the highest priority landbirds. They occur on the refuge in low abundances because of their preference for extensive, contiguous, mature conifer forests. Although they are not a refuge management priority, they would increasingly benefit over time from proposed management designed to increase the conifer component within the refuge landscape and promote larger blocks of mature spruce-fir. We will continue to monitor their presence and response to management along with our focal species.

Species that prefer hardwood forest showed moderate relative abundances in the refuge landscape; however, refuge management for this habitat type would not be a high priority. The site capabilities of current and proposed future refuge lands do not favor large blocks of hardwoods. Also, other areas of BCR 14 and the Northeast U.S. (USFWS Region 5) provide better opportunities to manage and sustain extensive areas of this habitat type. In addition, the planning team anticipates the refuge's surrounding landowners would continue conducting management as in the past, driven by the timber market, resulting in a higher hardwood component and a higher presence of hardwood-dependant landbird species.

4.0) Refuge Focal Species for Lake Umbagog NWR

From steps 1 through 3 above, the following table (table N.5) identifies high and moderate refuge habitats that will be a priority for active management in the next 15 years, and the refuge focal species associated with those habitats types.

Table N.5. Refuge Management Priority Habitats and Associated Focal Species

High Management Priority Habitats	Refuge Focal Species
Fen and Flooded Meadow	American Black Duck Ring-necked Duck Common Loon
Wooded Floodplain	American Black Duck Cavity Nesting Waterfowl Northern Parula
Shrub-Scrub Wetland	American Woodcock American Black Duck Canada Warbler
Open Water	Native Brook Trout Eagle and Osprey Common Loon
Mixed Forest – "Mixed Woods" Habitat Type	Blackburnian Warbler Canada Warbler Black-throated Green Warbler
Mixed Forest – Spruce/fir Habitat Type	Blackburnian Warbler Black-throated Green Warbler
Moderate Management Priority Habitats	**Refuge Focal Species**
Boreal Fen and Bog	Floating Island National Natural Landmark Rare Plant Communities
N. White Cedar Swamp	Rare Plant Community
Lakeshore Pine Hemlock	Eagle and Osprey Nest Sites
Mixed Forest – Northern Hardwood Habitat Type	Canada Warbler American Woodcock

4.1) Refuge Habitat-Focal Species Relationships

Table N.6 below identifies the key habitat structure elements for refuge focal species associated with respective refuge habitat types. Other species that will benefit from the management of the refuge focal species are listed in the far right column. Other benefiting species of conservation concern within the BCR, the State, or regional plan (Appendix B).

Table N.6. Key Habitat Structural Elements for Refuge Focal Species

Habitat	Refuge Focal Species	Habitat Structure	Other Benefiting Species
Fen and Flooded Meadow	American Black Duck	Nests within 145 meters of water. Food requirements include bulrush, arrowhead and wild rice. Key vegetation include sweetgale and conifers.	Pied-billed Grebe American Bittern Sora Migrating shorebirds, waterfowl and wading birds Leopard Frog Mink Frog Beaver
	Ring-necked Duck	Prefer shallow freshwater wetland with stable water levels and abundant emergent and submerged or floating plants. Nests are typically on a floating mat of vegetation, but often in clumps of herbaceous or shrubby growth or on islands. Peak nesting is in mid-May.	
	Common Loon	Nesting habitat associated with lakes in spruce-fir or spruce-fir northern hardwood transition zones. Bodies of water with stable water levels and little or no human disturbance. Nests on the ground at water's edge, usually on sand, rocks or other firm substrate. Prefers small islands to shore.	
Boreal Fen and Bog	Floating Island National Natural Landmark	Appropriate hydrology and nutrient input to maintain diverse plant community.	Palm Warbler Rusty Blackbird Yellow-bellied Flycatcher
	Circumneutral Pattern Fen		
	Rare Peatland Plants		
Northern White Cedar Swamp		Grows on sites with shallow organic layers, relief to have flowing groundwater, well decomposed organic layers and neutral or slightly basic pH.	Boreal Chickadee Gray Jay Black-backed Woodpecker Spruce Grouse
Shrub-Scrub Wetland	American Black Duck	Listed above.	Alder Flycatcher Common Yellowthroat Eastern Kingbird Beaver
	Canada Warbler	Forest with dense understory, especially along streams, bogs, swamps or moist areas. Northern hardwoods with softwood understory. High percent shrub cover (70%), moderate canopy cover (64%) and few conifers in the canopy. First appear in clear-cuts 5 yrs. after harvest, become common after 15 yrs and remain abundant until next cutting cycle.	
	American Woodcock	Moist, rich soil dominated by dense shrub cover (75-90%); alder is ideal, young aspen and birch are suitable as feeding areas and daytime cover. 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.	

Table N.6 (cont'd)

Habitat	Refuge Focal Species	Habitat Structure	Other Benefiting Species
Wooded Floodplain	American Black Duck	Listed above.	Wood Duck Common Goldeneye Common Merganser Hooded Merganser Rusty Blackbird American Redstart Big Brown Bat Hoary Bat Little Brown Bat Northern Long-eared Bat Vernal Pool Obligate species (Blue-spotted salamander, wood frog) Mink Frog
	Cavity Nesting Waterfowl	Large trees with cavities for nesting, near clear, clean water with abundant aquatic invertebrates for feeding (Goldeneye); sandy, gravelly, or cobbled bottom with abundant small fish, less than 24 in. deep (hooded merganser); calm to rapid flowing water 1.5 to 6 ft. deep (common merganser);water with brushy overstory, stumps and fallen logs, cavities within 1.2 miles of water (wood duck).	
	Northern Parula	Mature, moist spruce woods along forest or forest/shore edge where mosslike lichens (*Usnea*) are found. Close-canopy forests, variable conifer cover, and trees in the smaller size classes. Tolerates moderate levels of timber harvest, but absent from clear-cut and strip-cut areas. Sensitive to fragmentation, requires approximately 250 acres to sustain breeding populations.	
Open Water	Native Brook Trout	Cool, well-oxygenated water, temperature not to exceed 68°F for extended periods and oxygen levels remain at 5 ppm or greater. Vulnerable to the effects of predation and competition from other fishes, particularly in the first year or two of life. Spawn in flowing broods or streams, shore spawning successful in some ponds with spring-water inflows in gravelly shallows.	Migrating Waterfowl Land-locked Salmon American Eel Lake Chub
	Common Loon	Listed above.	
	Eagle and Osprey	Preferred feeding habitat: large bodies of water containing abundant fish resources (eagle); shallow-water areas of rivers, shoals of lakes where fish are close to the surface, abundant fish resources, preferably with little human disturbance (osprey).	

Table N.6 (cont'd)

Habitat		Refuge Focal Species	Habitat Structure	Other Benefiting Species
Mixed Spruce-Fir/Northern Hardwood Forest	Mixed Woods Habitat Type	Canada Warbler	Listed above.	Black and White Warbler Purple Finch Wood Thrush Northern Goshawk Northern Long-eared Bat Ruffed Grouse
		Blackburnian Warbler	Mature conifer forest of hemlock, pines, fir, spruce and mixed forests or moist forest where spruces are thickly draped with bearded lichen (Usnea). Strong affinity for saw-timber-size spruce and fire. Inhabits forests with high canopy cover (84%), variable coniferous cover and many trees in the smaller class sized >3 to <9.1 inches dbh. Nests high up in tree (usually spruce or hemlock), situated well away from the truck or in a small fork near the top of the tree.	
		Black-throated Green Warbler	Mid-to-mature mixed woodlands (especially hardwood-hemlock stands in northern hardwood-spruce), coniferous forest with large trees and larch bogs. Sensitive to logging activity, decline in heavily thinned forests. Large spruce for singing perches. Require large patches (>250 acres). Nest height 3 to 80 ft., typically 15 to 20 ft. usually on a horizontal or drooping branch in conifers and occasionally in hardwoods.	
	Spruce-fir Habitat Type	Blackburnian Warbler	Listed above.	Bay-breasted Warbler Cape May Warbler Boreal Chickadee Gray Jay Red Crossbill Spruce Grouse Three-toed Woodpecker Deer wintering areas Marten
		Black-throated Green Warbler	Listed above.	
	Northern Hardwood Habitat Type	Blackburnian Warbler	Foraging substrate of small limbs and bases of leaves.	Black-throated Blue Warbler Veery Wood Thrush Ovenbird
		Black-throated Green Warbler	Foraging substrate of paper birch. Occasional nesting.	
		Canada Warbler	Listed above.	
		American Woodcock	Listed above.	
Lakeshore Pine Hemlock		Bald Eagle and Osprey	Large trees adjacent to water for nesting, perching, and roosting, preferring areas with minimal human disturbance (eagle): elevated nest sites to 60 ft. preferring nest sites in or near water that provide good visibility, security and little human disturbance (osprey).	Migrating Landbirds Olive-sided Flycatcher Merlin

5.0) Common Goals with Partners

From the onset of the CCP process, wildlife partners from the States of Maine and New Hampshire have been involved with the selection of priority habitats, focal species and the development of refuge goals and objectives. Throughout the process, differing agency goals and scales of responsibility to conservation targets, was apparent. However, participative planning with professional wildlife stakeholders is useful to address issues that may otherwise result in controversy. The additional time and effort that is needed to identify priority habitats that offer commonality with partners' goals, is worthwhile and results in more broadly accepted decisions (Sportza 1999).

The planning team determined the most appropriate biological goals and objectives for the refuge based on National Wildlife Refuge System policy, and then found commonalities with the State partners in meeting State wildlife habitat goals. The freshwater wetlands and resources of concern that were identified as priorities for the refuge, are a direct overlap with State wetland goals. The mixed spruce-fir/northern hardwood forest contributes to State goals for the priority landbird species that were chosen, as well as provide habitat for other State species of concern. The mixed forest will provide connectivity of habitats for mammals with large home ranges and protection of white-tailed deer wintering areas.

Table N.7. Landbird species from the Bird Conservation Region 14 Plan. Species rankings for the BCR and for PIF Area 28 along with their Breeding Bird Survey relative abundance near the Refuge. Species selected for analysis based on their rank have a relative abundance. Species that were chosen as focal species for priority habitats are shaded.

Species Common Name	BBS	Bird Conservation Region 14					Partners In Flight
	Relative Abundance near Refuge	BCR Tier	Continental Concern	BCR Responsibility	BCR Concern	Blueprint Document	PIF 28 Tier
Am. Woodcock	4	Highest	*	*	*	1	1a
Canada Warbler	4		H	H	H	1	1a
Wood Thrush	2		H	M	H	1	1b
Olive-sided Flycatcher	1		H	M	H	2	1b
Ipswich Savannah Sparrow	0		*	*	*	1	-
Black-throated Blue Warbler	4	High	M	H	M	4	2b
Chestnut-sided Warbler	3		M	M	M	3	2a
Eastern Wood-Pewee	2		L	M	M	3	-
Rusty Blackbird	1		H	M	M	2	1a
Bay-breasted Warbler	1		H	H	M	1	1a
Cape May Warbler	1		M	M	M	3	2b
Black-billed Cuckoo	1		M	M	H	6	2a
Common Nighthawk	0		L	L	M	4	4
Bicknell's Thrush	0		H	H	M	1	1a
Nelson's Sharp-tailed Sparrow	0		H	M	M	1	1a
Chimney Swift	-		M	L	H	4	-
Long-eared Owl	-		M	M	M	4	4
Short-eared Owl	-	Medium	H	L	H	9	1b
Blackburnian Warbler	5		L	H	M	7	
Black-throated Green Warbler	4		L	H	M	7	
Northern Parula	4		L	H	M	7	2b
Purple Finch	3		L	H	M	4	2a
Brown Creeper	3		*	*	*	9	4
Ovenbird	3		L	M	L	7	2b
Veery	3		L	H	M	3	2a
American Redstart	2		L	H	M	4	
Boreal Chickadee	2		L	M	H	4	
Black-backed Woodpecker	2		*	*	*	9	4
Rose-breasted Grosbeak	2		M	M	M	5	2a
Bobolink	2		L	M	M	3	2a
N. Flicker	2		*	*	*	9	
Palm Warbler	1		*	*	*	9	
Gray Jay	1		*	*	*	9	4

Table N.7 (cont'd)

Species Common Name	BBS	Bird Conservation Region 14					Partners in Flight
	Relative Abundance near Refuge	BCR Tier	Continental Concern	BCR	BCR Concern	Blueprint Document	PIF 28 Tier
Yellow-bellied Flycatcher	1		*	*	*	8	
Blackpoll Warbler	1		M	L	H	6	4
Ruffed Grouse	1		L	M	H	5	
Pine Grosbeak	0		*	*	*	9	
Peregrine Falcon	-		*	*	*	9	3
Boreal Owl	-		*	*	*	9	
N. Goshawk	-		*	*	*	8	3
Yellow-bellied Sapsucker	-		L	H	M	4	
Whip-poor-will	-		*	*	*	9	4
Blue-winged Warbler	-		H	L	M	2	
Vesper Sparrow	-		*	*	*	9	
Upland Sandpiper	-		*	*	*	9	1b
Barn Swallow	-		*	*	*	9	
Bank Swallow	-		*	*	*	9	
Horned Lark	-		*	*	*	9	
N. Harrier	-		*	*	*	9	4
Willow Flycatcher	-		L	L	L		1b

BBS Relative Abundance near Refuge: * Relative abundance is displayed in a range of 1 to 5, one indicating the areas of lowest concentration, 5 indicating the area of highest concentration, - = species that were not analyzed because they are not present near the refuge or were not represented by BBS data.

BCR 14: * indicates that the species was not in the BCR landbird database so Continental Concern, BCR Responsibility and BCR Concern could not be calculated based on the new BCR landbird rules.
Blueprint Document Rules are from Dettmers, 2006.

PIF 28 Tier: from Rosenberg, Kenneth V. and T.P. Hodgman, 2000.

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