

U.S. Fish & Wildlife Service

IDENTIFYING REFUGE RESOURCES OF CONCERN AND MANAGEMENT PRIORITIES: *A Handbook*



January 2017

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Acknowledgements

We are thankful for the support in developing this handbook from Dirck Byler, Rob Dietz, Kevin Kilbride, Rebecca Kern, Bob Adamcik, Meredith Bixby and Pat Heglund. We are also especially grateful to all the Biologists and Planners who helped us improve the many drafts with insights from each new planning meeting.

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Horned grebe (G. Warrick)
Background: Mt. Foraker, AK (B. Thompson)

Overview of the Process to Prioritize Resources of Concern and Management Priorities for Your Refuge

Start with Mandates for Management on Refuges

Step 1. Identify your refuge's purposes



Step 2. Identify Refuge System Resources of Concern



Step 3. Identify elements of biological integrity, diversity, and environmental health

Identify Refuge Resources of Concern and Management Priorities

Step 4. Compile comprehensive list of your Refuge's Resources of Concern

- Filters
- site capabilities/limiting factors
 - response to management
 - best science/ professional judgement
 - ecological and ecosystem processes

Step 5. Identify priority Refuge Resources of Concern



Step 6. Identify priority habitats

Establish Management Agenda for the Refuge

Step 7. Write Goals



Step 8. Write Objectives

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INTRODUCTION

What Is the Purpose of this Handbook and Who Will Use It?

This U.S. Fish and Wildlife Service (FWS, Service) handbook provides a strategy for anyone who must identify biological priorities (Refuge Resources of Concern) and develop associated resource goals and objectives that will guide future refuge wildlife and habitat management, as well as inventory and monitoring needs. Other responsibilities such as archaeological, paleontological, and historic resources are not covered. This handbook provides step-down guidance to integrate the National Wildlife Refuge System (Refuge System) Mission and Goals and Refuge Purposes policy (601 FW 1) with our Refuge System Planning Overview (602 FW 1) and Habitat Management Plans (620 FW1) policies. This handbook provides a stepwise process (Figure 1) that will help you collect information and generate products necessary for your refuge Comprehensive Conservation Plan (CCP) or Habitat Management Plan (HMP), as well as products critical to short- and long-term resource management decisions on your refuge.

Specifically, the end product of the process described in this handbook is a set of wildlife and habitat management goals and objectives for refuge-specific planning. Because this process accounts for landscape-scale conservation needs of the species, species groups, and communities, these goals and objectives also will likely be applicable beyond refuge boundaries. As a result, this handbook provides a scientifically defensible way to derive resource objectives from a landscape perspective that will be beneficial and applicable to the Service's initiatives involving our conservation partners, such as Strategic Habitat Conservation (SHC), Landscape Conservation Cooperatives (LCCs), and surrogate species.

Guiding Principle: Management direction of each refuge is driven first and foremost by a refuge's purpose(s) and statutory mandates, coupled with species and habitat priorities. The latter are identified in various Service conservation plans, as well as those developed by our State, Federal, and private partners. By using the approach described in this handbook, you will accomplish the following:

- Determine Refuge Resources of Concern and management priorities for your refuge;
- Identify the contribution your refuge makes to wildlife and habitat priorities at multiple scales; and

- Meet your legal mandates as directed in law and policy.

What Sources Guide Management Priorities on Refuges?

This handbook draws from legislative mandates, Service and Refuge System policies, other Refuge System handbooks, and important Refuge System planning reports associated with Fulfilling the Promise and Conserving the Future. Refuge resource management priorities derive from the Refuge System mission, the individual refuge's purpose(s), Refuge System Resources of Concern, and the policy to maintain biological integrity, diversity, and environmental health (hereafter referred to as BIDEH) of the Refuge System.

These mandates are consistent with the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Refuge System Improvement Act). Guided by these mandates, each refuge will contribute to the goals of the Refuge System (601 FW 1) and achievement of the Refuge System mission.

Appendix A provides a list of website links to legislative mandates, policies, handbooks, and other documents that direct the approach of this handbook.

What Are Resources of Concern?

HMP policy defines Resources of Concern:

“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.” (620 FW1.4G)

Habitats or plant communities should be considered Resources of Concern when they:

- Are specifically identified in refuge purposes;

- Support species or species groups identified in those purposes;
- Support FWS trust resources;
- Are indicative of functional ecological processes that shape refuge habitats (e.g., nutrient cycling, hydrology);
- Are indicative of ecosystem drivers that shape surrounding landscapes (e.g., watershed variables, climate change); and/or
- Support maintenance or restoration of BIDEH.

What Is the Approach Presented in the Handbook?

The remainder of this handbook guides you through eight steps to identify Refuge Resources of Concern and refuge management priorities as a scientific basis for preparing refuge wildlife and habitat goals and objectives (Figure 1).

Steps 1 through 3 of the process lead up to the development of the Comprehensive List of Refuge Resources of Concern (Step 4). In these first three steps, you identify the Refuge System mission and individual refuge purpose(s) (Step 1), Refuge System Resources of Concern (Step 2), and the legal mandate to maintain the BIDEH of each refuge (Step 3). The Comprehensive List of Refuge Resources of Concern can be a large and daunting list to consider. Step 5 takes this list and uses four filters to narrow it down to the highest priority refuge Resources of Concern. The four filters are: site capabilities/limiting factors, response to management, best science/professional judgment, and ecological/ecosystem process. Step 6 uses these highest priorities species to identify priority habitats. Based on the priority species and habitats, you then prepare habitat and wildlife goals and objectives (Steps 7 and 8) to guide management of the refuge.

This is an iterative process that requires use of the best available information, including scientific literature, professional judgment of past and present refuge staffs, and consulting with other resource professionals in and outside the Service (including your Division of Natural Resources staff). This process will also help you develop a scientifically based refuge management plan and provide the foundation for creating an inventory and monitoring (I&M) program that is clearly linked to your management actions.

The Resources of Concern Selection Tool for America's Refuges (ROCSTAR) was developed to help refuges navigate this eight step process (Salas and Prankus 2015). ROCSTAR is a spreadsheet-based tool that follows Steps 1 through 5 in this document and provides a means for compiling,

organizing, and prioritizing resources of concern. ROCSTAR will help you to develop the tables recommended in each of these steps. This tool also provides an archived record of the documents and the thought process used to identify refuge resources of concern. The ROCSTAR template and guidance document is available online at: <https://ecos.fws.gov/ServCat/Reference/Profile?code=37596> The Pacific Southwest Region has also developed a workflow process that is a combination of database queries, data analysis, and professional judgement. The process will continue to evolve and become more automated with each planning process. The templates and guidance document is available online at: <https://ecos.fws.gov/ServCat/Reference/Profile?code=52110>

The Service has adopted a surrogate species approach for conservation planning. Surrogate species are defined as “*species that are used to represent other species or aspects of the environment to attain a conservation objective*” (Caro 2010). Surrogate species simplify planning by focusing on a smaller number of species that best represent the needs of a larger group of species and their habitats across a larger landscape.

The term surrogate species incorporates a wide variety of approaches, including focal, umbrella, flagship, indicator, and keystone species. In this handbook, we generally use a focal resources approach to select priority Refuge Resources of Concern, which embraces SHC and is consistent with surrogate species principles. Priority Refuge Resources of Concern can be wildlife species or species groups, plant or plant communities, as well as the more general habitat associations (see Step 5 for more information). Refuge priority resources may be selected (Step 5) from Service and Refuge System priorities by considering the following:

- Are they high priorities for the FWS/Refuge System or our conservation partners?
- Do they represent the needs of other species of concern (are they surrogate species, such as umbrella, indicator, keystone, or focal species)?
- Are they indicative of functional ecological processes that shape refuge habitats (e.g., nutrient cycling, hydrology)?
- Are they indicative of ecosystem drivers that shape surrounding landscapes (e.g., watershed variables, climate change)?
- Are they supported by your refuge's habitats or plant communities?
- Do they respond to management actions?

You must ensure that the collective requirements of the priority Refuge Resources of Concern (and



Photo Credit: D. Rhine

the goals and objectives developed to support them) meet Refuge System and FWS legislative mandates and address important ecological and ecosystem processes representative of the refuge and surrounding landscape. In most cases, refuge goals and objectives developed to support priority refuge resources that represent BIDEH (Step 3) will address these ecological and ecosystem processes.

How Does this Handbook Support the Implementation of Adaptive Management and Development of an Inventory and Monitoring Plan for a Refuge?

Adaptive management promotes flexible decision-making through an iterative learning process that readily responds to uncertainties, new information, variability in climate, and ecosystem responses to management. The foundation of adaptive management is the development of objectives and subsequent identification of management strategies to achieve them. Monitoring allows staff to evaluate progress toward achievement of those objectives to determine if adjustments are required to improve the outcome of resource management strategies.

The management priorities identified in Step 5 and the refuge habitat and wildlife objectives that you write in Step 8 become the foundation for preparing a refuge's CCP, HMP, and Inventory and Monitoring Plan (IMP). For example, key habitat attributes or wildlife responses identified in refuge objectives are parameters that are used to develop and implement refuge surveys to determine if objectives are being met. Monitoring results are then used in an

adaptive management context to make adjustments, as needed, to management programs to ensure achievement of the refuge's purpose(s) and the Refuge System's mission, and the maintenance of the Refuge System's BIDEH.

These elements of adaptive management and the development and implementation of a refuge IMP are critical steps in the SHC approach discussed below. After completing the CCP and/or HMP, you are required to develop your step-down IMP—a task made easier using the strategies in this handbook. Guidance on designing and implementing a monitoring program is available in Reynolds et al. 2016.

What Is the Relationship of this Handbook to Strategic Habitat Conservation?

Through LCCs, the Service is working collaboratively to develop and implement SHC, involving all Service programs as well as those of our conservation partners. SHC will lead the Refuge System and individual refuges to view their lands as part of a much larger landscape, as well as part of an interrelated and comprehensive network of resource conservation efforts.

The purpose of SHC is to help the Service become more efficient and effective at conserving fish, wildlife, and plant populations through wildlife and habitat management (protection, restoration, and/or management). The SHC approach complements the direction of the Refuge System by articulating the contribution each refuge can make at multiple landscape scales to the highest conservation needs (Step 8). By incorporating the priorities developed

using the SHC framework, this handbook considers broader ecosystems and landscapes as well as local scales when identifying the best contribution each refuge can make to address Refuge System and Service priorities.

The Service recently initiated a new landscape-scale approach to conservation planning, called Landscape Conservation Design (LCD). The goal of LCDs is to bring together a variety of partners to set strategic, common conservation goals and priorities to help make better conservation decisions across a large landscape (e.g. habitat protection, restoration, and management). LCDs are generally facilitated by the LCCs and are an important component of SHC. Ultimately, the goal is to develop LCDs prior to completing the next round of CCPs. The goals and priorities developed during the preparation of the LCD will be used to help inform the CCP revisions. For more information on SHC and LCDs, visit: <https://www.fws.gov/landscape-conservation/index.html>

While working through the stepwise processes in this handbook, refuge staff should seek information developed through national or Regional conservation plans to help identify Refuge and Refuge System Resources of Concern as well as to identify the contributions a refuge can make at various landscape scales.

Opportunities to use information assimilated via SHC are highlighted in the relevant steps in this handbook. Your Refuge Division of Natural Resources, Science Applications, or Refuge Planning Branch staffs can help you identify the appropriate Regional contacts for the latest information regarding SHC.

How is Climate Change Considered in this Process?

Climate change presents new challenges, forcing refuge staff to make complex wildlife and habitat management decisions with uncertain or incomplete information. The Service has developed a coordinated network of LCCs across the United States, in part, to address major environmental and human-related factors that affect fish and wildlife populations at the broadest of scales, including developing adaptation strategies in response to climate change. The science support generated by these partnerships will assist refuge staff during the development of CCPs and HMPs.

In Step 3, climate change is an issue to consider as you identify natural processes and limiting factors important for the maintenance or restoration of BIDEH. This policy views historic conditions as a frame of reference from which to identify native fish, wildlife, plants, habitats, and the ecological and ecosystem processes supporting them to be

maintained and, where appropriate, restored on each refuge. The policy does not require a return to historic conditions no longer climatically appropriate and/or feasible. Instead, it directs you to consider historic conditions as a frame of reference to project potential successional shifts that may occur on the refuge from climate change.

In Step 5, you must consider how a changing climate will affect refuge wildlife and plant resources. This applies especially to the fourth filter: ecological or ecosystem processes within a refuge and the surrounding landscape.

The Service's "Conservation in a Changing Climate" website provides the latest information and resources about climate change predictions, impacts to wildlife, and the Service's response: <https://www.fws.gov/home/climatechange/index.html>

The website contains links to a wide range of climate change planning resources, such as:

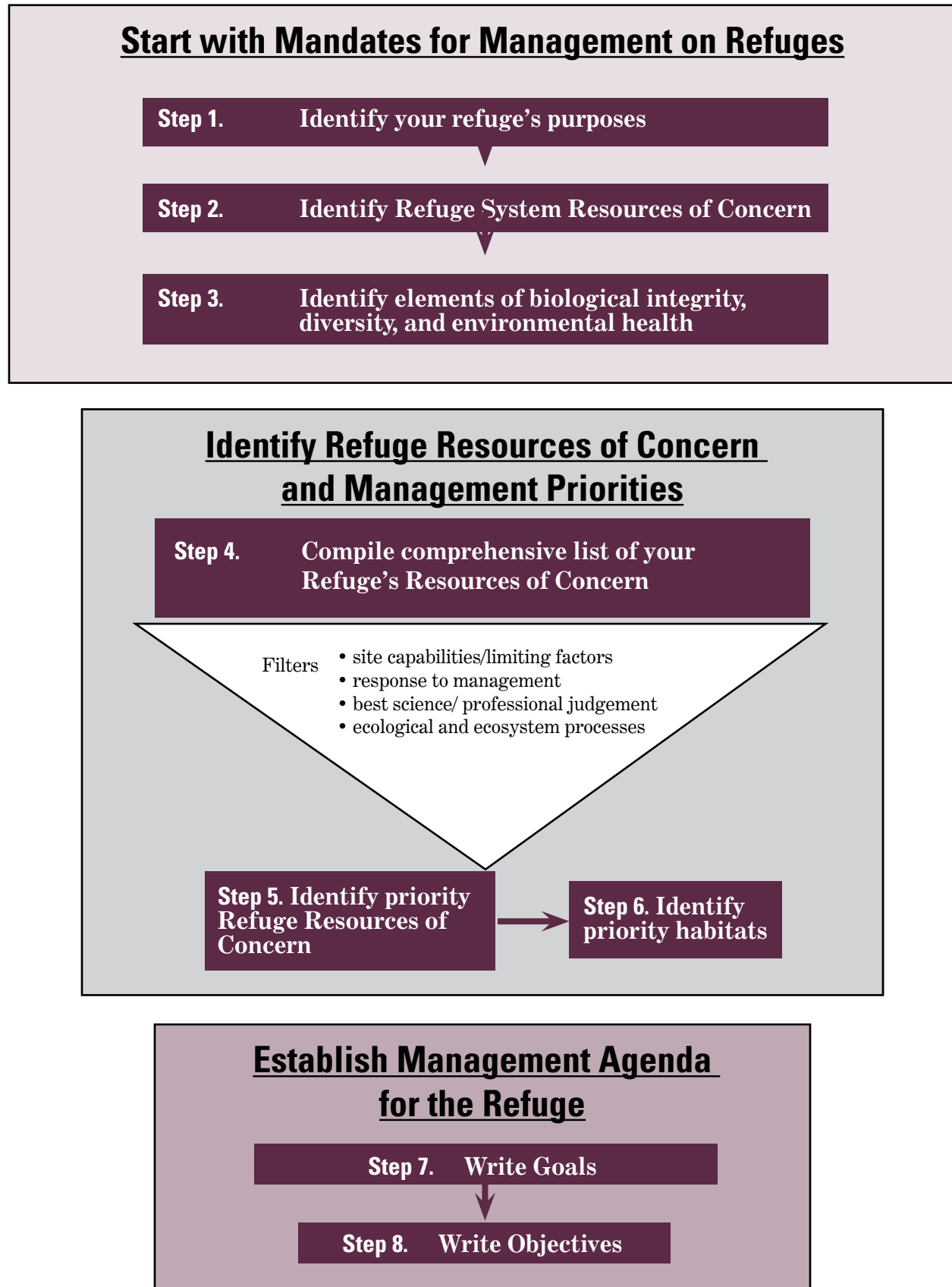
- Planning for Climate Change on the National Wildlife Refuge System (FWS 2014)
(<https://www.fws.gov/refuges/vision/pdfs/PlanningforClimateChangeontheNWRs.pdf>)
- Considering Multiple Futures: Scenario Planning to Address Uncertainty in Natural Resource Conservation (FWS 2014)
(<https://www.fws.gov/home/climatechange/pdf/Scenario-Planning-Report.pdf>)
- National Fish, Wildlife, and Plants Climate Change Adaptation Strategy (2012)
(<https://www.fws.gov/home/climatechange/pdf/Scenario-Planning-Report.pdf>)

The National Conservation Training Center also has a website dedicated to climate change educational resources, including webinar and course listings: <https://training.fws.gov/courses/programs/climatechange/>



Photo Credit: A. Fernández

Figure 1. Overview of the Process to Identify and Prioritize Resources of Concern and Management Priorities and Write Wildlife and Habitat Goals and Objectives for Your Refuge



SECTION I: Mandates for Managing Units of the National Wildlife Refuge System

This section reviews the primary legal mandates and FWS policies that direct priorities for wildlife and habitat management on refuges. There are three categories of these management mandates:

- Policy and law that identify refuge purposes
- Policy and law that govern management of refuges and Refuge System Resources of Concern
- Policy and law that directs management to achieve BIDEH on each refuge.

Start with Mandates for Management on Refuges

Step 1. Identify the refuge's purpose

Step 2. Identify Refuge System Resources of Concern

Step 3. Identify elements of biological integrity, diversity, and environmental health

Step 1: Identify the Refuge's Purposes

The Refuge System Improvement Act and subsequent policies require that each refuge be managed to fulfill both its establishment purpose(s) and the mission of the Refuge System. The policy on Refuge System Mission and Goals and Refuge Purposes (601 FW 1) explains the relationship between these two. Where there is a conflict between the mission and refuge purposes, individual refuge purposes have priority. The following legislation and policy must be considered to define the specific refuge purpose(s):

"With respect to the Refuge System, it is the policy of the United States that – (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...." [NWRs Improvement Act, Section 5(a)(3)]

"[Refuge System mission is]...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, Section 4(a)(2)]

"Ideally, we view the System mission, goals, and unit purpose(s) as symbiotic in nature; however, we give priority to achieving a refuge's purpose(s) when we identify conflicts with the Refuge System mission or goals." (601 FW 1, Section 1.4)

"Where a refuge has multiple establishing purposes related to the conservation and management of fish, wildlife, and plants and their habitats, the more specific purpose will take precedence in instances of conflict." As stated in Section 1.16, "When we acquire an addition to a refuge under an authority different from the authority used to establish the original refuge, the addition also takes on the purpose(s) of the original refuge, but the original refuge does not take on the purpose(s) of the addition unless Congress determines otherwise." (601 FW 1, Section 1.15)

"...purposes of a refuge and purposes of each refuge mean the purposes 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 subunit." (Refuge Improvement Act, Section 5)

"...any number of specified documents which establish, authorize, or expand a refuge. This includes acquisition purposes in cases where land at a refuge has been acquired under authority other than the establishing authority." (Refuge Improvement Act House Report 105-106, Section 3)

"...for refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the wilderness portion of the refuge." (603 FW 2.6L)

Clarity of refuge purpose(s). The specific purpose(s) of a refuge may not be immediately available. Many refuges were established (or subsequent tracts were acquired) under one or more of 15 statutes (e.g., the Migratory Bird Conservation Act, Fish and Wildlife Coordination Act, or Refuge Recreation Act) that authorize acquisition of the refuge. Refuge purpose statements often consist of language excerpted from these statutes, and can be quite general.

Other documents associated with the refuge establishment may provide additional insights on wildlife or habitats to be managed on the refuge. These include Land Protection Plans, Conceptual Management Plans, and various environmental

compliance documents required by the National Environmental Policy Act of 1969 (NEPA).

The policy on the Comprehensive Conservation Planning Process (602 FW 3), directs planning teams to:

“Document the history of refuge establishment and management as well as refuge purposes and authorizing authority (for example; legislation [including wilderness designation, if applicable], executive orders, administrative memoranda). These will become driving forces in the process of determining and subsequently be reflected in the refuge vision statement, goals, objectives, and strategies in the comprehensive conservation plan.” [602 FW 3.4 C(1)(b)]

Examples of refuge purposes. Two examples illustrate how refuge purposes can range from general to specific. This can depend on the establishment date of the refuge, its authorizing and expanding authorities, and official historic records that document reasons for its establishment.

General: The 10,819-acre Sacramento National Wildlife Refuge (NWR), located in the Sacramento Valley of California, was established by Executive Order No. 7562 on February 27, 1937 by Franklin D. Roosevelt. The Executive Order identified it as the *“Sacramento Migratory Waterfowl Refuge”* and stated it was acquired *“... as a refuge and breeding ground for migratory birds and other wildlife.”* Thus, we have the generic language of the Executive Order, as well as the original refuge name to suggest the establishment purpose of conserving migratory waterfowl. Although official establishment documents are lacking, historic descriptions of the area indicate its importance to waterfowl. In addition, there are early written recommendations that the refuge be established as a waterfowl sanctuary.

Specific: A more detailed authority exists for Ridgefield NWR, which is located on 5,149 acres in southwest Washington within the Columbia River floodplain. Ridgefield NWR was authorized under the Migratory Bird Conservation Act (MBCA) by the Migratory Bird Conservation Commission (MBCC) on May 18, 1965. Thus, a general purpose is derived from the MBCA language, *“... as a refuge and breeding ground for migratory birds and other wildlife.”* However, MBCC’s meeting notes, specifically Memorandum #1, specify the refuge purpose further as *“Provide wintering habitat for dusky Canada goose and other waterfowl. Will also provide breeding and migration use and substantial public shooting in area. Estimated peak population: 125,000 ducks and 3,000 geese.”*

Where Can I Find Information on a Refuge’s Purpose(s)?

Information to identify refuge purposes can be found in individual refuge files, in Division of Realty files in both Regional and Washington offices, and in the National Archives in Washington, D.C.

For Step 1, use the ROCSTAR tool to develop the following tables and information. These tables will contain references to documents used to define the original intent of refuge establishment and will be used to identify management required to fulfill refuge purpose(s).

- A summary history of the refuge’s establishment that includes statutes, proclamations, executive orders, agreements, public land orders, donation documents, administrative memoranda, Land Protection Plans, Conceptual Management Plans, and environmental compliance documents. Use any of these or related documents that contain information pertaining to the authorization, establishment, and expansion of a refuge (Table 1; full example in Appendix B).
- A summary of species, species groups, and/or habitats identified in refuge purpose(s), including information regarding specific seasonal or life-history requirements (Table 2; full example in Appendix C).
- A concise summary of these tables for inclusion in the CCP and/or HMP.

Table 1. Summary of the Establishment of Ridgefield National Wildlife Refuge (full example in Appendix B)

Date	Legal Document	Direction
May 18, 1965	Migratory Bird Conservation Commission Memo #1	The Migratory Bird Conservation Commission (MBCC), acting under authority of the Migratory Bird Conservation Act of 1929, authorized FWS to acquire 14 tracts in Clark County, Washington, totaling 6,130.08 acres at a price of \$2.2 million, “to provide wintering habitat for dusky Canada geese and other waterfowl. Will also provide breeding and migration use and substantial public shooting in area. Estimated peak population: 125,000 ducks and 3,000 geese.”
Jan. 27, 1966.	Warranty Deed	Tracts 21 and 21a (655.73 acres) purchased from Mary E. Carty et. al. under authority of the Migratory Bird Conservation Act. Purpose derived from MBCC Memo #1.
Jan. 31, 1966	Warranty Deed	Tracts 17, 17-I, 17R, 17R-1 (1,739.23 acres) purchased from West Coast Farms Company under authority of the Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718-718j). Purpose derived from MBCC Memo #1.

Table 2. Summary of Species and Habitats Identified in Ridgefield National Wildlife Refuge’s Purpose (full example in Appendix C)

Species, Species Group, or Habitat	Supporting Habitat Type(s)	Life History Requirement(s)	Documentation
Dusky Canada goose - wintering	Old fields, bottomland prairie, emergent wetlands, agricultural pastures	Migration and wintering habitat	Migratory Bird Conservation Commission (MBCC) 1, 8, Ridgeport Dairy (RPD), Preliminary Project Proposal (PPP) RPD Categorical Exclusion (Cat. Ex.)
Trumpeter swan	Emergent wetlands, tidal riverine	Migration and wintering habitat	RPD PPP
Sandhill crane	Emergent wetlands	Nesting	MBCC 8, Bachelor Island (BI) Environmental Impact Statement (EIS)
Bald eagle	Bottomland forests	Roosting, nesting	MBCC 8, BI EIS, RPD Environmental Assessment (EA), RPD PPP, RPD Cat. Ex.

Step 2: Identify Refuge System Resources of Concern

Refuge System Resources of Concern are identified through the Refuge System Mission and Goals and Refuge Purposes policy (601 FW 1). Specifically, this policy states:

“We will manage each refuge to fulfill the specific purpose(s) for which that refuge was established and the Refuge System mission. These goals will help guide development of specific management priorities during development of comprehensive conservation plans. Setting and implementing management priorities

will help us achieve the purposes of the refuge, and, to the extent practicable, the Refuge System mission. The priorities for management activities and uses are: (1) conserving fish, wildlife, and plants and their habitats (Goals A, B, and C); (2) facilitating compatible wildlife-dependent recreational uses (Goals D and E); and (3) considering other appropriate and compatible uses.” (601 FW 1.10)

“The goals in this policy provide guidance for accomplishing the Refuge System mission and directives on managing the Refuge System under the Administration Act, as amended. Collectively, these goals articulate the foundation for our stewardship

of the Refuge System and define the unique and important niche it occupies among the various Federal land systems.” (601 FW 1.11)

“... Refuge System goals will help guide the development of comprehensive conservation plans (CCP) and the administration, management, and growth of the Refuge System” (601 FW 1.8)

The following are the first three Refuge System goals (601 FW 1.8) that identify the natural resource conservation priorities for the Refuge System.

“A. Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.

“B. Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

“C. Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.”

Goals A and C address, in part, the Refuge System’s legal mandate to maintain BIDEH (see Step 3 for more information). The species identified in Goal A (federally threatened and endangered species) and Goal B (migratory birds, anadromous and interjurisdictional fish, and marine mammals), along with their supporting habitats, are priorities for the Refuge System and are considered “Refuge System Resources of Concern.” Additionally, habitats, plant communities, and ecosystems are also Refuge System Resources of Concern when they are rare, declining, or underrepresented (Goal C), and/or when they are important to the maintenance or restoration of BIDEH.

Priorities. Species groups identified in Goals A and B are also identified in numerous Federal statutes and international treaties (see the Migratory Bird Treaty Act of 1918, as amended [16 U.S.C. 703-712] and the Marine Mammal Protection Act of 1972, as amended [16 U.S.C. 1361-1471h]) as natural resource management priorities for the entire Service, and are often collectively referred to as “Service Trust Species”.

Consistent with the Refuge System Improvement Act, management to achieve its establishment and acquisition purpose(s) is the first and highest priority for each refuge. Secondly, each refuge should be managed to achieve the Refuge System mission. Consistent with these responsibilities, refuges should also be managed to support the species groups and their habitats listed above, and thereby comply with

the associated Federal statutory mandates and help achieve the Refuge System’s goals.

Each of these groups of Refuge System Resources of Concern is further described below.

- **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 is contained in subchapter B of title 50 CFR § 10.13. The Migratory Bird Program also maintains subsets of this list that provide priorities at the national, regional, and ecoregional (bird conservation regions) scales.
- **Interjurisdictional Fish:** Fish “...populations that two or more states, nations, or Native American tribal governments manage because of their geographic distribution or migratory patterns.” (710 FW 1.5H). Examples include anadromous species of salmon and free-roaming species endemic to large river systems, such as paddlefish and sturgeon. (601 FW 1)
- **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 section 8A(a) that “*The Secretary of the Interior... 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 that “*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.*”

- **Marine Mammals:** The Marine Mammal Protection Act of 1972 (16 U.S.C. 1361-1407) prohibits, with certain exceptions, the take of marine mammals in United States waters and by United States citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The following is a list of marine mammals under Service jurisdiction.
 - o West Indian Manatee (Antillean and Florida)
 - o Polar Bear (Alaska Chukchi/Bering Seas and Beaufort Sea)
 - o Pacific Walrus (Alaska)
 - o Sea Otter (South Central, Southeast, and Southwest Alaska; California; and Washington)

Where Can I Find Information on Refuge System Resources of Concern?

It is important for your refuge to do a thorough investigation of potential Resources of Concern for your area. A comprehensive list of potential Resources of Concern can be compiled from landscape-level plans developed by the Service or its partners. Keep a record of the source information that you are using. Following the guidance in this handbook, a station can begin to narrow down the list to a set of species that is highly relevant. A beneficial next step is to then look to your LCC for its list of surrogate species. One or more of the surrogates may align well with the candidate list of Resources of Concern that you have developed for your station. It is important to ensure that you understand the source information and selection process for your LCC's list of surrogates. Check with your LCC for an update on its progress in developing the list. Even where surrogate species lists have yet to be developed, LCCs may be able to provide important species and habitat information. Where there is alignment between your station-generated list of potential Resources of Concern and your LCC's list, use the proposed surrogates and augment that list with the remaining species or important natural features that your station's staff feels best represents your landbase.

Ecoregional assessments are available in some areas of the nation. For example, an assessment of conservation goals and objectives has been completed for the lower Colorado River watershed and includes FWS priorities for species and plant communities.

Where such compilations are not available, you must seek out information on species for your area, including any Regional or local priorities among them. Specific ideas for each category of FWS Trust Species are provided below.

Migratory Birds: Sources of information that can be used to identify local and Regional migratory birds that are conservation priorities include the following:

- Bird Conservation Region (BCR) plans.
- Continental plans for landbirds, waterfowl, shorebirds, and marshbirds.
- FWS Birds of Conservation Concern (BCC) List (<https://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>)
- State wildlife action plans
- Rocky Mountain Bird Observatory Species Assessment Database (<https://www.rmbo.org/pif/pifdb.html>).
- Partners in Flight (PIF) plans, including statewide and physiographic area plans (<https://www.partnersinflight.org/>).
- Status and trend information from refuge bird surveys.

Interjurisdictional Fish: A standard set of information resources about interjurisdictional fish is not currently available, although some Regions and ecoregions have databases and other documentation on fish priorities. In addition to such sources, FWS Regional Fisheries Resource offices can provide up-to-date information on fish priorities.

Threatened and Endangered Species: Information on federally threatened and endangered species, Federal candidate species, and species petitioned for federal listing is available online at: <https://www.fws.gov/endangered/>. For more detailed information, contact your Ecological Services field office.

There are also three tools on the Environmental Conservation Online System (ECOS;) <https://ecos.fws.gov/> that provide information on threatened, endangered, candidate, and delisted species. Note that ECOS requires a username and password from the ECOS administrator.

- The Information, Planning, and Conservation System (IPaC) allows users to define an area of interest and generates a list of threatened and endangered species occurring in that area (these lists are for planning purposes only; staff should contact the appropriate FWS Ecological Services Field Office to verify official species lists).
- The Threatened and Endangered Species System (TESS) database generates lists of threatened and endangered species, as well as candidate and delisted species, based on a variety of user inputs. TESS contains information on species status and range and links to more detailed species profiles including information on recovery plans, habitat conservation plans, critical habitat designations, and Federal Register notices about the species.
- The Recovery Online Activity Reporting System (ROAR) provides links to species recovery information, such as recovery plans, recovery actions, and other reports.

Marine Mammals: The best sources of information are specific species management plans available through appropriate FWS Regional offices.

For Step 2, use the ROCSTAR tool to compile the necessary resources (e.g., plans, lists, reports, databases, etc.) to identify Refuge System Resources of Concern for the following categories:

- Migratory birds that occur on the refuge
- Interjurisdictional and anadromous fish that occur on the refuge
- Threatened and endangered species that occur on the refuge
- Marine mammals (for which FWS has responsibility) that occur on the refuge

Step 3: Address Biological Integrity, Diversity, And Environmental Health

In addition to achieving refuge purposes and the Refuge System mission, the Refuge Improvement Act directs the Secretary of Interior to also consider maintaining the BIDEH of the Refuge System:

“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”
[Refuge Improvement Act, Section 4(a)(4)(B)].

This requires that we consider and protect the broad spectrum of native fish, wildlife, plants, and habitat resources found on a refuge. The policy on BIDEH (601 FW 3.3) provides information and guidance to manage a refuge to maintain existing and/or restore lost or severely degraded components of biological integrity, diversity, and environmental health, where appropriate.

The policy explains the relationship to the Refuge System mission, and refuge purposes as follows:

“...each refuge will be managed to fulfill refuge purpose(s) as well as to help fulfill the System mission, and we will accomplish these purpose(s) and our mission by ensuring that the biological integrity, diversity, and environmental health of each refuge are maintained, and where appropriate, restored.”
(601 FW 3.7B)

Simply stated, elements of BIDEH are represented by native fish, wildlife, plants, and their habitats as well as those ecological processes that support them.

Historic conditions as reference. Most significant within the policy is the definition of BIDEH, which establishes historic conditions as a reference for implementation. Historic conditions are defined and qualified in the policy as follows:

“Composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial

human related changes to the landscape.”
(601 FW 3.6D)

“We consider the natural frequency and timing of processes such as flooding, fires, and grazing. Where it is not appropriate to restore ecosystem function, our refuge management will mimic these natural processes including natural frequencies and timing to the extent this can be accomplished.” [601 FW 3.10A.(4)]

The policy requires careful examination of the refuge’s historic conditions, the processes that maintained them, changes on the landscape that have altered those conditions or processes, and the remnant habitats or populations still present or that might be restored. Using the policy, you must decide which of these you will manage for, and to what degree.

Historic conditions were dynamic and not static. Ecological communities (e.g., prairies, shrublands, and woodlands) transitioned back and forth via natural processes. Therefore, it is not necessary to preserve refuge habitats at a specific point in historic time (e.g., early successional prairie); you may choose to manage within a natural range of variability. This strategy retains processes that allow species, genetic strains, and natural communities to evolve with changing conditions. In addition, when determining what BIDEH you will maintain or restore on the refuge, you must also consider the effects of climate change and determine if historic conditions important in the maintenance or restoration of these components will be significantly altered during the life of the CCP or HMP.

Multiple landscape scales. The policy also directs the Refuge System to consider multiple landscape scales as follows:

“Biological integrity, diversity, and environmental health can be described at various landscape scales from refuge to ecosystem, national, and international.... Individual refuges contribute to biological integrity, diversity, and environmental health at larger landscape scales, especially when they support populations and habitats that have been lost at an ecosystem, national, or even international scale. In pursuit of refuge purposes, individual refuges may at times compromise elements of biological integrity, diversity, and environmental health at the refuge scale in support of those components at larger landscape scales.” (601 FW 3.7C)

As stated, individual refuges contribute to BIDEH locally and at larger landscape scales. The former occurs when you examine local or site-specific historic conditions and processes. Examples include protecting patches of unplowed prairie or fens, restoring agricultural fields to woodland, or removing a dam to establish historic stream flow.

The latter is apparent when you realize the refuge must support populations and habitats that have declined or been lost at an ecosystem, national, or even international scale (flyway). Examples include waterfowl refuges within California's Central Valley. Many of these refuges are islands of habitat surrounded by urban areas or intensive agriculture. They were established to provide nesting, migration, and wintering areas for migratory waterfowl and waterbirds in the face of such landscape-level changes. Such refuges must maintain wetland habitats and hydrologic regimes not historically present. Therefore, they forego some local elements of BIDEH in support of those components at larger landscape scales. Even these refuges, however, generally have local elements (such as vernal pools or unplowed grassland) that they can preserve or restore while meeting component needs at larger landscape-scales.

Maintaining or mimicking natural processes.

This is another principle that assists with identification of priority resources for the maintenance and restoration of BIDEH on the refuge.

“Management, ranging from preservation to active manipulation of habitats and populations, is necessary to maintain biological integrity, diversity, and environmental health. We favor management that restores or mimics natural ecosystem processes or functions to achieve refuge purpose(s). Some refuges may differ from the frequency and timing of natural processes in order to meet refuge purpose(s) or address biological integrity, diversity, and environmental health at larger landscape scales.” (601 FW 3.7D)

Ideally, to meet the letter and spirit of the policy, you would maintain or duplicate historic processes (such as floods or wildfire), mimicking as much as possible historic timing, frequency, and intensity.

Given changing conditions and landscape patterns (e.g., economic development) of the last century or more, it is often not feasible to rely solely on natural processes. When selecting resources required to maintain or restore BIDEH should consider if natural processes responsible for them are still intact. If not, ask yourself, “*are management strategies available that can be implemented to mimic natural processes so that these elements can be maintained or restored on the refuge?*” Consider the potential impacts of climate change on the ecological processes that shape refuge habitats (e.g., nutrient cycling, hydrology, soils), and on the ecosystem drivers that shape surrounding landscapes (e.g., watershed variables). Although legislatively mandated requirements for management of refuge purposes will be the highest priority, most refuges have associated with them significant elements of BIDEH that must be maintained or potentially restored. The policy provides the Refuge System an opportunity to consider and protect a broad spectrum of fish, wildlife, plant, and habitat resources, as well as the ecological and ecosystem processes that support them, found on refuges and the associated landscape.

Information on site-specific historic conditions may be available in historic, archeological, or other accounts. Historic information includes written and, in some cases, pictographic accounts of Native Americans, explorers, surveyors, traders, and early settlers. Archeological information comes from collections of cultural artifacts maintained by scientific institutions.



Photo Credit: A. Wright

Where Can I Find Information on Biological Integrity, Diversity, and Environmental Health?

Other data come from a range of sources, including research, soil sediments, and tree rings. Much of this information has been summarized in technical publications, many of which draw from existing ecological communities as well as older resources to portray historic pictures.

Following are sources to use when determining historic conditions, site capability, current Regional landscape conditions and biological diversity.

- Maps and associated data on abiotic conditions and site capability.
 - Potential natural vegetation (e.g., Kuchler's coarse-scale GIS dataset).
 - Soils can provide information regarding vegetation potential and insight into historic vegetation (<https://www.nrcs.usda.gov/wps/portal/nrcs/main/soild/survey/>).
 - Topography and hydrology.
 - History of natural disturbance patterns (e.g., fire, insect outbreaks, storms).
- Maps and associated data on current biological conditions.
 - Gap Analysis Program GIS data on potential species distribution, vegetation, and conservation lands (<https://gapanalysis.usgs.gov/>).
 - Fine-scale GIS datasets of current land cover (e.g., vegetation classified into ecological systems, alliances, or associations).
 - GIS datasets or aerial photography of historical land cover.
 - NatureServe/State Natural Heritage Program species occurrence databases (<https://explorer.natureserve.org/>).
 - NatureServe Terrestrial Ecological Systems of the United States (<https://www.natureserv.org/conservation-tools/terrestrial-ecological-systems-unitedstates>).
- State wildlife action plans.
- Status and trend information from refuge surveys and studies.
- The Nature Conservancy's Ecoregional Assessments (<https://www.conservationgateway.org/ConservationPlanning/SettingPriorities/EcoregionalReports/Pages/EastData.aspx>).

These assessments may help identify the contribution refuge resources make to the maintenance of BIDEH. They can also help identify focal species as conservation targets for these components.

For Step 3, use the ROCSTAR tool to develop a table describing the following (Table 3; full example in Appendix D):

- Native plant communities, species, or species groups that may have existed on the refuge and surrounding landscape prior to significant disturbances by humans. Include unique or important natural communities, species, and ecological processes that are rare or declining, both within and beyond refuge boundaries. These resources and the processes supporting them are critical to the maintenance of BIDEH.
- The natural ecological and ecosystem processes responsible for creating and maintaining these communities, species, and ecological processes important for BIDEH. Climate change and its effects on

these processes should be considered.

- The limiting factors responsible for changes from the historic to the current habitat conditions. These include disturbances or changes to the physical environment caused by agriculture, catastrophic events, economic development, altered fire intensities and return intervals, contaminants, erosion, climate change, and similar factors.

Describe the differences between historic and current conditions, such as more frequent fires due to invasive exotics, and the resulting inability to support native plant communities. This list represents limiting factors that may constrain your ability to manage for some Refuge System Resources of Concern. In some circumstances, they will preclude or limit management for BIDEH. This list of limiting factors will be used in subsequent

sections to ensure that you only develop achievable resource objectives. Develop a concise summary of the existing elements of BIDEH and the processes that contribute to their maintenance on the refuge and surrounding landscape for inclusion in the CCP and/or HMP.



Photo Credit: R. Thompson



Photo Credit: K. Goodenough

Table 3. Summary of Biological Integrity, Diversity, and Environmental Health (BIDEH) for Ridgefield National Wildlife Refuge (full example in Appendix D)

Habitats ¹ , Species, or Species Groups	Habitat/Population Attribute(s) ²	Natural Processes Responsible for Habitat Conditions or Wildlife Populations	Limiting Factors
Bottomland (wet) prairie	Native herbaceous species: sedge dominated, tufted hairgrass, rushes, unique: Willamette daisy, Bradshaw's lomatium, Nelson's checkermallow <i>Potential Conservation Species: rail, harrier</i>	Periodic fire and poorly drained soils; seasonal flooding. Transition zone above mean high gauge throughout refuge	Invasive species, esp. reed canarygrass, displace/outcompete native communities; lack of periodic fire
Dry prairie	<i>Agropyron caninum</i> , <i>Bromua sterilis</i> , <i>Holcus</i> , <i>Hordeum brachyantherum</i> , <i>Poa palustris</i> , unique: basalt outcrops, northern alligator lizard, <i>Camassia spp</i> , nuttall's larkspur <i>Potential Conservation Species: brush prairie pocket gopher</i>	Periodic fire, shallow, well-drained soils	Invasive species encroachment, lack of fire, grazing/soil disturbance
Western hemlock forest	Oregon lily	Infrequent fire, light grazing/browsing by large ungulates	Blackberry encroachment; canopy closure
Columbian white-tailed deer	Total population of >80 deer on the refuge	Natural hydrology maintaining a diversity of lowland, floodplain habitats in the lower Columbia River	Nutritional stress and disease associated with extensive and prolonged flooding; altered hydrology; predation; poaching; habitat loss and degradation from agricultural conversion, livestock grazing, and urban development.

¹For habitats, include plant communities that represent existing BIDEH.

²Examples of habitat/population attributes include the following: age class, structure, seral stage, species composition, total population.

SECTION II: IDENTIFYING REFUGE RESOURCES OF CONCERN AND PRIORITIES

This section describes how to use the information gathered in Section I to identify a comprehensive list of species, species groups, and habitats (Refuge Resources of Concern) that would potentially drive a refuge's management. It then explains how to select a subset of these as priorities that represent legally mandated species and natural communities for management of the Refuge System. In most cases, priorities developed from refuge purposes and Refuge System Resources of Concern (which includes FWS Trust Species) result in plant, wildlife species, or species groups as priorities for management on the refuge.

The habitats required to support these priority Refuge Resources of Concern are ultimately used to develop wildlife and habitat management objectives for the refuge. Plant communities are also Refuge System Resources of Concern when they are rare, declining, underrepresented, represent important ecological or ecosystem processes, and/or when they are important in the maintenance or restoration of BIDEH. Objectives should be developed for these plant communities if they are not represented as habitats for priority species or species groups. The development of objectives for representative communities of the refuge and surrounding landscape will ensure that important ecological/ecosystem processes are addressed during the development of the CCP and/or the HMP.

Identify Refuge Resources of Concern and Management and Priorities

Step 4. Compile comprehensive list of Refuge's Resources of Concern

Filters: * site capabilities/limiting factors
* response to management
* best science/ professional judgment
* ecological and ecosystem processes

Step 5.
Identify priority
Refuge Resources
of Concern

Step 6.
Identify
priority
habitats

Step 4: Compile Comprehensive List of Refuge Resources of Concern

Using the information gathered in Section I, compile a list of all species, species groups, and plant communities that could be of management concern for the refuge. When identifying Refuge Resources of Concern, you must determine if habitat/plant communities that meet the life-history needs of these species are present or can be restored on the refuge. Effectively, this list will include everything on and around the refuge addressed in the Refuge System's legal and policy mandates. In addition to these species and plant communities, include appropriate State-listed species and priority species identified in State Wildlife Action Plans. Where available, also consider LCC-derived surrogate species lists.

As the Service and LCCs develop databases of Regional and/or ecoregional priorities using SHC, it will be important for refuge staff to evaluate their potential contribution to these priorities during this step.



Photo Credit: G. Warrick

Where Can I Find Information on Refuge Resources of Concern?

Various plans, reports, and datasets developed by the Service or in cooperation with our conservation partners provide information to identify species and habitats that are, or could be, supported by the refuge. Here are some examples:

- Existing refuge species lists.
- Technical papers or reports identifying species or species groups along with their habitat requirements, and life-history needs as well as plant communities, for the ecoregion.
- Refuge inventory and monitoring data.
- Ecosystem assessment data from The Nature Conservancy.
- GAP analyses.
- Trend and status maps for birds in Bird Conservation Region (BCR) plans.
- Local university plant and animal collections.
- State Wildlife Action Plans.
- Fisheries Management Plans.
- State Natural Heritage Program rankings for rare plants and natural communities.
- State priority habitat and species plans.
- Federally listed species recovery plans.
- Water Resources Inventory And Assessment (WRIA)
- ServCat

For Step 4, use the ROCSTAR tool to develop a table, “Comprehensive List of Refuge Resources of Concern” (Table 4; full example in Appendix E). Include the resources that you identify by the following criteria:

- Identified in refuge purpose(s).
- Fish, wildlife, and natural plant communities that represent BIDEH.
- Federally threatened or endangered species.
- FWS Birds of Conservation Concern (BCC).
- FWS Birds of Management Concern (BMC).
- Bird Conservation Region (BCR) priority.
- Partners in Flight (PIF) priority.
- Shorebird plan priority.
- Waterbird plan priority.
- North American Waterfowl Management Plan priority.
- Priority interjurisdictional fish.
- Priority marine mammal.
- State-listed species.
- State Wildlife Action Plan priority.
- Priority plant communities that are under-represented in conservation areas.
- Other Federal agency designations (e.g., USDA Forest Service species of concern).

Step 5: Identify Priority Refuge Resources of Concern

The “Comprehensive List of Refuge Resources of Concern” table developed in Step 4 contains the full array of species, species groups, and plant communities of concern on the refuge. That table addresses a broad range of conservation needs. Now you must selectively reduce this table to those priority species and plant communities that will be managed to fulfill obligations to refuge purposes, Refuge System Resources of Concern, and BIDEH. This list of priority Refuge Resources of Concern will drive the setting of biological goals and objectives in CCPs and HMPs.

The process for selecting priority Refuge Resources of Concern in this handbook is consistent with our surrogate species approach, which advocates for selecting a subset of species to define important habitats or environmental conditions at the landscape or ecosystem scale that if protected, restored, or managed will facilitate the Service’s ability to conserve a larger array of wildlife populations. By managing for surrogate species and resources, important components of functional, healthy ecosystems will be addressed. There are several different methods for selecting surrogate resources, including:

- *Focal species:* Species that are highly associated with conditions that represent the needs of larger groups of species or communities with similar requirements (e.g., habitats, ecological and/or ecosystem processes) and respond to management similarly (USFWS 2008).

Table 4. Comprehensive List of Resources of Concern for Ridgefield National Wildlife Refuge (full example in Appendix E)

Species	Refuge Purpose Species	BIDEH	Federal T&E	State T&E	BCR # 5 (Table 8)	PIF (tier)	BMC Region 1 Status	BCC- 2002 Region 1 (Table 41)	BCC National (Table 48)	State Wildlife Action Plan Priorities (SGCN)	Shorebird Plan	Waterbird Plan	Waterfowl Plan	Flyway Depredation	TNC-WVPTGSEA	WA NHP S Rank
Dusky Canada goose	x						GBBDC						x	x		
Trumpeter swan (wintering habitat)	x						GBBDC (interior & rocky			x					x	S3
American wigeon	x						GBBDC								x	S4
Great blue heron (nesting)	x									x		x			x	S4
Shorebirds, raptors, marsh/waterbirds, mammals, riparian habitat	x															
Peregrine falcon	x		FCo	SS	x	X2c		x	x	x					x	S2
Cooper's hawk						X2										
Vaux's swift				SC		X2b				x						S3
Depressional wetland broadleaf forest		x														
Tidally-influenced freshwater		x														
Wetlands		x														
Riparian forest and shrublands		x													x	
Freshwater marshes		x													x	
Northern oak woodlands		x													x	
Gray-tailed vole				SC						x					x	
Western pond turtle			FCo	SE						x					x	S1
Red-legged frog															x	
Pacific lamprey															x	S2
Coho salmon			FCo													

*See Appendix E for a key to the abbreviations in this table.

- *Umbrella species*: Protection for these species may cover a wide range of co-existing species in the same habitat.
- *Indicator species*: Species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem.
- *Keystone species*: Species with an effect on many other species in an ecosystem disproportionate to their abundance or biomass.
- *Flagship species*: Raising the profile of these species at the refuge may leverage more support for biodiversity conservation in a larger context.

Each of these methods has its own merits and drawbacks. For example, some methods might be more useful during conservation planning efforts (e.g., umbrella species), while others might be better for selecting species for monitoring programs (e.g., indicator species). The idea is not that a refuge must use all of these different surrogate species approaches, but rather select the best method or methods to achieve their own goals and objectives. The process in this handbook uses the focal species method, as defined above, to select priority Refuge Resources of Concern to drive the development of species and habitat objectives. Because they represent the needs of many other species, setting management objectives for a subset of focal species should result in habitat conditions and ecological settings/process that benefit a wide-range of species of conservation concern.

Focal Species in a Partners in Flight Plan

The Partners in Flight plan, Conservation Strategy for Landbirds in the Northern Rocky Mountains of Oregon and Washington, identifies “focal species” of landbirds associated with priority habitats for this physiographic area. White-headed woodpeckers are identified as the focal species for late-succession dry ponderosa pine forest. Habitat requirements of the white-headed woodpecker are associated with important attributes for management and restoration of this type of forest. Managing for the white-headed woodpecker yields forest attributes that also benefit many other landbirds with similar habitat requirements including flammulated owl, Lewis’ woodpecker, white-breasted nuthatch, pygmy nuthatch, Williamson’s sapsucker, northern goshawk, Hammond’s flycatcher, hairy woodpecker, and brown creeper. These forest attributes also benefit a broad array of other native vertebrates, invertebrates, and plant species associated with BIDEH.

Filters to Select Focal Resources

We suggest using the following four filters to help you select the appropriate priority refuge resources: site capabilities, limiting factors, response to management or restoration, and best available science and professional judgment. Also, consider ecological or ecosystem processes within the refuge and surrounding landscape and importance for the maintenance and restoration of BIDEH when selecting priority refuge resources. Together with these filters, rely on your own professional judgment, as well as that of other resource professionals with State, Federal, private resource agencies, and academia to assist with identification of priority refuge resources. Seek advice from resource professionals engaged in the development of species habitat models for SHC.

(1) The **first filter** to help select priority refuge resources from the comprehensive list is “site capabilities and limiting factors.” Often, physical conditions and processes on or around the refuge may limit support for certain Refuge Resources of Concern. Such conditions include patch size, connectivity of habitats, land cover, contaminants, urban/industrial encroachment, roads, climate change, invasive species, predation, and disease. Select a Resource of Concern as a priority only if the refuge is capable (currently or through restoration) of providing the habitat components necessary for the specific life-cycle needs of the species when it occupies the refuge.

Site Capabilities at Parker River National Wildlife Refuge

At Parker River NWR, numerous acres of fields were being managed as grasslands on several management units; maintaining them was labor intensive, and it was difficult to meet management objectives. After completing a soil analysis and reviewing historic information, the staff concluded that abiotic conditions were not suitable for supporting grasslands on some units. After decades of mowing, the refuge converted the grasslands into shrub/scrub habitat, significantly reducing labor intensive management and benefiting other priority Resources of Concern identified during the planning process.

The **second filter** evaluates how well a Refuge Resource of Concern will “respond to management or restoration” of habitat(s) used by the species when it occupies the refuge. Select those species and plant communities that respond best to habitat management or restoration.

Response to Management at Little Pend Oreille National Wildlife Refuge

For the Little Pend Oreille NWR HMP, several

Service priority species, including the endangered grizzly bear and gray wolf, were not selected as priority Refuge Resources of Concern. Because these species are at the periphery of their range at the refuge, have large home ranges, and extremely low population densities, they will likely not respond directly to management at the refuge. By selecting priority refuge species indicative of healthy forest types, habitat will be available for these two species if their future ranges overlap the refuge boundaries.

(3) The **third filter** uses the best available science and professional judgment through adoption of “priority rankings” from Service programs, partner agencies and organizations, and other available experts. Many Regional FWS offices, State wildlife agencies, universities, and non-governmental organizations (NGOs) have special expertise on Refuge System Resources of Concern, and they have prioritized them for conservation purposes. Examples of these rankings include NatureServe G (global) and S (subnational) ranks; Partners in Flight scores; Bird Conservation Region (BCR) highest high (HH), high (H), and medium (M) rankings; and FWS prioritization scores for threatened and endangered species. In conjunction with the first two filters, also consider these rankings.

Using an External Assessment (Partners in Flight Database) to Prioritize

The Partners in Flight database provides scores for breeding birds in BCR 33 (Sonoran and Mohave Deserts). Bill Williams River NWR considers Bendire’s thrasher (score of 21) and crissal thrasher (score of 19) to be Refuge Resources of Concern. Refuge staff might consider selecting Bendire’s thrasher as a priority Refuge Resource of Concern over the crissal thrasher because of its higher score in the Partners in Flight database.

(4) The **fourth filter** considers how well the Refuge Resources of Concern represent (a) ecological processes (internal factors responsible for refuge habitats [nutrient cycling, hydrology, soils]) or (b) ecosystem processes (external drivers [watershed variables, climate change]) within the refuge and surrounding landscape and (c) their importance in the maintenance and restoration of BIDEH.

Individually or collectively, Refuge Resources of Concern may represent habitats or plant communities requiring key natural ecological or ecosystem processes that are fundamental in maintaining ecosystem health. Priority refuge resources may be plant or wildlife communities or individual species requiring specific attributes for survival that are also critical factors for ecosystem function and health. Often endangered or rare plants and animals are the best indicators of these critical ecological or ecosystem processes. While

using this filter consider the effects of climate change when identifying Priority Refuge Resources of Concern.

Maintaining Ecological and Ecosystem Processes

At Ridgefield NWR, three migratory bird species (Swainson’s thrush, willow flycatcher, and Bewick’s wren) were selected as priority Refuge Resources of Concern because they occupy different seral stages of the Lower Columbia River bottomland forest (black cottonwood, willow, ash communities). Bottomland forest requires a functioning floodplain, which represents a natural ecosystem process. A federally listed submerged aquatic plant was selected to represent ephemeral ponds because it requires shallow consistent spring flooding and subsequent drying (ecological process) to grow and produce seed. The selection of these priority Refuge Resources of Concern at Ridgefield NWR not only represent Refuge System Resources of Concern (which includes FWS Trust Resources), but also represent important communities and ecological processes that maintain BIDEH.

When identifying priority Refuge Resources of Concern, use these filters simultaneously. As noted previously, it is important to rely on your professional judgment and the input of trusted experts. In addition to the filters described above, consult handbooks and other literature developed for implementation of the SHC framework to facilitate the selection of priority refuge species.

Working from the “Comprehensive List of Refuge Resources of Concern” table developed in Step 4, build a “Priority Refuge Resources of Concern” table (Table 5; full example in Appendix F). Use the appropriate filters below:

- Assess which Refuge Resources of Concern can be supported by current or restorable refuge capabilities.
- Evaluate which Refuge System Resources of Concern respond well to management or represent the condition of larger natural communities.
- Identify Refuge Resources of Concern ranked high by LCCs, States, joint ventures, BCR plans, and/or other resource partners and experts.
- Identify Refuge Resources of Concern that represent ecological and ecosystem processes important for maintaining and restoring BIDEH.

Application of these filters will lead to a subset of priority Refuge Resources of Concern. Most of the Refuge Resources of Concern identified in Step 4 that are not selected as focal species should still

Where Can I Find Information to Select Priority Refuge Resources of Concern?

There are many sources of information to help you sort through the comprehensive list of Refuge Resources of Concern for your refuge and identify those which should be your priorities for management:

- The knowledge of the refuge staff and the conservation literature are the first sources to use for identifying priority refuge species, assessing refuge site capabilities, and evaluating likely responses to management.
- Joint ventures and their regional partnerships are excellent sources of priority management needs. They have worked with the North American Bird Conservation Initiative (NABCI) and BCRs to rank migratory bird needs across North America. Their ecological assessments can help refuge staff determine individual contributions to BCR's priority species and habitats.
- LCC and other resource professionals engaged in the development of species habitat models for the SHC framework can lend their expertise.
- Partners in Flight conservation strategies for landbirds in specific physiographic areas often contain a list of focal species and habitat attributes (<https://www.partnersinflight.org/>).
- A database maintained by the Rocky Mountain Bird Observatory scores birds for each BCR using population size and trend, breeding distribution, threats, and other factors. Birds with higher scores are higher priority (<https://www.rmbo.org/pif/scores/scores.html>).
- Regional Migratory Bird Program personnel have expertise regarding specific bird groups (e.g., waterfowl, landbirds, shorebirds, waterbirds, and seabirds).
- Threatened and endangered species have priority designations based on degree of threat, potential for recovery, and taxon level (the highest priority species receive a rank of 1 and the lowest a rank of 18). Regional Ecological Services offices maintain this information.
- NatureServe Explorer is a database that ranks species and ecological systems based on assessments of State and global conservation status (<https://www.natureserv.org/explorer/>).
- Some State Wildlife Action Plans prioritize species and habitats (<https://www.teaming.com/state-wildlife-action-plans-swaps>).
- The FWS Targeted Resource Acquisition Tool (TRACT) provides decision support with criteria to rank species and priorities for land acquisition

benefit from management actions that are directed at the final refuge priorities.

After identifying the final priority Refuge Resources of Concern, complete the table with the following information for each resource element:

- General habitat type(s) required to support the species.
- Within the habitat, the specific structure or attributes required to support the species.
- Life history requirements provided by the refuge (e.g., foraging, breeding, or wintering habitat).
- Identification of “other benefiting species” from your table of “Refuge Resources of Concern” (Step 4) that will benefit from the management of priority Resources of Concern.

Developing this table is an iterative process. There is no standard number of priority resources, but generally it is better to select the smallest number that will allow you to benefit the greatest number of other Refuge Resources of Concern.

In addition to considering wildlife species and plant communities that represent refuge purposes and Refuge System Resources of Concern, review Table 3 to determine if wildlife and plant communities and the natural processes important for BIDEH are addressed by the suite of priority Refuge Resources of Concern.

Step 6: Identify Priority Habitats

In Step 5, you identified priority Refuge Resources of Concern and the habitats on which those resources depend. You also identified the habitat characteristics or attributes required by each species (Table 5). Because the Refuge System primarily manages plant communities or habitats, link priority Refuge Resources of Concern to habitats that provide for their life-cycle needs on the ref-

Table 5. Priority Refuge Resources of Concern for Ridgefield National Wildlife Refuge (full example in Appendix F)

Priority Refuge Resource	Habitat, Species, or Species Group	Habitat Structure or Species/Species Group Population Attribute(s)	Life History Requirement(s)	Other Benefitting Species
Swainson's thrush	Riparian	Bottomland Forest - mid to late successional with intact understory (<i>Fraxinus latifolia</i> - <i>Populus trichocarpa</i> / <i>Cornus stolonifera</i> / <i>Urtica dioica</i>). Shrub layer cover >50% with >60% of native shrubs; canopy cover > 50% (Ref: PIF 2000 pp 81)	Breeding	song sparrow, Bewick's wren, house wren, pileated woodpecker, downy woodpecker, black-headed grosbeak, red-eyed vireo, p.s. flycatcher, tree swallow
Willow flycatcher		Bottomland Forest-early successional, willow (<i>Salix lasiandra</i> / <i>Urtica dioica</i>). Patchy shrub layer, 1-4 m tall, with 30-80% cover and scattered herbaceous openings; canopy trees > 4 m covering < 20% of landscape (Ref: PIF 2000 pp 75)	Breeding	yellow warbler, song sparrow
Bewick's wren		Bottomland Forest - Ash Forest with little shrub layer (<i>Fraxinus latifolia</i> / <i>Carex deweyana</i> / <i>Urtica dioica</i>)	Breeding, year-round for benefiting species	s.b. white-breasted nuthatch, western wood-peewee, house wren, tree swallow, song sparrow, downy woodpecker, pileated woodpecker
Columbian white-tailed deer	<i>Odocoileus virginianus leucurus</i>	Total population of >80 deer on the refuge. Diversity of lowland, floodplain habitats in the lower Colombia River	Year round, full life cycle (wintering, fawning, summer, and fall)	Other riparian and floodplain species (e.g., willow flycatcher, yellow warbler, bald eagles, salamanders and other amphibians)

uge. You will use the specific characteristics or attributes of each of these habitats to construct measurable habitat objectives.

In Step 6, the goal is to identify the highest priority habitats to manage on the refuge. These may be habitats that already exist, or ones that can be restored. Typically, high-priority habitats correspond to the highest Priority Refuge Resources of Concern or will benefit the broadest number of these resources. *High priority habitats* are those that can be actively managed, maintained, or restored. *Low priority habitats* benefit fewer or less important Refuge Resources of Concern. Alternatively, these lower priority habitats may not require management, or they may be beyond FWS authority or our ability to manage them.

These two habitat categories are simply defined as “Priority I” and “Priority II.” By focusing on the former, refuge funding and personnel manage habitats for the

highest priority Refuge Resources of Concern. Those in the latter category are still important because they provide value to a range of species and contribute to the overall biodiversity of the refuge. These may be managed, if necessary, when refuge resources allow. For Step 6, you will use the factors identified below to rank habitats as Priority I or II. Also, in Table 6, explain why you ranked each habitat Priority I or II, and identify those factors that may constrain your management of each habitat, species, or species groups. Use the following factors to identify habitats as either Priority I or Priority II:

Priority I Habitats

- Can be managed to provide the greatest conservation benefit to priority species, especially those specifically identified in the refuge purpose(s).
- Offer the greatest contribution to:

- 1) The maintenance/restoration of BIDEH;
- 2) Represent important ecological and ecosystem processes not well represented within the landscape (including the broader ecoregion of which the refuge is a part); and
- 3) Address conservation needs of the Refuge System Resources of Concern.

- Habitat condition or other factors suggest an urgent need for active management.

Priority II Habitats

- Too limited in extent to make a meaningful difference.
- Outside the management authority or jurisdiction of the refuge.
- Do not require active management to maintain their present condition (does not include habitats identified above as Priority 1 Habitats under bullet 2).

Priority I and II management categories are most useful for long-term planning. On a year-to-year basis, the actual resources you choose to work on will vary, depending on resource conditions, needs, management cycles, and available staff and time. These are decisions made when preparing annual work plans. Also, changes on the landscape may push Priority II resources into the higher category.

Where Can I Find Information to Identify Priority Habitats?

Identification of priority resources is based on the information compiled in Steps 1-5. You should also base prioritization of refuge resources on your professional judgement and the experience of refuge staff.



Photo Credit: B. Thompson

Table 6. Habitat Priorities at Parker River National Wildlife Refuge (Example)

Habitat	Reasons for Ranking	Limiting Factors/Threats
Priority I Habitats		
Sandy Beach, Rocky Shore, Dune Grassland	Presence of nesting federally listed species; Importance to fall migrating shorebirds including highest priority species in Bird Conservation Region 30; Active management results in positive, measurable impact on Refuge System resources of concern	Human disturbance; storms; sea level change
Salt Marsh	Salt marsh habitat is limited; High potential for greatest Refuge contribution; Presence of several highest priority birds in Bird Conservation Region 30 (saltmarsh sparrow, seaside sparrow, and black duck); At 2,660 acres, it is the largest habitat type on the refuge and part of Great Marsh, the largest contiguous salt marsh north of Long Island	Diking and draining; altered hydrology; invasive species; sea level change; mercury contamination
Priority II Habitats		
Pitch Pine Dune Woodlands	Supports uncommon plant species, but the refuge contains only a small portion of this community type	Succession; lack of disturbance; invasive plants
Grasslands	A valuable cultural habitat type that supports nesting bobolinks, monarchs and other pollinating insects, foraging raptors, and migrating birds	Succession, requires regular mowing or other treatments; invasive plants
Open Water	Lack of jurisdiction and ability to manage to this habitat	Mercury and other contaminants; commercial and recreational fishing and other uses



Photo Credit: G. Warrick

SECTION III: WRITING REFUGE GOALS AND OBJECTIVES

The Refuge System handbook for writing goals and objectives identifies them as the unifying elements of successful refuge management. It is critical that they be clearly written and primarily derived from the characteristics or attributes of habitats or wildlife populations that support priority Refuge Resources of Concern. This applies when writing a CCP or HMP. Ideally, you should be able to step down goals and objectives from a CCP directly to an HMP although some earlier CCP objectives may not meet the SMART criteria (specific, measurable, achievable, results-oriented, time-fixed). In addition, CCPs do not always have enough objectives or sufficient detail to address requirements adequately for all priority Refuge Resources of Concern. In such cases, this handbook provides the approach you will need to step down CCP objectives to an HMP. In some cases, other plans may also help inform refuge management and monitoring, such as federally threatened and endangered species recovery plans. These objectives also provide a foundation for surveys that would be included in your refuge's IMP.



Step 7: Write Goals

Goals describe the desired future resource conditions of a refuge in broad and succinct statements. Goals are not measurable, but each one generates one or more objectives describing specific conditions in measurable terms. You should write goals for each of the habitat types identified under the Habitat Type column in Table 5. You may be able to combine similar habitat types into a more general goal that will later result in the development of several specific objectives. For example, mudflats to support shorebirds and moist-soil marshes for dabbling ducks can be grouped into seasonal wetlands. The more general seasonal wetlands habitat becomes the basis for a goal. (Note: When you develop specific objectives in Step 8, you will write at least one objective for mudflats and one for moist-soil marshes to support such a goal.) Ultimately, your goals will define the general direction for refuge wildlife and habitat management.

Where Can I Find Information to Write Goals?

Writing Refuge Management Goals and Objectives: A Handbook (page 4) provides specific guidance on how to write a goal statement. <https://nctc.fws.gov/resources/knowledge-resources/Pubs9/writingrefugegoals04.pdf>

Step 8: Write Objectives

Objectives are outcome-oriented and specify what you plan to achieve in measurable terms. In short, they are the basis for management, something especially important when engaged in adaptive management. Objectives are derived from goals and are the foundation for selecting strategies (e.g., disking, prescribed fire, water-level management, protection from threats), monitoring change, and evaluating success. As specified in the goals and objectives handbook, objectives should be SMART.

Each objective is typically composed of both habitat and wildlife-based parameters (habitat attributes e.g., vegetation cover, tree diameter at breast height; and population attributes e.g., total population, chicks per pair). As noted in the goals and objectives handbook, habitat-based objectives are generally more quantitative measures because management activities are typically habitat-based. Therefore, habitat monitoring is the primary (but not exclusive) basis for evaluating the success of achieving the habitat objectives set forth in CCPs or HMPs.

“Habitat monitoring, in association with monitoring wildlife response to habitat manipulation, provides the best measure of achievement for HMP objectives...Monitoring wildlife populations as a sole indicator of wildlife habitat is not usually appropriate. Animal population changes may result from events other than habitat manipulations (e.g., biotic and abiotic conditions such as weather, disease, human intervention, and contaminants). Often these external factors can affect wildlife populations and mask benefits associated with improved habitat conditions.” (620 FW1.14A)

That said, properly designed monitoring can provide valuable feedback on the effectiveness of habitat management actions in benefitting wildlife populations

(Morrison et al. 2001). More often, population-based objectives will be needed for a refuge where the metrics are production levels to support recovery of a federally listed species or target predator densities for a predator removal effort, for example.

The number of objectives written for each goal will vary. Minimally, there should be one objective for each specific habitat, species, or species group identified in your “Priority Refuge Resources of Concern” table (Step 5). Habitat objectives should be measureable in terms of quantity and quality. Most habitat objectives will be quantitatively measureable in terms of acreage or linear measurement (e.g., stream miles). Qualitative attributes of each objective should be identified in the Habitat Structure or Species/Species Group Population

Attribute(s) column for each priority Refuge Resource of Concern. In many cases, the habitat attributes describe the quality of the acres to be maintained or restored over time. It is likely you will identify additional attributes that will more completely describe the desired conditions while developing the objectives. To determine if an objective is achievable, it must include a brief narrative (rationale) that describes how the objective will contribute to meeting the needs of priority Refuge Resources of Concern, describes its assumptions, documents potential conflicts with other priority Refuge Resources of Concern (e.g., where a mudflat objective for shorebirds conflicts with a shallow wetland objective for dabbling ducks), and explains the limiting factors (e.g., irreversible landscape alteration or insufficient funds).

Where Can I Find Information to Write Objectives?

- *Writing Refuge Management Goals and Objectives Handbook* describes how to write an objective (<https://nctc.fws.gov/resources/knowledge-resources/Pubs9/writingrefuge-goals04.pdf>).
- Refer to your “priority Refuge Resources of Concern” table (Step 5). The column describing habitat structure or species/species group population attribute(s) will contain the specific attributes about each resource type you want to achieve. If you properly described each resource type according to life-history needs of your priority Refuge Resources of Concern (e.g., DBH and density of trees, water depth and acreage, minimum patch size, etc.), the attributes recorded there are what you will use to make your habitat and wildlife objectives measurable.
- During development of the habitat and wild-life objectives, it is likely you will identify additional attributes that will more completely describe the desired resource conditions on the refuge.
- Implementation of the SHC approach will provide a mechanism to step down landscape level population objectives meaningfully and defensibly to a local scale (refuges). These objectives can be derived from scientific information found in various plans, reports, and datasets developed by the FWS or in cooperation with our conservation partners and from references used to generate tables during Steps 4 and 5.
- If preparing an HMP, the CCP (if available) can provide source material.

Use the Habitat Structure or Species/Species Group Population Attribute(s) column from your “Priority Refuge Resources of Concern” table (Step 5) to develop the appropriate number of SMART objective(s) for each resource goal. Generally, an objective is written for each cell in the Habitat Structure or Species/Species Group Population Attribute(s) column with habitat or population attributes required to support the life-history requirements of a priority refuge resource(s). You will use these and other resource attributes identified through an iterative process to develop habitat and wildlife objectives to manage on the refuge. Most habitat objectives will be quantitatively measureable by acreage, or linear scale (e.g., stream miles). It is often desirable to develop a range of acres or measureable attributes that will describe the variability of natural environmental conditions (e.g., snow pack, rainfall) or administrative constraints frequently limiting refuge habitat management capabilities. Because this process is iterative, additional attributes that will more completely

describe the desired resource conditions, may be identified while developing the objectives. In addition to Appendix A of *Writing Refuge Management Goals and Objectives: A Handbook*, see Appendix H of this document for examples of habitat objectives.

Write a short narrative documenting the rationale for each objective. When describing conflicts, you may want to explain how you partitioned habitats or why you chose to support the needs of one priority resource of concern over another. Consider limiting factors to ensure that each objective is achievable. You should also consider the limiting factors for maintenance of BIDEH in Appendix D. In many cases, these limiting factors are the primary constraints that affect the ability of a refuge to achieve one or more objectives. When considering limiting factors and achievability of objectives, remember the life span of a CCP and/or HMP is 15 years, so some factors could become more limiting while others (funding, personnel, and equipment) could improve.

When assessing limiting factors, you may consider the following:

- Lack of capital resources on the refuge
 - Funding
 - Personnel
 - Equipment
 - Infrastructure (e.g., dikes, levees, control structures, pumps)
- Abiotic factors
 - Soils or topography
 - Surface or subsurface hydrology
 - Air quality and water quantity or quality
 - Contaminants and other pollution
 - Climate and predicted climate change
- Administrative requirements
 - Sections 404 and 401 Clean Water Act
 - Rivers and Harbors Act
 - Clean Air Act
 - Wilderness Act
- Prescribed fire limitations (e.g., smoke management)
- Other compliance issues (e.g., NEPA, management plans)
 - Habitat conditions on or surrounding the refuge
 - Patch size
 - Fragmentation and connectivity of habitats
 - Buffers between other land uses that have negative impacts
- Fires, storms, and other catastrophic events
 - Predation
 - Invasive species
 - Disease

How Do I Use The Information From This Handbook to Develop Comprehensive Conservation Plan Alternatives?

NEPA guidance tells us to present and analyze no-action and action alternatives for management. More specifically, the conservation planning policy (602 FW 3.4c[3][b]) directs the planning staff to:

“Develop a range of alternatives, or different approaches to planning unit management, that we could reasonably undertake to achieve planning unit goals and refuge purposes; help fulfill the refuge system mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the refuge system; help achieve the goals of the national wilderness preservation system; meet other mandates; and resolve any significant issues identified. Alternatives consist of different sets of objectives and strategies for management of the refuge.”

The species-habitat matrices’ and list of priority refuge resources identified as you worked through this handbook provide the biological foundation for management of the refuge. As you develop SMART habitat and wildlife objectives for each goal, often the planning team, our conservation partners, and the public will identify different approaches to achieve refuge purposes, manage for Refuge Resources of Concern, and/or address the maintenance of BIDEH on the refuge. When appropriate, these approaches may be used to write realistic and achievable alternatives for the CCP. These alternatives may range from different acreage of habitat types to be managed or restored to consideration of alternative management strategies that can be used to achieve objectives. The biological information compiled through the use of this handbook process will help when determining appropriate compatible wildlife-dependent recreational uses to consider while developing alternatives. Often alternatives follow a theme, such as listed below:

- Current habitat management
- Passive habitat management
- Active habitat management
- Natural processes management

However you decide to develop alternatives, the biological foundation generated by following this handbook will support the collaborative process used by the planning team to prepare realistic alternatives for the CCP or stepped-down HMP.

How do Refuge Quantitative Objectives Contribute to Conservation Needs at Larger Landscape Scales?

Objectives developed in Step 8 (in terms of acres, populations, productivity, etc.) can be used to identify how each refuge and collectively the Refuge System contribute to larger scale habitat and wildlife objectives (e.g., ecoregional, BCRs, watersheds, States, flyways, and FWS Regional or national plans). For example, Appendix I demonstrates how CCP/HMP objectives for the Northeast refuges collectively contribute to BCR objectives. It is important for the Refuge System

to use a standardized approach documenting the objectives development process to help us compare the information at multiple scales and improve objectives as new scientific information becomes available over time. Currently, FWS and our conservation partners are striving to develop population and habitat objectives for surrogate species at ecosystem or larger scales through SHC to ensure the conservation of functional landscapes capable of supporting self-sustaining populations of fish, wildlife, and plants. As a result, we will improve our capability to assess the relative contribution of individual refuges and the Refuge System to landscape conservation priorities.



Photo Credit: B. Thompson

Literature Cited

- Caro, T. 2010, Conservation by proxy: indicator, umbrella, keystone, flagship and other surrogate species. Island Press, New York
- Morrison, M.W. Block, M.D. Strickland, and W.L. Kendall. 2001. Wildlife study design. Springer-Verlag New York, Inc., New York
- Reynolds, J.H., M.G. Knutson, K.B. Newman, E.D. Silverman, and W.L. Thompson. 2016 A road map for designing and implementing a biological monitoring program. Environmental Monitoring and assessment 188:1-25.
- Salas, D. and M. Prankus. 2015. ROCSTAR: Resources of Concern Selection Tool for America's Refuges. JF CardnoNew, Fitchburg, Wisconsin. Unpublished Report-37596

APPENDIX A. LEGISLATIVE MANDATES, POLICY, GUIDANCE, HANDBOOKS, AND OTHER RESOURCES REFERENCED IN THE HANDBOOK

National Wildlife Refuge System Administration Act of 1966, as amended by National Wildlife Refuge System Improvement Act of 1997 (Refuge System Improvement Act) https://www.fws.gov/refuges/policiesandbudget/HR1420_index.html

Mission of the U.S. Fish and Wildlife Service https://www.fws.gov/policy/npi99_01.html

Mission and Guiding Principles of the National Wildlife Refuge System <https://www.fws.gov/refuges/about/mission.html>

Policy on National Wildlife Refuge System Mission and Goals and Refuge Purposes (601 FW 1) <https://www.fws.gov/policy/603fw2.html>

Policy on Compatibility of Proposed and Existing Uses on National Wildlife Refuges (603 FW 2) <https://www.fws.gov/policy/603fw2.html>

National Wildlife Refuge System Vision: Conserving the Future (2011) <https://www.americaswildlife.org/vision/>

National Wildlife Refuge System Vision: Conserving the Future: Fulfilling the Promise (1999) <https://www.fws.gov/refuges/whm/promises/index.html>

National Environmental Policy Act of 1969 (NEPA) <https://www.fws.gov/r9esnepa/RelatedLegislative-Authorities/nepa1969.pdf>

Migratory Bird Conservation Act (16 U.S.C. 715d) <https://www.fws.gov/laws/lawsdigest/MIGBIRD.html>

Fish and Wildlife Coordination Act (16 U.S.C. 661-667e) <https://www.fws.gov/laws/lawsdigest/FWCO-ORD.html>

Refuge Recreation Act (16 U.S.C. 460k-460k-4) <https://www.fws.gov/laws/lawsdigest/refrecre.html>

Endangered Species Act (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) <https://www.fws.gov/endangered/laws-policies/index.html>

Marine Mammal Protection Act of 1972 as amended 2007 (16 U.S.C. 1361-1407) <https://www.nmfs.noaa.gov/pr/laws/mmpa>

Policy on Maintaining Biological Integrity, Diversity and Environmental Health of the National Wildlife Refuge System (601 FW 3) <https://www.fws.gov/policy/601fw3.html>

Fish and Wildlife Resource Conservation Priorities, Region 3 (January 2002) <https://nctc.fws.gov/Pubs3/priorities02.pdf>

U.S. Fish and Wildlife Service's Climate Change website <https://nctc.fws.gov/home/climatechange/climate101.html>

Writing Refuge Management Goals and Objectives: A Handbook (602 FW 1, 3, & 4) <https://nctc.fws.gov/resources/knowledge-resources/Pubs9/writingrefugegoals04.pdf>

National Environmental Policy Act (NEPA) for National Wildlife Refuges: A Handbook <https://www.fws.gov/policy/NEPARefugesHandbook.pdf>

U.S. Fish and Wildlife Service's *Strategic Habitat Conservation Handbook: A Guide to Implementing the Technical Elements of Strategic Habitat Conservation* (February 2008). <https://www.fws.gov/science/doc/SHCTechnical-Handbook.pdf>

Clean Water Act (Section 401) <https://www.epa.gov/cwa-404/clean-water-act-section-401-certification> and Clean Water Act (Section 404) <https://www.epa.gov/cwa-404/clean-water-act-section-404>

Rivers and Harbors Act <https://www.fws.gov/laws/lawsdigest/riv1899.html>

Clean Air Act <https://www.epa.gov/laws-regulations/summary-clean-air-act>

Wilderness Act <https://www.fws.gov/laws/lawsdigest/WILDRNS.html>

APPENDIX B. SUMMARY OF THE ESTABLISHMENT OF RIDGEFIELD NATIONAL WILDLIFE REFUGE

Date	Legal Document	Direction
May 18, 1965	MBCC Memo #1	The Migratory Bird Conservation Commission (MBCC), acting under authority of the Migratory Bird Conservation Act (MBCA) of 1929, authorized FWS to acquire 14 tracts in Clark County, Washington, totaling 6,130.08 acres at a price of \$2.2 million “to provide wintering habitat for dusky Canada geese and other waterfowl. Will also provide breeding and migration use and substantial public shooting in area. Estimated peak population: 125,000 ducks and 3,000 geese.”
Jan. 27, 1966	Warranty Deed	Tracts 21 and 21a (655.73 acres) purchased from Mary E. Carty et. al. under authority of the MBCA. Purpose derived from MBCC Memo #1.
Jan. 31, 1966	Warranty Deed	Tracts 17, 17-I, 17R, 17R-1 (1,739.23 acres) purchased from West Coast Farms Company under authority of the Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718-718j). Purpose derived from MBCC Memo #1.
Feb. 14, 1966	Warranty Deed	Tract 19 (23.83 acres) purchased from James E. Carty with Migratory Bird Conservation funds. Purpose derived from MBCC Memo #1.
Mar. 29, 1966	Warranty Deed	Tract 20 (11.47 acres) purchased from William E. Carty with Migratory Bird Conservation funds. Purpose derived from MBCC Memo #1.
Sept. 23, 1966	Warranty Deed	Tract 25 (49.14 acres) purchased from Albert L. Kunz with Migratory Bird Conservation funds. Purpose derived from MBCC Memo #1.
Nov. 17, 1966	Warranty Deed	Tract 26 (3.63 acres) purchased from Fred and Elizabeth Laws with Migratory Bird Conservation funds. Purpose derived from MBCC Memo #1.
Nov. 29, 1967	Quitclaim Deed	Tract 21-I (24.99 acres) donated to the Service by Constance and Aubrey Morgan under the authority of the MBCA of 1929. Purpose derived from MBCC Memo #1.
Feb. 22, 1968	Quitclaim Deed	Tract 21-I (24.99 acres) donated to the Service by Mary E. Carty et. al. under the authority of the MBCA of 1929. Purpose derived from MBCC Memo #1.
Aug. 5, 1969	MBCC Memo #4	Reapproved purchase of Tracts 11,12,14a due to increased values. Purpose of refuge: “to provide resting and wintering area for migratory waterfowl.”
Oct. 21, 1969	Agreement for Purchase of Lands	Tract 11 (153.78 acres) purchased from Rosa Roth with Migratory Bird Conservation funds under the authority of the MBCA of 1929. Purpose derived from MBCC Memo #1 and #4. Note: Agreement for Purchase of Lands dated June 16, 1969.
Jan. 13, 1970	Warranty Deed	Tracts 11a,b (356.62 acres) purchased from Rosa Roth with Migratory Bird Conservation funds under the authority of the MBCA of 1929. Purpose derived from MBCC Memo #1 and #4.

Date	Legal Document	Direction
Mar. 1972	MBCC Memo (not numbered)	Reapproved purchase due to increased values. Purpose of refuge: “to provide resting and wintering area for migratory waterfowl.”
Jan. 22, 1974	MBCC Memo #6	Reapproved purchase due to increased values. Purpose of refuge: “to provide resting and wintering area for migratory waterfowl.”
Mar. 1980	EIS, Land Acquisition Zimmerly Tract	Covered acquisition of 1,610 acres of Bachelor Island within the acquisition boundary. Purpose of acquisition: “to preclude uses that would be incompatible with wildlife use, such as industrial, commercial, or residential development, and to gain the capability to manage the land for increased wildlife benefits.” Species or species groups specifically mentioned: wintering waterfowl, bald eagle, sandhill crane, great blue heron.
Dec. 1983	EA, Acquisition of Remaining Tracts, Ridgefield NWR	Covered acquisition of remaining tracts (12, 14, 18, 22, 23, 23a, 24, 27, 42, 41) within the approved refuge boundary. Purposes of acquisition: “to preclude activities, such as industrial, commercial, and residential development, that would be incompatible with wildlife use; to prevent changes in the present pattern of land use; and to gain authority to manage the lands for increased wildlife benefits... to increase overwintering carrying capacity for dabbling ducks . . . to maintain current capacity in support of existing overwintering use by Canada geese, swans, and diving ducks.”
Nov. 1984	LPP, Proposed Acquisitions to the Ridgefield NWR	Covered acquisition of tracts 12 (tract 41 is a part of this tract), 14, 18, 22, 23, 23a, 24, 27 and 42 within the approved refuge boundary under authority of the MBCA of 1929. Purposes of acquisition: “to preclude human activities that would be incompatible with wildlife use; to prevent major changes in the present pattern of land use; and to manage added refuge lands for increased wildlife benefits.” Species and species groups specifically mentioned: wintering waterfowl, bald eagles, sandhill cranes, great blue heron.
Feb. 5, 1985	MBCC Memo #8	Reapproved purchase due to increased values. Purpose of refuge: “to provide resting and wintering area for migratory waterfowl.”
Feb. 11, 1985	Warranty Deed	Bachelor Island tracts (23 and 23 a, 1,609.97 acres) purchased from Bachelor Island Ranch Inc. with Migratory Bird Conservation funds under the authority of the MBCA of 1929. Attachment to deed states acquisition authority for this tract as “Section 5 of the Act of February 18, 1929 (45 Stat. 1222) as amended by the Fish and Wildlife Improvement Act of 1978 (92 Stat 3110), Section 6 of the Act of February 18, 1929 as amended by the Section 301 of the Act of June 15, 1935 (49 Stat 381) and the Migratory Bird Hunting Stamp Act of March 16, 1934 as amended.” Purpose derived from MBCC Memos #1, #4, #6, #8 and memo of March 1972; EIS of 1980, and EA of 1983.
Oct. 12, 1989	CatEx (Decision Document, Acquisition of Port of Vancouver Tract)	Purpose of acquisition of Tract 12: “to preclude human activities, such as land development and commercial enterprise, (both with potential for altering habitat and polluting areas) that would be incompatible with wildlife use; to prevent major changes in the present pattern of wildlife use; and to manage added refuge land for increased wildlife benefits.” Species or species groups specifically mentioned: “over 20 species of waterfowl wintering along the lower Columbia River including mallard, pintail, and blue winged teal which are listed in the North American Waterfowl Management Plan;” six subspecies of Canada geese (Taverner’s, dusky, western, cackling, lesser, and the endangered Aleutian); bald eagle; peregrine falcon; tundra swan; sandhill crane; shorebirds; marshbirds; and songbirds.

APPENDIX B, *continued*

Date	Legal Document	Direction
Mar. 1, 1991	Warranty Deed	Ridgeport Dairy tract (Tract 12, 520.81 acres, also called the Port of Vancouver Tract) purchased from the Port of Vancouver using Land and Water Conservation funds under authority of the Fish and Wildlife Act of 1956. The purposes of lands purchased with Land and Water Conservation Funds are “for the development, advancement, management, conservation and protection of fish and wildlife resources” [Fish and Wildlife Act of 1956, 16 U.S.C 742f(a)(4)]. Purposes also derived from MBCC Memos #1, #4, #6, #8 and memo of March 1972; EA of 1983; CatEx of October 12, 1989.
Mar. 21, 1995	MBCC Memo #10	Price approval for Tracts 14 and 14a (68.5 acres). Purpose of refuge: “to preserve a major wintering area for migratory waterfowl along the Pacific coast.”
Sep. 5, 1995	Warranty Deed	Tracts 14 and 14a (68.5 acres) purchased from Campbell Lake Rod and Gun Club with Migratory Bird Conservation funds under the authority of the MBCA of 1929. Purposes also derived from MBCC Memos #1, #4, #6, #8, #10 and memo of March 1972; EA of 1983.

APPENDIX C. SUMMARY OF SPECIES AND HABITATS IDENTIFIED IN RIDGEFIELD NATIONAL WILDLIFE REFUGE'S PURPOSE

Species, Species Group, or Habitat	Supporting Habitat Type(s)	Life History Requirement(s)	Documentation
Wintering 125,000 ducks, 3,000 geese	Old fields, bottomland prairie, emergent wetlands, agricultural pastures	Wintering habitat	Migratory Bird Conservation Commission (MBCC) 1
Breeding, migration, resting wintering waterfowl	Old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Migration and wintering habitat	MBCC 1
Dusky Canada goose - wintering	Old fields, bottomland prairie, emergent wetlands, agricultural pastures	Migration and wintering habitat	MBCC 1, 8, Ridgeport Dairy (RPD), Preliminary Project Proposal (PPP), RPD Categorical Exclusion (Cat. Ex.)
Other Canada/ cackling geese – resting and wintering	Old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Migration and wintering habitat	MBCC 4, RPD Environmental Assessment (EA)
Taverner's, dusky, western, cackling, lesser geese	Old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Migration and wintering habitat	RPD PPP, RPD Cat. Ex.
Aleutian cackling goose	Old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Migration and wintering habitat	RPD Cat. Ex.
Tundra swans - roosting	Emergent wetlands, tidal riverine	Migration and wintering habitat	RPD EA, RPD PPP, RPD Cat. Ex.
Trumpeter swans	Emergent wetlands, tidal riverine	Migration and wintering habitat	RPD PPP
Dabbling ducks – resting and nesting	Dabbling ducks – resting and nesting	Migration and wintering habitat	MBCC 1, RPD EA

Species, Species Group, or Habitat	Supporting Habitat Type(s)	Life History Requirement(s)	Documentation
Wintering habitat - mallard, pintail, blue-winged teal	Emergent wetlands, tidal riverine	Wintering habitat	RPD PPP, RPD Cat. Ex.
Diving ducks - wintering	Emergent wetlands, tidal riverine	Migration and wintering habitat	RPD EA
Wigeon – native pasture	Dry prairie, bottomland prairie	Wintering habitat	MBCC 1
Sandhill crane	Emergent wetlands	Nesting	MBCC 8, Bachelor Island BI Environmental Impact Statement (EIS)
Sandhill cranes – resting/roosting	Tidal riverine, bottomland prairie, croplands, agricultural pastures	Migration and wintering habitat	MBCC 8, 10, BI EIS, RPD EA, RPD PPP, RPD Cat. Ex.
Great blue herons - nesting	Bottomland forest	Nesting	MBCC 8, BI EIS
Resting, feeding, wintering waterfowl	Old fields, bottomland prairie, emergent wetlands, agricultural pastures	Resting, feeding, wintering	MBCC 4, 6, 8, 10, unnumbered MBCC memo circa 1972
Bald eagle	Bottomland forest	Roosting, nesting	MBCC 8, BI EIS, RPD EA, RPD PPP, RPD Cat. Ex.
Preserve major wintering area for waterfowl	Old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Wintering	MBCC 10
Feeding and resting dusky and cackling geese	Old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Migration and wintering	MBCC 10
Resting, feeding waterfowl	Wetland, old agricultural fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands	Migration and wintering	BI EIS

Species, Species Group, or Habitat	Supporting Habitat Type(s)	Life History Requirement(s)	Documentation
Shorebird, raptors, marsh and waterbirds, mammals, riparian	Wetland, agricultural old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands, bottomland forests		BI EIS, RPD EA
Shorebirds, marshbirds, songbirds, black-tailed deer, coyote, fox, raccoon, skunk, beaver, otter, brush rabbit	Wetland, agricultural old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands, bottomland forests	Spring and fall migrations and resident populations	RPD PPP
Shorebirds, marshbirds, songbirds	Wetland, agricultural old fields, bottomland prairie, emergent wetlands, agricultural pastures, croplands, bottomland forests	Spring and fall migrations	RPD Cat. Ex.
Provide and protect wintering habitat		Wintering	RPD EA
Peregrine falcon		Wintering	RPD EA, RPD PPP, RPD Cat. Ex.
Common loon		Wintering	RPD PPP
<i>Howellia aquatilis</i>	Wetland		RPD PPP
<i>Trillium albidum</i>	Old fields		RPD PPP
<i>Erythronium oregonum</i>	Old fields		RPD PPP
<i>Delphinium nuttalli</i>	Old fields		RPD PPP

APPENDIX D. SUMMARY OF BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH FOR RIDGEFIELD NATIONAL WILDLIFE REFUGE

Habitats (plant communities) that represent existing biological integrity, diversity, and environmental health	Population/habitat attributes (age, class, structure, seral stage, species composition)	Natural Processes responsible for these conditions	Limiting factors
Bottomland forest	<p>Subtypes:</p> <ul style="list-style-type: none"> Black cottonwood with appropriate native shrub understory Willow pure stand (wet sites) Ash/nettle/sedge community; Ash with dense herbaceous and shrub understory, > 12" DBH, > 40% canopy coverage <p>General attributes of bottomland forest: Native shrub layer dominants include willow, snowberry, cascara, Nootka rose, red-osier dogwood, red alder, spirea, and red elderberry and saplings of native canopy trees. Native sub-canopy trees include black hawthorn, vine maple, big leaf maple, willow, ninebark, hazelnut, and young canopy trees. Native canopy trees include Oregon ash and black cottonwood.</p> <p><i>Potential Conservation Species: song sparrow (all stages), Swainson's thrush (dense shrub), willow flycatcher (shrub/young seral), purple martin (snag/low competition by non-native birds, nearby water), Columbia white-tailed deer.</i></p>	<p>Functioning floodplain major flood events, scour of trees/herbaceous layers, deposition of silts</p> <p>Frequency of flooding?</p> <p>Flooding is the primary natural disturbance regime in Columbia River bottomland forest.⁶</p>	<p>Non-functioning floodplain dike construction and dams reduce/alter flood events</p> <p>Past grazing, invasive species (competition and soil binding), lack of silt deposition</p>
Bottomland (wet) prairie	<p>Native herbaceous species: sedge dominated, tufted hairgrass, rushes, unique: Willamette daisy, Bradshaw's lomatium, Nelson's checkermallow</p> <p><i>Potential Conservation Species: rail, harrier</i></p>	<p>Periodic fire and poorly drained soils; seasonal flooding. Transition zone above mean high gauge, through-out refuge</p>	<p>Invasive species especially reed canarygrass, displace/out compete native communities; lack of periodic fire</p>

Habitats (plant communities) that represent existing biological integrity, diversity, and environmental health	Population/habitat attributes (age, class, structure, seral stage, species composition)	Natural Processes responsible for these conditions	Limiting factors
Dry prairie	<p><i>Agropyron caninum</i>, <i>Bromua sterilis</i>, <i>Holcus</i>, <i>Hordeum brachyantherum</i>, <i>Poa palustris</i>, unique: basalt outcrops, northern alligator lizard, <i>Camassia</i> spp, nuttall's larkspur</p> <p><i>Potential Conservation Species: Brush Prairie Pocket Gopher</i></p>	Periodic fire, shallow well drained soils	Invasive species encroachment, lack of fire, grazing/soil disturbance
Western hemlock forest	Mixed forest, Douglas-fir, western red cedar, Indian plum, Oregon white oak, unique: sessile trillium, Oregon lily	Infrequent fire, light grazing/browsing by large ungulates	Blackberry encroachment; canopy closure
Oak savannah/woodlands (unique habitat based on basalt outcrops and transitional floodplain habitat)	<p><i>Potential Conservation Species: Breasted nuthatch, western gray squirrel</i></p>	<p>Frequent low intensity fire (approx. every 5 years); absence of ground disturbance; presence of acorn dispersing animals (squirrels, jays, acorn woodpeckers); light grazing/browsing by native ungulates</p> <p>Oak habitats were formerly maintained by fires of various frequency. Areas of infrequent fire supported shrub cover. Fire is credited with reducing encroachment by conifers and other competing species. Post-fire establishment and survival of oak saplings have increased.</p>	Invasive species (i.e. blackberry) displace/out-compete native communities; lack of fire; conifer encroachment; competition by native trees/canopy closure; lack of light grazing/browsing pressure by large ungulates; overgrazing in summer (oak seedlings eaten); spread of sudden oak death fungus
Emergent wetlands	<p>Seasonal, semi-permanent, permanent, (see Gorge CCP Appendix J)</p> <p><i>Potential Conservation Species: waterfowl, Canada geese, dusky Canada goose, cackling geese, tundra swan, sandhill cranes, shorebirds, great blue heron and other species identified in Purpose documents, rails, shorebirds</i></p>	Periodic flooding; seasonal fluctuations/drying but more permanent water situation than typical seasonal wetlands	Invasive spp (esp reed canarygrass, nutria); dams on river change water regime, diking, flood depth and duration
Tidal riverine	<p>Open, generally flowing water; potentially supporting rearing anadromous fish affording fish passage throughout watershed</p> <p><i>Potential Conservation Species: anadromous fish cutthroat and coho salmon</i></p>	Tidal and periodic flooding, open water; submergent vegetation, perennial water flows	Residential/commercial development, lack of major flooding, siltation, invasive species encroachment (reed canarygrass); contaminants; water quality/temperature

APPENDIX D, *continued*

Habitats (plant communities) that represent existing biological integrity, diversity, and environmental health	Population/habitat attributes (age, class, structure, seral stage, species composition)	Natural Processes responsible for these conditions	Limiting factors
Ephemeral ponds	Small < 1 acre perched wetlands located on RNA/Carty Unit. Unique: <i>Howellia aquatilis</i> <i>Potential Conservation Species:</i> <i>Howellia aquatilis</i>	Generally open canopy; sparse emergent and submergent vegetation; inundation Nov-June via rainfall; generally < 1' depth	Reed canarygrass encroachment ; canopy closure

¹For habitats, include plant communities that represent existing biological integrity, diversity, and environmental health.

²Examples of habitat/population attributes include the following: age class, structure, seral stage, species composition, total population.

APPENDIX E. REFUGE SYSTEM RESOURCES OF CONCERN FOR RIDGEFIELD NATIONAL WILDLIFE REFUGE

Species	Refuge Purpose Species	BIDEH	Federal T&E	State T&E	BCR # 5 (Table 8)	PIF (tier)	BMC Region 1 Status	BCC- 2002 Region 1 (Table 41)	BCC National (Table 48)	State Wildlife Action Plan Priorities (SGCN)	Shorebird Plan	Waterbird Plan	Waterfowl Plan	Flyway Depredation	TNC-WVPTGSEA	WA NHP S Rank
Dusky Canada goose	x						GBBDC						x	x		
Cackling Canada goose (feeding/resting habitat)	x						GBBDC						x	x		
Other Canada Geese (resting/wintering habitat)	x												x	x		
Ducks/geese (wintering)	x												x			
Taverner's cackling, dusky, western, cackling, lesser Canada geese	x												x			
Aleutian cackling goose	x		FCo	ST									x			SZ
Tundra swan (wintering habitat)	x												x			S4
Trumpeter swan (wintering habitat)	x						GBBDC (interior & rocky)			x					x	S3
Dabbling ducks (resting/nesting)	x														x	
Mallard, pintail, blue-winged teal (wintering habitat)	x															
Diving ducks (wintering)	x														x	
American wigeon	x						GBBDC								x	S4
Sandhill crane (roosting/resting habitat)	x			SE												S1
Sandhill crane (nesting habitat)	x			SE												S1
Bald Eagle (nesting/roosting)	x		FT	ST						x						S4
Wintering waterfowl (resting/feeding/wintering)	x															
Great blue heron (nesting)	x									x					x	S4
Shorebirds, raptors, marsh waterbirds, mammals, riparian habitat	x															
Peregrine falcon	x		FCo	SS	x	X2c		x	x	x					x	S2
Shorebirds, marshbirds, songbirds	x															
Western Canada goose													x	x		
Common loon	x			SS						x						S2
<i>Howellia aquatilis</i>	x		FT	ST											x	S3
<i>Trillium albidum</i>	x															
<i>Erythronium oregonum</i>	x															

APPENDIX E, *continued*

Species	Refuge Purpose Species	BIDEH	Federal T&E	State T&E	BCR # 5 (Table 8)	PIF (tier)	BMC Region 1 Status	BCC- 2002 Region 1 (Table 41)	BCC National (Table 48)	State Wildlife Action Plan Priorities (SGCN)	Shorebird Plan	Waterbird Plan	Waterfowl Plan	Flyway Depredation	TNC-WWPTGSEA	WA NHP S Rank
<i>Delphinium nuttalli</i>	x															
Olive-sided flycatcher	x		FCo		x	X1		x	x						x	S4
Taverner's/Lesser cackling goose													x	x		
White-fronted goose							GBBDC									
Snow goose							GBBDC (Wrangle only)									
Mallard							GBBDC						x			
Northern pintail							GBBDC			x			x			S5
Wood duck							GBBDC									S3
Diving ducks															x	
Ring-necked duck							GBBDC			x						S4
Lesser scaup							GBBDC			x				x		S4
Canvasback							GBBDC									
Northern harrier						X1			x							
American kestrel						X1										S4
Western screech-owl						X2										S4
Red-shouldered hawk						X2										
Cooper's hawk						X2										
Band-tailed pigeon						X1	GBBDC								x	S3
Mourning dove							GBBDC									S5
Swainson's thrush						X1										S5
Tree swallow						X2										
Western meadowlark						X1									x	
Pileated woodpecker						X1				x						S4
Purple martin				SC		X1				x					x	S3
Willow flycatcher						X1									x	
Slender-billed white-breasted nuthatch			FCo	SC		X1				x					x	S1
Streaked horned lark (strigata)			FC	SC	x	X1	x	x	x	x						S1
Downy woodpecker						X2										
Western wood-peewee						X1									x	S5
Common bushtit						X1										
Bewick's wren (altus and bewickii)						X1			x							
House wren						X2										
Vaux's swift				SC		X2b				x					x	S3
Rufous hummingbird					x	X1	x		x						x	S4
Lazuli bunting						X2a										S4
Pacific-slope flycatcher						X2a									x	S4
Purple finch						X2a										
Short-eared owl						X			x							S3
Spotted towhee						X2a										
Black-headed grosbeak						X2b										
Red-eyed vireo						X1										

Species	Refuge Purpose Species	BIDEH	Federal T&E	State T&E	BCR # 5 (Table 8)	PIF (tier)	BMC Region 1 Status	BCC- 2002 Region 1 (Table 41)	BCC National (Table 48)	State Wildlife Action Plan Priorities (SGCN)	Shorebird Plan	Waterbird Plan	Waterfowl Plan	Flyway Depredation	TNC-WWPTGSEA	WA NHP S Rank
Yellow warbler						X1										S4
Grasshopper sparrow						X1										
Oregon vesper sparrow			FCo	SC	x	X1				x						S1
Bullock's oriole						X2									x	
Black-bellied plover											4					S4
Common snipe											4					S4
Dunlin											4					S4
Greater yellowlegs											4					S4
Killdeer											4					S4
Western sandpiper											4					S4
Least sandpiper											4					S4
Spotted sandpiper											3					S3
Long-billed dowitcher											3					S4
Semipalmated plover											3					
Wilson's phalarope									x		3					S3
Lesser yellowlegs											2					
Black-necked stilt											1					
<i>Fraxinus latifolia</i> / <i>Carex deweyana</i> / <i>Urtica dioica</i> plant association		x														S2
Depressional wetland broadleaf forest		x													x	
Tidally-influenced freshwater wetlands		x													x	
Riparian forest and shrublands		x													x	
Freshwater marshes		x													x	
Northern oak woodlands		x													x	
Freshwater aquatic beds		x													x	
Autumnal freshwater mudflats		x													x	
Vernal pools		x													x	
Upland prairie and savanna		x													x	
Wet prairie		x													x	
Townsend's big-eared bat (Pacific subspecies)			FCo	SC						x					x	
Douglas fir-western hemlock-western redcedar forests		x													x	
Yuma myotis			FCo												x	S5
Columbian white-tailed deer			FE	SE						x						S1
Gray-tailed vole																
Western pond turtle			FCo	SE						x					x	S1
Red-legged frog															x	
Pacific lamprey															x	S2
Coho salmon			FC													

Species	Refuge Purpose Species	BIDEH	Federal T&E	State T&E	BCR # 5 (Table 8)	PIF (tier)	BMC Region 1 Status	BCC- 2002 Region 1 (Table 41)	BCC National (Table 48)	State Wildlife Action Plan Priorities (SGCN)	Shorebird Plan	Waterbird Plan	Waterfowl Plan	Flyway Depredation	TNC-WWPTGSEA	WA NHP S Rank
Brush prairie pocket gopher				SC						X						
Sessile trillium																
Wheeler's bluegrass				SS												
Golden paintbrush			FT	SE												
Nelson's checkermallow			FT	SE												
Bradshaw's lomatium			FE	SE												
Oregon white oak		X													X	
Shorebird concentrations (non marine, >7spp. >5k birds)		X													X	
Communal bald eagle roosts >100 birds		X													X	
Great blue heron rookeries >20 nests & >3 years																
Dabbling duck concentrations (wigeon used as surrogate)		X													X	
Diving duck concentrations (scaup used as surrogate)		X													X	
Winter raptor concentrations		X													X	
Note: Need to better assess anadromous fish and amphibian species.																

Key:

Federal Threatened and Endangered Species:

FE = Federal Endangered

FT = Federal Threatened

FC = Federal Candidate

FCo = Federal Species of Concern

State Threatened and Endangered Species:

SE = State Endangered

ST = State Threatened

SC = State Candidate

SS = State Sensitive

State wildlife action plan: x = identified by plan as Species of Greatest Conservation Needs.

Shorebird Plan: 1 = no risk; 5 = highly imperiled

APPENDIX F. PRIORITY REFUGE SYSTEM RESOURCES OF CONCERN FOR RIDGEFIELD NATIONAL WILDLIFE REFUGE

Priority Refuge Resources	Habitat, Species, or Species Group	Habitat Structure or Species/Species Group Population Attribute(s)	Life-History Requirement(s)	Other Benefitting Species
Swainson's thrush	Riparian	Bottomland Forest - mid to late successional with intact understory (<i>Fraxinus latifolia</i> - <i>Populus trichocarpa</i> / <i>Cornus stolonifera</i> / <i>Urtica dioica</i>) Shrub layer cover >50% with >60% of native shrubs; canopy cover > 50% (Ref: PIF 2000 pp 81)	Breeding	song sparrow, Bewick's wren, house wren, pileated woodpecker, downy woodpecker, black-headed grosbeak, red-eyed vireo, p.s. flycatcher, tree swallow
Willow flycatcher		Bottomland Forest - early successional, willow (<i>Salix lasiandra</i> / <i>Urtica dioica</i>) Patchy shrub layer, 1-4 m tall, with 30-80% cover and scattered herbaceous openings; canopy trees > 4 m covering < 20% of landscape (Ref: PIF 2000 pp 75)	Breeding	yellow warbler, song sparrow
Bewick's wren		Bottomland Forest - Ash Forest with little shrub layer (<i>Fraxinus latifolia</i> / <i>Carex deweyana</i> / <i>Urtica dioica</i>)	Breeding, year-round for benefiting species	s.b. white-breasted nuthatch, western wood-peewee, house wren, tree swallow, song sparrow, downy woodpecker, pileated woodpecker
Grass-hopper sparrow (western spp.)	Dry (native) prairie – moderate to tall	Manage fallow fields, pastures, and/or native prairies in variable heights of 6-24 inch, >90% grass forb cover, <5% shrub cover, patches of >50 acres (Partners in Flight 2000 pp 44)	Breeding	savanna sparrow, northern harrier, short-eared owls, western meadowlark, gray-tailed vole, streaked horned lark, Oregon vesper sparrow, western pond turtle, lazuli bunting, nesting waterfowl
Dusky Canada goose	Agricultural pastures – small adjoining water	Short grass (<6"); pastures < 100 acres adjacent to wetlands	Foraging	other Canada geese, wigeon, great blue herons, American pipits, streaked horned lark (pipits and larks prefer grazed pasture), short eared owls, raptors, coyotes, great egrets, sandhill cranes (feed on voles), black-bellied plover, semipalmated plover, Wilson's phalarope

Priority Refuge Resources	Habitat, Species, or Species Group	Habitat Structure or Species/Species Group Population Attribute(s)	Life-History Requirement(s)	Other Benefitting Species
Northern Harrier	Bottom-land (wet prairie)	Short-medium height native emergent wetland plant species Buffer >122 m radius for harrier nests, residual duff preferred for nesting habitat, but no mowing before July 15 (see pg 45 Partners in Flight 2000)	Breeding, wintering	common yellowthroat, American bittern, nesting waterfowl, dusky Canada geese (feeding), rare plant species (lomatium, checkermallow), short-eared owl, savanna sparrow, common snipe, song sparrow, western meadowlark
Cackling goose	Agricultural pastures	Short grass (<6"); pastures >100 acres, (legumes)	Foraging	other cackling geese, great blue herons, American pipits, streaked horned lark (pipits and larks prefer grazed pasture), short eared owls, raptors, coyotes, great egrets, sandhill cranes (feed on voles), black-bellied plover, semipalmated plover, Wilson's phalarope
Orange-crowned warbler	Mixed coniferous/deciduous forest	In early successional forests provide an average of >30% cover of deciduous shrubs and small trees (<15 feet tall)	All, breeding	rufous hummingbird, Wilson's warbler, MacGillivray's warbler, willow flycatcher, Bewick's wren, song sparrow, spotted towhee
Slender-billed white-breasted nuthatch	Oak savannah/woodland	Maintain and provide: Contiguous minimum stand size 100 acres. Canopy 40 to 80% with non-oak cover less than 10%. Mean dbh of oak should exceed 21 inches with 20% greater than 28 inches. (RNA 129 ac) (Ref: Partners in Flight 2000, pp 55)	Breeding, year-round	western pond turtle, bewick's wren, western skink, northern alligator lizards, western gray squirrel, house wren
Mallard	Emergent wetlands – winter water depth 4-18 inch	Shallow water depths averaging 4-18" over 75% of the wetland; largely native emergent vegetative community Dabbling ducks use 4-9 inch with most ssp using lower end of range (Frederickson in Bookout, see Gorge CCP), low/no velocity; (flood strategy could include incremental flood-up to allow dabblers staged access to appropriate depths), >40% cover of >10 genera of native (or desirable non-native) short and tall emergent plants	Wintering	other ducks, tundra swans, western painted turtle, yellow headed blackbird (could be focal sp), common snipe, long-billed dowitcher, black necked stilt, rail

Priority Refuge Resources	Habitat, Species, or Species Group	Habitat Structure or Species/Species Group Population Attribute(s)	Life-History Requirement(s)	Other Benefitting Species
Dusky Canada goose	Emergent wetlands - <4 inches	Potential plants species include carex obnupta, Juncus effuses, reed canarygrass mowed, Juncus bufonius, Mowed (preseason) to <6 inch, flooding of critical dusky areas to <4 inch of water, minimal hydroperiod early Dec. to mid March, willow management may be necessary with encroachment	Breeding, wintering	wigeon, mallard, rail, heron, snipe, stilt, shorebirds
Lesser Scaup	Permanent wetlands	Water depths 3-10 feet, mixed open water and submergent vegetation, water present in summer months, winter depths variable with precipitation		ring-necked duck
Mallard - Swan	Emergent wetlands – semi-permanent	Summer depths may be several inches, winter depths 18-36 inches, vegetation includes tall emergents, wapato, submergent vegetation	Mallard – brood water (summer)	mallard, tundra swan, trumpeter swan, wapato, amphibians, turtles, yellow-headed blackbird note: Rest and Mantrap
Water Howellia - FT	Ephemeral vernal ponds	Seasonal pools <20% reed canary grass, water depth dry in late summer, depths <36 inches spring, >30% canopy cover predominately ash, fish absent	all	amphibians
Sandhill crane	Tidal riverine	Hydroperiod and depth variable with river. Water body has open water, submergent, and emergent wetland types. Tall emergents <40% of wetland	Wintering	mallard, tundra swan, anadromous fish, geese, herons, shorebirds, all dabbling duck, swans, Note: Fowler Lake, Boot Lake, Campbell Lake
Sandhill cranes	Croplands	Corn and other grain crops	Foraging	Canada geese, wigeon, mallard
Coastal cutthroat	(connected) Riverine habitats	Barrier free, water quality/chemistry/temperature, intact riparian corridor; seven day minimum intragravel DO 6.5 mg oxygen/liter, Temperature <73 Fahrenheit	Anadromous fish rearing, lamprey spawning, connectivity between spawning habitat/river	coho salmon, lamprey, steelhead

APPENDIX G. PRIORITY REFUGE SYSTEM RESOURCES OF CONCERN FOR PARKER RIVER NATIONAL WILDLIFE REFUGE

Habitat Species, or Species Group	Reasons for Ranking	Limiting Factors/Threats
Priority I Habitats		
Sandy Beach, Rocky Shore, Dune Grassland	Presence of nesting federally listed species; importance to fall migrating shorebirds including highest priority species in Bird Conservation Region 30; active management results in positive, measurable impact on Refuge System Resources of Concern	Human disturbance; storms; sea level change
Salt Marsh	Salt marsh habitat is limited; High potential for greatest Refuge contribution; Presence of several highest priority birds in Bird Conservation Region 30 (saltmarsh sharp-tailed sparrow, seaside sparrow, and black duck); At 2,660 acres, it is the largest habitat type on the Refuge and part of Great Marsh, the largest contiguous salt marsh north of Long Island	Diking and draining; altered hydrology; invasive species; sea level change; mercury contamination
Interdunal Swale	A rare (S1) natural community in Massachusetts; Host locally rare plants, and vernal pool species; The only freshwater habitat on the Refuge	Coastal storms; sea level change; human disturbance/recreation; invasive species
Sandplain Grassland	A rare (S1) natural community in Massachusetts; Host rare plants state-threatened seabeach needlegrass; This natural community type is known to support rare moths and beetles	Recreation; succession; requires periodic disturbance
Brackish Marsh - Impoundments	Supports many high priority breeding, wading and marsh, waterfowl, and migrating shorebirds in Bird Conservation Region 30; wetlands are a trust resource; meets original purpose of Refuge establishment	Requires intensive management and maintenance; invasive plants; water quality issues (e.g., salinity levels)
Thacher Island	Currently not occupied by nesting terns but is an historical nest site for common, arctic, and roseate terns	Human disturbance; high gull population; availability of fish as prey
Maritime Shrubland and Forest	Many high priority bird species in BCR 30 in this habitat; potential habitat for New England cottontail; important for fall migrating songbirds	Succession; lack of disturbance; invasive plants

APPENDIX G, *continued*

Habitat, Species, or Species Group	Reasons for Ranking	Limiting Factors/Threats
Priority II Habitats		
Pitch Pine Dune Woodlands	Supports uncommon plant species, but the Refuge contains only a small portion of this community type	Succession; lack of disturbance; invasive plants
Grasslands	A valuable cultural habitat type that supports nesting bobolinks, monarchs and other pollinating insects, foraging raptors, and migrating birds	Succession, requires regular mowing or other treatments; invasive plants
Nearshore Marine Open Water	Lack of jurisdiction and ability to manage this habitat	Mercury and other contaminants; commercial and recreational fishing and other uses
Estuarine and Bay	Lack of jurisdiction and ability to manage this habitat	Contaminants; sea level change; invasive species

APPENDIX H. SELECT HABITAT GOALS AND OBJECTIVES TAKEN FROM RIDGEFIELD NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN

Goal 1: Provide and manage a mixture of secure, diverse, productive grassland habitats for foraging migratory waterfowl and grassland-dependent wildlife.

Objective 1.1 Enhance/Maintain Improved Pasture for Dusky Canada Geese

Enhance and annually maintain *340 acres* of improved pasture in core dusky Canada goose use areas, with the following attributes:

- Field size range from 2 to 45 acres with a minimum predator-detection width of 250 feet.
- Field (or portion of field) should be adjacent to accessible wetland* (within 400 ft) or consist of hydric soils.
- Short vegetation along the field/wetland interface.
- Mix of desirable, palatable grasses* (e.g., perennial ryegrass, orchardgrass, fescues) and forbs (e.g., clover) with a height of < 4 inches by October 15.
- < 20% cover of invasive species (e.g., Canada thistle, buckhorn plantain, tansy ragwort, teasel).
- No encroaching woody vegetation (e.g., blackberry).
- No false indigo and poison hemlock.
- Minimal thatch.*
- Minimal human disturbance when duskys are present (October 1 to April 1) limited to necessary management activities.

*Definitions:

Accessible wetland: Wetland without fences or vegetative barriers (tall, dense vegetation) at its margins.

Palatable grasses: Short, actively growing grass preferred as forage by geese.

Thatch: The dense covering of cut grass that remains after mowing.

Alternatives Objective as written above is modified by replacing acres in italics with the text in the alternatives (Alt) columns.	Alt 1 Current	Alt 2 Preferred	Alt 3	Alt 4
<i>Total acreage annually managed as improved pasture for dusky Canada geese:</i>	186 ac		340 ac	
Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3	Alt 4
Mow and/or hay pastures after July 15, unless surveys indicate a specific pasture is not being used by nesting grassland birds.	✓	✓	✓	✓
Mow after July 15, as needed, to maintain grass palatability and minimal thatch and provide < 4 inch height by October 15.	✓	✓	✓	✓
Graze (domestic animals) between May 1 and October 1 (after geese have migrated and as field conditions allow) to maintain grass palatability, minimal thatch, and provide < 4 inch height by October 15. Grazing will only occur in areas where refuge staff have determined that significant impacts to grassland nesting birds will not occur.	✓	✓	✓	✓
Hay from July 15-September 30 (as conditions allow) to maintain grass palatability, minimal thatch, and provide < 4 inch height by October 15.	✓	✓	✓	✓
Use agricultural practices (e.g., seeding, disking, planting cover crops, fertilizing, soil amendments, and herbicides) to rehabilitate pastures that do not meet the objective.	✓	✓	✓	✓

Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3	Alt 4
Use prescribed fire during late summer to eliminate thatch, invasive plants, and rank grasses (contingent upon receiving South-west Washington Clean Air permit).		✓	✓	✓
Use IPM strategies including mechanical, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix K, IPM Program).	✓	✓	✓	✓
Continue to cooperate with the County Weed Board to control county-listed invasive weeds.	✓	✓	✓	✓
Control weeds in accordance with the refuge's IPM program using methods such as crop rotation, mechanical treatment, biological controls, and low toxicity approved pesticides (see Appendix K).	✓	✓	✓	✓
Pesticide use must be in compliance with the Service's policy requirements for completing an approved Pesticide Use Proposal, and must meet other State and Federal requirements.	✓	✓	✓	✓
Cooperators that conduct haying, mowing, or grazing on the refuge will only apply herbicides with prior refuge approval and will provide a record of herbicides used including chemical name, amount used, date, location, and how applied.	✓	✓	✓	✓
Pursuant to the refuge's CLMA, cooperators will provide annual records of animals grazed on and plant products removed from the refuge.	✓	✓	✓	✓
<p>Rationale: The refuge was established to protect and provide wintering habitat for the dusky Canada goose, a subspecies that winters primarily in the Willamette Valley of Washington and Oregon. The dusky Canada goose has experienced substantial declines over the past several decades. While once the predominant goose in the Willamette Valley, dusky Canada geese now comprise < 5% of the overall goose population in its Washington winter range. Population declines coupled with loss of breeding and wintering habitat, has elevated this subspecies to one of management emphasis by the Federal and state governments (Bromley and Rothe 2003, PFC 2008), therefore, they continue to be the primary management focus for the refuge.</p> <p>While many Canada and cackling geese are readily adaptable to foraging in large open agricultural fields and croplands, dusky Canada geese in the northern Willamette Valley continue to utilize more natural habitats reminiscent of the historic Columbia River floodplain. These habitats include small wet meadows and upland grasslands, shorelines and seasonal wetlands, frequently interspersed among riparian bottomland forest. Despite the substantial alterations to the Willamette Valley landscape, dusky Canada geese continue to prove relatively traditional in their habits, their habitat use, and their preference for maintaining relatively small flock associations. These behaviors and preferences negate the ability to manage goose habitats similarly for the eight species and subspecies of geese utilizing the refuge. Due to the dusky Canada goose's penchant for using traditional sites, many portions of the refuge with seemingly suitable habitats are under-utilized. This traditionalism has, however, allowed staff to identify preferred sites through surveys, and focus management on these core use areas. All action alternatives propose increasing management of improved pasture in core dusky areas to improve quality of green browse. Wet meadows are also an important foraging habitat for dusks (see Objective 3.6).</p> <p>Minimizing disturbance in core dusky foraging areas is also a high priority. The most recent update of the Pacific Flyway Management Plan for the Dusky Canada Goose (2008) proposes that the Service, WDFW, and ODFW "Develop new public land management guidelines that result in increased goose food production and reduced disturbance of geese during winter, especially for dusky geese." Therefore, Alternative 2 proposes removing a portion of the auto tour route along the south side of Rest Lake on the River 'S' Unit, reducing disturbance from vehicles, and creating a larger contiguous sanctuary area for dusks.</p> <p>Young grass and forb shoots are preferred forage of Canada and cackling geese. We use management tools (grazing, mowing and haying) in combination to achieve the maximum cover of short, actively growing grass, where appropriate and feasible based on soil condition and other factors. Pastures in need of rehabilitation may be planted with cover crops to break weed cycles (winter wheat, clover, or alfalfa). This treatment would count toward total crop acreage planted (see Objective 2.1).</p> <p>Meeting the habitat quality objectives for pastures (< 20% weed cover, height < 4 inches, and minimal thatch) will ensure that the refuge provides high quality goose habitat. The refuge staff assesses fields at the beginning of the growing season and several</p>				

times during the summer to determine whether these objectives are being met and treating those fields where the objectives are not being met. For example, thatch inhibits growth of new grass and also inhibits goose foraging. Mowing treatments must either be frequent to minimize thatch, or if less frequent (e.g. once a year) include a means of thatch removal (e.g., raking, mulching, burning.) Haying and grazing preferred to mowing, where feasible, as these treatments eliminate thatch. A field with >20% thatch cover and visible windrows of thatch would be treated by grazing, haying, or prescribed

fire depending on the field.

The specific treatment would depend on site conditions; a field that is not fenced or not near a water supply would likely be hayed instead of grazed. Prescribed fire would only be used where it can be accomplished safely, and will require approval from the Southwest Washington Clean Air Agency.

Objective 1.2 Maintain and Enhance Native Grassland Habitat

Enhance and annually maintain up to 15 acres of native grassland habitat on the Carty Unit for grassland-dependent birds and native plant species. Native grassland habitat is characterized by the following attributes:

- Optimal patch size or contiguity with oak woodland habitat is >50 acres
- Mosaic of vegetation heights between 6-36 inches
- >50% cover of native grasses (e.g., Roemer's fescue, California oatgrass, tufted hairgrass, red fescue) and native forbs (e.g., northwest cinquefoil, common camas, blue-eyed Mary, yarrow, largeleaf lupine)
- <20% cover of invasive/undesirable nonnative grasses (e.g., poverty brome), forbs (e.g., ox-eye daisy, thistle and trefoil), and shrubs (e.g., blackberry)

Strategies Applied to Achieve Objective	Alt 1 Current	Alt 2 Preferred	Alt 3	Alt 4
Conduct survey of native plants in grassland areas of the Carty Unit to determine which native and nonnative species are present, densities, and need for treatment (also see Objective 7.4)		✓	✓	✓
Use IPM strategies including mechanical, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix K -IPM Program)		✓	✓	✓
Utilize prescribed fire, where feasible and necessary, to maintain native plant communities. (Contingent upon receiving permit with Southwest Washington Clean Air)		✓	✓	✓
Pending survey results, drill native grass seed and plant native forbs (seed or head-started seedlings) to increase proportion of native to nonnative species		✓	✓	✓
Conduct site monitoring to determine efficacy of restoration and need for follow-up treatments.		✓	✓	✓

Rationale: Small patches of grassland occur on the Blackwater Island RNA (approx. 15 acres total) as small openings within oak woodland habitat. These grasslands are dominated by an introduced species (poverty brome), and the native grass component appears to be small. However grassland habitat on the RNA appears to be an important area for native wildflowers. Soils on RNA grassland are thin, overlying basalt bedrock, and well drained. Because of thin soils, some restoration and management techniques that could be utilized on bottomland grasslands with deeper soils (e.g. grazing, mowing, disking) are not appropriate here.

Inventories of the Blackwater Island RNA include vegetation surveys and community descriptions developed from the 1970s through the early 1990s, annual surveys for the federally-listed water howellia, and pit trap and live trap mammal and amphibian surveys conducted in the 1990s. Updated inventories of native habitats and vegetation, and habitat conditions (including presence of invasive species) are needed in order to manage grasslands and oak woodland habitat on the RNA (also see Objective 7.4: Conduct Baseline Inventories of Native Habitats/Vegetation and Major Fish and Wildlife Groups.)

Goal 2: Provide, manage, and enhance a diverse assemblage of wetland habitats characteristic of the historic lower Columbia River.

Objective 2.1 Managed Seasonal Wetlands

Enhance and annually maintain a minimum of **445 acres** of managed seasonal wetlands for migratory waterfowl, wading birds, shorebirds, and other wetland-dependent wildlife species in the River 'S' Unit. Seasonal wetlands are characterized by the following attributes:

- > 60% cover of desirable and/or native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, and water plantain), wapato, and nutsedges.
- < 20% cover of native emergent species (e.g., cattail, hardstem bulrush) that are > 5 feet tall.
- < 40% cover of undesirable/invasive plants including reed canarygrass and ricefield bulrush.
- No purple loosestrife and false indigo present.
- During initial flood-up (October to November), water depths of 4-12 inches.
- Water depths 24-30 inches from late January to May; achieve drawdown by June 15.
- Minimal damage to wetland infrastructure by nutria.

*Definition:

Managed seasonal wetlands: Wetlands which have existing infrastructure (pumps, culverts, water control structures) to manipulate water levels on a seasonal basis, relatively independent of water conditions in the surrounding watershed.

Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3	Alt 4
<p>Wetland rotation: As needed, rotate 225 acres of seasonal wetland to semipermanent wetland to control undesirable plants (e.g. reed canarygrass). Flood wetlands to > 24 inches from late January to May. Once control is achieved resume management as seasonal wetland.</p> <p>Except where needed to control reed canarygrass and ricefield bulrush, incrementally floodup and drawdown (e.g., using water control structures, pumps) to promote waterfowl foraging within the entire basin, and create mudflats for use by shorebirds.</p>	✓	✓	✓	✓
Use mechanical techniques (e.g. disking, mowing) to set back succession of emergent vegetation and promote moist-soil and native plant production as well as control invasive/undesirable plants such as reed canarygrass.		✓	✓	✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants, particularly ricefield bulrush (see Appendix K, IPM Program).	✓	✓	✓	✓
As needed, reconfigure water delivery system to allow to enhance water level management.		✓	✓	✓
Use IPM techniques to control beaver and nutria from damaging water control structures and dike systems (see Appendix K). Protect desirable trees from beaver using fencing and propagating a dense shrub layer to exclude them from shorelines. Protect levees from nutria by periodically lowering water levels where practicable, and by removing animals in accordance with the refuge's IPM plan and 50 CFR 31.14, Official Animal Control Operations, which allows the take of animals that are detrimental to a refuge's wildlife management program.	✓	✓	✓	✓
Partner with counties for education/weed control along refuge borders and reduce sources.		✓	✓	✓

Rationale: The refuge was established to provide migration and wintering habitat, including wetlands for dusky Canada geese and other waterfowl. Providing a diversity of wetlands is vital to the refuge's purposes. Yet because of the numerous dams along the length of the Columbia River, and the construction of levees to protect private landowners along the lower river, the natural hydrological processes of a free-flowing riverine system have been eliminated. Managed seasonal wetlands Refuge waters inside diked areas of the River 'S' Unit (23 wetlands totaling 445 acres) are now intensively managed to mimic natural disturbance mechanisms, providing and maintaining the cyclical aging and renewal processes of wetlands over time. By maintaining the number of acres of open shallow marsh through active management such as mechanical soil disturbance and wetland infrastructure, the refuge can provide a diversity of early successional vegetation stages that increase overall biodiversity and prevent wetland loss over time. Species benefiting from these seasonal wetland habitats include waterfowl, wading birds, rails, cranes, shorebirds, amphibians, and muskrats.

Currently, the refuge spends approximately \$10,000 annually to operate electrical pumps to fill and maintain wetland water levels within the waterfowl hunt area on the River 'S' Unit during the hunting season. Water is pumped onto the managed wetlands in early fall (September). As winter rains add more water to these wetlands, it is necessary to then pump the water off to avoid flooding refuge roads, and other infrastructure. Because out-pumping generally cannot keep pace with inflow from rains, this pumping regime creates relatively deep-water conditions for most of the fall through spring season. Over time, this has caused changes in wetland vegetation. In addition, these depths are not conducive for most foraging waterfowl (for example, mallard, wigeon, and pintail), but instead favor ducks deft of gathering food from near the water's surface (shovellers) and diving ducks (ring-necked ducks and scaup). In contrast to current management, a more natural, gradual floodup regime is proposed in the action alternatives. With gradual floodup these wetlands would support foraging by a wider range of waterfowl species. This management change will also result in cost savings

(less pumping costs) that can be used for other habitat management activities.

Invasive plants (primarily reed canarygrass) are widespread in many refuge wetlands. Altered plant and animal community composition was identified as a very high stress to refuge wetland systems. Invasive plants limit native plant production and cause impacts to food, nesting, and cover for wildlife. Invasive plants in wetlands reduce waterfowl food availability during the migration and wintering periods. Limiting invasive species will help the refuge to comply with county and state noxious weed ordinances. In wetland basins, reed canarygrass is best controlled by disking followed by prolonged deep flooding (Kilbride and Paveglio 1999, Paveglio and Kilbride 2000, Tu 2004). This has been done in past years; however, recent infestations of ricefield bulrush have reduced the use of this treatment protocol in many areas. As a result, reed canarygrass has spread in refuge wetlands. We propose re-initiating reed canarygrass control in areas with minimal ricefield bulrush and monitoring these areas for ricefield bulrush. A primary method of controlling reed canarygrass and other undesirable species will be periodically managing these wetlands as semipermanent wetlands, with deeper and a longer duration of flooding until control is achieved. Nine wetlands on the River 'S' Unit, totaling 225 acres (about half of the acreage in this habitat type) have sufficient basin depth to allow for this management regime. The interval of rotation will vary according to the wetland, but could typically be expected to be 4-5 years. However, 14 seasonal wetlands on the River 'S' Unit do not have sufficient basin depth or water control capability to allow management as semipermanent wetlands. These would be drawn down and disked approximately every 2 years, or as needed.

Lack of staffing and funding to contain the expansion of invasive species and reduce infested acreage has been an ongoing issue with all wetland habitats on the refuge. An increase in staffing and funding would be needed to meet this and other wetland habitat objectives (see Appendix D, Implementation Analysis).

Objective 2.2 Managed Semi-permanent Wetlands

Enhance and annually maintain *228 acres* of managed semi-permanent wetlands* for migratory waterfowl, wading birds, shorebirds, and other wetland-dependent wildlife species. Semi-permanent wetlands are characterized by the following attributes:

- 20-30% cover of desirable and native wetland plants including moist-soil annuals (e.g., smartweeds, wild millet, and water plantain).
- 40-50% cover of submergent plants (e.g., pondweeds).
- 20-40% cover of native emergent species (e.g., cattail, hardstem bulrush, wapato, and bur-reed) that are > 5 feet tall.
- < 20% cover of undesirable/invasive plants including reed canarygrass and ricefield bulrush.
- No purple loosestrife and false indigo present.
- Water depths 24-30 inches by late January to control undesirable plants with no more than 60-80% of wetland bottoms exposed (dry) by October 1.
- Minimal damage to wetland infrastructure by nutria.

***Definition:**

Managed semi-permanent wetlands: Wetlands which have existing infrastructure (pumps, culverts, water control structures) to manipulate water levels on a seasonal basis, relatively independent of water conditions in the surrounding watershed.

Alternatives <i>Objective as written above is modified by replacing acres in <u>italics</u> with the text in this row.</i>	Alt 1 Current	Alt 2 Preferred	Alt 3	Alt 4
<i>Total acres managed semipermanent wetlands:</i>	190 ac		220 ac	
Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3	Alt 4
Wetland rotation (definition): Use mechanical techniques (e.g., disk-ing and mowing) to control undesirable plants, set back succession to maintain a desirable ratio of robust emergent vegetation to open water; and increase wetland productivity. Use heavy equipment to remove mineral and organic deposits to deepen wetlands as necessary.		✓	✓	✓
Except where needed to control reed canarygrass, use water control to incrementally flood-up, to promote waterfowl foraging within the entire basin.		✓	✓	✓
Use water control structures and pumping, where possible, to maintain 24-30 inches water depth by late January.	✓	✓	✓	✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix K).	✓	✓	✓	✓
As needed, reconfigure water delivery system to enhance water level management.		✓	✓	✓
Inventory wetland plant communities and annually monitor effectiveness of invasive plant control measures. Control any reinvasion by nonnative plants.		✓	✓	✓
Partner with counties for education/weed control along refuge borders and reduce sources.		✓	✓	✓

Rationale: The refuge was established to provide migration and wintering habitat, including wetlands, for dusky Canada geese and other waterfowl. Providing a diversity of wetlands is vital to the refuge's purposes. Yet because of the numerous dams along the length of the Columbia River, and the construction of levees to protect private landowners along the lower Columbia River, the natural hydrological and floodplain processes of a free-flowing riverine system have been eliminated. Refuge waters inside diked areas of the River 'S' Unit are now intensively managed to mimic natural disturbance mechanisms, providing and maintaining the cyclical aging and renewal processes of wetlands over time.

The Refuge's managed semi-permanent wetlands include four wetlands, totaling 133 acres, on the River 'S' Unit; and five wetlands, totaling 58 acres, on the Bachelor Island Unit. The total acreage in the action alternatives reflects maintenance of existing managed semi-permanent wetlands, and conversion of 37 acres of other wetlands (Wigeon Lake and Wetland 013E on Bachelor Island) to this type.

By maintaining the number of acres of open shallow marsh through active management (e.g. mechanical disturbance and wetland infrastructure), the refuge can provide a mosaic of early to late successional vegetation

stages that increase overall biodiversity and prevent wetland loss over time. Species benefiting from these seasonal wetland habitats include waterfowl, wading birds, rails, shorebirds, amphibians, and muskrats.

Currently, water is pumped onto the managed wetlands of the River 'S' Unit in early fall (September). As winter rains add more water to these wetlands, it is necessary to pump the water off to avoid flooding refuge roads and other infrastructure. Because out-pumping generally cannot keep pace with inflow from rains, this pumping regime creates relatively deep-water conditions for most of the fall through spring season. These depths are not conducive for most foraging waterfowl. In contrast, a more natural, gradual floodup regime is proposed in action alternatives. This will also result in cost savings (less pumping costs) that can be used for other habitat management activities. The depth and timing of inundating individual wetland units will be determined in annual habitat work plans.

In addition, where topography and soils are appropriate

and water management capability exists, we propose rotating the four semi-permanent wetlands on the River 'S' Unit, totaling 133 acres, between semi-permanent and seasonal wetlands. These wetlands would primarily be managed as semi-permanent, however, wetlands with extensive and persistent cover of emergent vegetation, or with more than 50% open water, would be periodically drawn down, disked, and/or mowed to maintain a desirable ratio of robust emergent vegetation to open water and increase wetland productivity. Mineral and organic deposits that lead to filling and wetland loss would be removed as necessary. These actions will help mimic natural cycles of flood and drought and help maintain productivity as organic matter decomposes and nutrients that accumulated during flooded periods are made available to plants during dry periods.

As in Objective 3.1, we propose reinitiating reed canarygrass control in areas where good control of ricefield bulrush has been achieved, and monitoring these areas for presence of ricefield bulrush.

Objective 2.3 *Howellia* wetlands

Enhance and maintain the four small seasonal wetlands totaling 1.2 acres that support populations of the federally threatened water howellia (*Howellia aquatilis*). *Howellia* wetlands have the following attributes:

- Water depths range from saturated soils to 20 inches in winter (November-June), drying to mudflats in late summer and fall.
- < 20% cover of emergent wetland plants and shrubs.
- 80% open water with *Howellia* and other native submergent plants.
- < 10% cover of invasive/undesirable plants, primarily reed canarygrass.
- Minimal encroachment by woody species (e.g., spirea).

Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3	Alt 4
Allow natural flood-up (no pumping capabilities).	✓	✓	✓	✓
Use IPM strategies including mechanical, physical, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix K). Timing of treatment (after drying, but before fall rains) and minimizing soil disturbance is critical to protect <i>Howellia</i> seedlings.	✓	✓	✓	✓
As needed, hand-remove or chemically treat spirea and tree seedlings invading the wetlands. This should be accomplished with a minimum of soil disturbance and conducted after basin drying has occurred, but before fall rains begin.		✓	✓	✓

Rationale: Water howellia is a federally threatened, annual submergent plant species that occurs in ephemeral and seasonal wetlands. Federally-listed species are trust resources and are essential to maintaining refuge and regional biological integrity. This species is known from only 3 sites in Washington and has been extirpated from much of its historic range. On the refuge, these plants are part of the submergent plant community, and occur along the shorelines of several small, ephemeral ponds on the Carty Unit. These wetlands fill naturally with rainwater in

fall, but dry during the summer months. These wetlands cannot be supplemented with pumped water or artificially dewatered.

Howellia requires wetlands or wetland edges that dry down in late summer and fall, as seed must be exposed to air for fall germination (USFWS 1996). As an aquatic annual plant, howellia plants are fragile, vulnerable to destruction by premature wetland drying and trampling. Moreover, howellia seed is not considered to have a

long period of viability, so several years of poor seed production can have negative effects on the population.

Howellia does not persist in wetlands overgrown with emergent vegetation, reed canarygrass, or woody plants. Currently, one of the refuge's four howellia ponds has been largely taken over by reed canarygrass, and growth of woody vegetation (*Spirea*) is a problem at another pond. Therefore, removal of these plants to achieve

optimal habitat conditions for howellia is proposed. Because of its life history, invasive plant control must occur post-drawdown but prior to fall germination; soil disturbance within the basin should be kept to a minimum during these activities. (Canopy cover from associated upland deciduous trees does not appear to be a limiting factor; in fact one howellia pond on the refuge occurs in a wooded wetland.)

Goal 3: Protect, manage, and restore a natural diversity of native floodplain forests representative of the historic lower Columbia River ecosystem.

Objective 3.1 Early Successional Floodplain Forest

Protect and maintain at least 330 acres of early successional floodplain forest benefiting migratory and resident landbirds, native reptiles, and native amphibians. Early successional floodplain forest is characterized by the following attributes:

- Understory with 30-80% cover of native shrubs (3-12 feet tall) such as red-osier dogwood, willow, snowberry, Douglas' spirea, serviceberry, red elderberry, Indian-plum, cascara, rose with scattered openings containing native herbaceous species (e.g., Columbia sedge, green-sheathed sedge, wooly sedge, retrorse sedge, and stinging nettle).
- < 30% cover of invasive plants (e.g., reed canarygrass, false indigo, and blackberry) in understory/herbaceous layer.
- < 20% canopy cover of native trees (> 12 feet tall) such as Pacific willow, cottonwood, and red-osier dogwood.

Strategies Applied to Achieve Objective *Strategy applies to alternatives (✓) or is modified by replacing text in italics with the text in this row*

Monitor and treat up to 10% of early successional forest annually for invasive plants. Use IPM strategies including mechanical, physical, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants.

Allow natural succession via natural willow/cottonwood seedfall.

Pump water to mimic floodplain processes in units with water management capabilities to control invasive plants and promote native seed germination.

**Alt 1
Current**

**Alt 2
Preferred**

Alt 3

Alt 4

up to
5%

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

Rationale: In presettlement times, Pacific willow (*Salix lucida* ssp. *lasiandra*) swamps were a widespread plant community along the lower Willamette and Columbia rivers. Presettlement components of this plant community probably included Columbia sedge (*Carex aperta*), green-sheathed sedge (*Carex feta*), wooly sedge (*Carex pellita*), retrorse sedge (*Carex retrorsa*), and stinging nettle (*Urtica dioica*) (Guard 1995). Since the arrival of settlers in the early 1800s, between 50% and 90% of riparian habitat in Washington has been lost or extensively modified (Knutson and Naef 1997). This was once a common habitat type on the refuge and contributes to the species diversity. Much of the native understory has been lost or highly degraded by livestock grazing and alterations to natural hydrology (levees, dams). Today Pacific willow

and reed canarygrass form a common community type.

Intact riparian areas are important to the conservation of Washington's vertebrate species. Of the 118 species of landbird migrants occurring in Washington, 67 (57%) use riparian habitat (Andelman and Stock 1994). Avian densities in riparian forests along the Columbia River can be as high as 1,500 birds per 100 acres (Tabor 1976). Approximately 85% of Washington's terrestrial vertebrate species use riparian habitat for essential life activities (Knutson and Naef 1997). Riparian habitat is additionally important to supporting healthy native fish populations by benefiting instream characteristics including temperature, water quality, water chemistry, cover, and nutrients.

The refuge contains approximately 1,100 acres of

riparian and/or floodplain forest habitat in various seral stages or conditions. Most of this habitat on the refuge is vulnerable and/or remains in a degraded condition due to invasive plants, past grazing practices, alteration of hydrologic regimes, altered river levels, and poor native plant recruitment/ recovery. The refuge can contribute

toward providing habitat or habitat connectivity for species that are dependent on riparian and floodplain forests by enhancing or restoring a mix of early, mid, and late successional floodplain forests on the refuge.

Objective 3.1a Restore Early Successional Floodplain Forest

Within the lifetime of the CCP, restore up to 160 acres of selected old fields, pasture, and non-managed wetlands to early successional floodplain forest. Restored early successional floodplain forest is characterized by the following attributes:

- Understory with 30-80% cover of native shrubs (3-12 feet tall) such as red-osier dogwood, willow, snowberry, Douglas' spirea, serviceberry, red elderberry, Indian-plum, cascara, and rose with scattered openings containing native herbaceous species (e.g., Columbia sedge, green-sheathed sedge, wooly sedge, retrorse sedge, and stinging nettle).
- < 30% cover of invasive plants (e.g., reed canarygrass, false indigo, and blackberry) in understory/herbaceous layer.
- < 20% canopy cover of native trees (> 12 feet tall) such as Pacific willow, cottonwood, and red-osier dogwood.

Alternatives <i>Objective as written above is modified by replacing acres in <u>italics</u> with the text in this row.</i>	Alt 1 Current	Alt 2 Preferred	Alt 3	Alt 4
<i>Acres of early successional floodplain forest restored over lifetime of CCP:</i>	0 acres	160 acres	170 acres	185 acres
Strategies Applied to Achieve Objective	Alt 1	Alt 2	Alt 3	Alt 4
Seed or plant willow and red-osier dogwood in wetlands, wetland edges, or other appropriate hydric areas. Incorporate techniques to remove competing vegetation such as reed canarygrass by mechanical or chemical methods and use fencing or mats to reduce rodent damage to new plantings. New plantings will focus on connecting or expanding existing riparian stands in areas that are unlikely to be used by focus species such as dusky Canada goose or cranes.		✓	✓	✓
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix K).		✓	✓	✓
Allow natural succession via natural willow/cottonwood seedfall.	✓	✓	✓	✓
Pump water to mimic floodplain processes in units with water management capabilities to control invasive plants and promote native seed germination and survival.		✓	✓	✓

Rationale: The refuge has an opportunity to restore early successional floodplain (bottomland) forest in selected old fields, pastures with low productivity, and wetland basins with poor water holding capabilities. Restored early successional floodplain forest benefits migratory and resident landbirds, native reptiles, and native amphibians. Planting willow and red osier dogwood would accelerate regeneration, enhance habitat quality, and provide habitat connectivity with existing floodplain forest. Highest priority areas for restoration would be based on their size and connectivity on and off the refuge.

Though these acreages are relatively small, restoration efforts may provide valuable habitat or habitat connectivity for some species that are dependent on riparian and bottomland forests. New plantings will focus on connecting or expanding existing riparian stands in areas that are unlikely to be used by focus species such as dusky Canada geese or cranes. One seasonal wetland on River 'S' Point (16 acres) is undergoing succession to native trees. Under all alternatives this succession would continue; therefore, this wetland is now included under the early successional floodplain forest habitat type.

Goal 4: Protect, enhance and where feasible, restore riverine habitat and tidal wetlands representative of the historic lower Columbia River ecosystem, to benefit salmonids and other native aquatic species.

Objective 4.1 Instream and Riverine Habitats				
<p>Enhance and improve in-stream and riverine conditions of Gee Creek (3.76 miles) and Campbell Slough (2.6 miles) as well as other appropriate areas for the benefit of salmonids and other native aquatic species. Instream and Riverine habitat is characterized by the following attributes:</p> <ul style="list-style-type: none"> • 7-day mean maximum water temperature < 63.5° F¹. • Low turbidity (<70 nephelometric turbidity units [NTU]²). • Lack of barriers to upstream spawning and rearing habitats. • Presence of instream woody debris. • Minimal presence of warm water fishes. <p>¹ WA water quality standards for salmonid spawning, rearing, and migration (WDOE 2006) ² Threshold for avoidance by juvenile coho salmon (Bisson and Bilby 1982)</p>				
Strategies Applied to Achieve Objective <i>Strategy applies to alternatives (✓) or is modified by replacing text in <u>italics</u> with the text in this row</i>	Alt 1 Current	Alt 2 Preferred	Alt 3	Alt 4
Improve instream habitat conditions by planting riparian trees and shrubs (primarily willow, black cottonwood and Oregon ash) along the 0.8 miles of shoreline of Gee Creek, at a minimum, from the east refuge boundary to Middle Lake (Also see Objectives 4.1a and 4.3a).	0.8 mile	0.8 mile	0.8 mile	1.25 mile
In Gee Creek, endorse watershed-wide approaches and partner (where feasible) with private and public agencies, and adjacent landowners to maintain temperature and water quality and reduce in-flow of siltation from upstream sources.	✓	✓	✓	✓
Pending results of study (see Objective 7.3), implement techniques to reduce populations and reproduction of carp without negatively affecting salmonids in Campbell Slough. Coordinate with WDFW on funding initiatives and partnerships.		✓	✓	✓
Based on results of sedimentation and fish passage assessments in lower Gee Creek (see Objective 7.7), implement restoration actions if necessary (e.g., deepen channel near the mouth, excavate historic (1929) channel, and other actions), to improve fish passage.		✓	✓	✓
Based on results of the Campbell Slough assessment for salmonid rearing habitat (see Objective 7.7), implement appropriate restoration actions if necessary (e.g., deepen channel, increase canopy cover, and eliminate passage barriers) to improve salmonid rearing habitat.		✓	✓	✓
<p>Rationale: Under this objective, aquatic habitat management activities would be developed and implemented to protect and restore instream/riverine habitats, for the benefit of salmonids, and other native aquatic species. Over the past 150 years, watershed conditions on the lower Columbia River and its tributaries have been severely degraded as the result of land use practices (e.g. forest clearing, agricultural uses, and urban and industrial development). Hydrologic regimes have also been altered by diking, channelization of streams and rivers, and dam operations. Gee Creek and Campbell Slough represent the major riverine habitats within the refuge that are connected to the Columbia River, and the connectivity is not directly affected by dikes. Approximately 3.76 miles of Gee Creek, and all of Campbell Slough (2.6 miles) lie within refuge boundaries. The refuge also includes riparian areas adjacent to Lake River, Bachelor Slough, and the Columbia River. The refuge boundary extends only to mean high tide of Lake River, Bachelor Slough,</p>				

and the Columbia River. Therefore, these water bodies are outside the refuge's management control. Watershed-wide approaches and partnerships with private and public agencies and adjacent landowners would be necessary to maintain or improve habitat conditions in Lake River and Bachelor Slough. Management of the refuge's riparian areas adjacent to Lake River, Bachelor Slough, and the Columbia River would have a slight influence on habitat quality, and nutrient dynamics of these waters.

By being outside the dikes, Gee Creek and Campbell Slough likely possess habitat conditions similar to those historically present in the lower Columbia River, more so than other areas directly affected by dikes, and offer the best opportunities to restore some historic conditions. A comprehensive assessment of habitat conditions is needed to prioritize and guide restoration efforts (see Objectives 7.4 and 7.7). The present physical, chemical, and biological attributes of these habitats, including use by salmonids and other native aquatic species, need to be described and quantified to assess their current status. Implementation of habitat management/restoration strategies under this objective will be contingent upon the results of these studies.

Several species/stocks of anadromous fish including coastal cutthroat trout, Chinook and coho salmon and steelhead spend portions of their life history either on or adjacent to refuge waters and shorelines on the Columbia River. Historically, Gee Creek, Campbell Slough, Lake River, Bachelor Slough, and shallow overflow lakes such as Campbell Lake served as nurseries for young developing salmonids. Spawning chum salmon were noted in a tributary of Gee Creek in the late 1940s, and there was an anecdotal account of coho salmon trying to get past a barrier near Royle Road on Gee Creek "prior to the 1950s." Trout (mostly identified as cutthroat) have been reported anecdotally in the creek for many decades (Cornelius 2006).

Surveys in 1995-1997 found cutthroat trout, juvenile steelhead, and juvenile salmon (coho and Chinook) in lower Gee Creek. More recent surveys (2002-2005) conducted upstream of the earlier ones have found only cutthroat trout and juvenile coho in Gee Creek (Cornelius 2006). A May 2007 survey found juvenile Chinook salmon in Campbell Slough. Numbers of cutthroat trout in Gee Creek are low compared to similar creeks nearby. The creek has stretches of suitable habitat (Hogle 2006), but others appear to be of marginal quality. In addition to degraded habitat, low cutthroat numbers may be due in part

to the presence of large numbers of warmwater fish, which compete with or prey upon native fish. The presence and size of cutthroat suggests that spawning occurs in the drainage, and therefore, habitat improvements could enhance populations of this species. The source of the juvenile coho in Gee Creek has not been determined and it is possible though unlikely, that coho spawning habitat may exist in the upper areas of Gee Creek off the refuge.

Although Gee Creek and Campbell Slough offer the best opportunities to restore historical habitat conditions, these areas have been degraded by multiple stressors (both on and off the refuge) influencing water temperature, water quality, sediment transport, habitat complexity, and fish passage. Existing and new information generated by habitat and biological assessments (Objective 7.7) will be used to identify location-specific (e.g., on a stream or slough basis) habitat objectives for which management strategies will be developed. Using these strategies, specific management actions (e.g., protecting habitats, removing fish passage barriers, planting native vegetation, and modifying channel form) would be implemented. This approach would also be applied to areas where it is feasible to establish connectivity with the Columbia River. Because watersheds represent a natural unit for focusing habitat restoration efforts, the Service intends to engage in partnerships at the watershed scale to coordinate activities so that refuge actions are not negated by other activities within the watershed.

The refuge is currently partnering in a project to improve instream habitat throughout the Gee Creek watershed. Although Gee Creek and Campbell Slough are the top priorities for habitat enhancement and restoration, where funding and partnership opportunities become available restoration/enhancement could be undertaken in other tidal and riverine habitat on the refuge.

Conserving and restoring trout, salmon, and steelhead populations is an important regional priority, not only for protecting the species, but also because of their cultural, historical, and ecological value. These fish are important food sources for numerous wildlife species. Protection and/or restoration of instream habitats and tidal wetlands may also benefit turtles, amphibians, and waterbirds. Planting shoreline vegetation will improve water quality by creating shade and reducing shoreline erosion; and will provide habitat for migratory and resident landbirds.

APPENDIX I. COLLECTIVE CONTRIBUTIONS OF NORTHEAST REFUGES TO ECOSYSTEMS

Example of Northeast Refuges and their contributions to landscape level population objectives for Resources of Concern identified in Comprehensive Conservation Plans or Habitat Management Plans using the systematic process outlined in this handbook.

BCR	PIF	Refuge/Complex	Resource of Concern	Habitat Goal (acres)	Population Goal	BCR Habitat Goal	% Refuge Contribution-Habitat	Bird Conservation Region Population Goal	% Refuge Contribution-Population
30	9	Rachel Carson	Sharp-tailed sparrow	3,844		24,711	15.56	1,300 and 385,000	
			American black duck						
14	27/28	Parker River	Salt Marsh	2,060 (HMP)/7262 (HMP) Impoundment		24,711	9.40		
		Lake Umbagog	Blackburnian warbler	12,252	4,321 pairs	988,422	1.24	330,000	1.31
			Arctic tern		Goal: 1.0 fledged chicks/ nesting pair 14,277 breeding pairs (2008)			219,000 breeding	22.51
			Common tern		Goal: 1.0 fledged chicks/ nesting pair 17,467 breeding pairs (2008)			Restore (increase)	Increasing- based on data ranging from 1984 to 2008
			Roseate tern		Goal: 1.0 fledged chicks/ nesting pair 1200 breeding pairs (2008)			26,900 breeding	2.90
28	44	Maine Coastal Islands	Atlantic puffin		Goal: increase population by 50% and maintain .5 fledged chicks/ nesting pair ~1900 breeding pairs (2008)			23,550 breeding	25.35
			Razorbill		Goal: increase population by 50% and maintain .5 fledged chicks/ nesting pair ~1570 breeding pairs (2008)			Restore (increase)	Increasing- based on data ranging from 1984 to 2008
			Common murre		Goal: increase population by 50% and maintain .5 fledged chicks/ nesting pair ~1570 breeding pairs (2008)			36,900-69,500 breeding	Present on one island (2008)
			Leach's storm-petrel		Goal: 0.5 fledged chicks/ nesting pair 110,370 breeding			2322,248 breeding	3.22
			Great cormorant		Goal: 1.0 fledged chicks/ nesting pair 180 breeding (2008)			212,300 breeding	0.65
28	44	Walkill River	American black duck	1,216/335*MSU		11,120	10.94	670/385,000	

Notes

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January 2017

