Idaho Partners in Flight

Idaho Bird Conservation Plan

Version 1.0
January 2000

Address Questions to:
Sharon Ritter
Idaho Partners in Flight Coordinator
142 West Hills Way
Hamilton, MT 59840
406-375-9150
ritter@bitterroot.net

EXECUTIVE SUMMARY

JUSTIFICATION

Continental and local declines in numerous bird populations have lead to concern for the future of migratory and resident bird species. The reasons for declines are complex. Habitat loss, modification, and fragmentation, loss of wintering and migratory habitat, and brood parasitism have been implicated. Scientists and the concerned public agreed that they needed a coordinated, cooperative conservation initiative focusing on birds. Partners in Flight was conceived as a voluntary, international coalition of government agencies, conservation groups, academic institutions, private businesses, and everyday citizens dedicated to "keeping common birds common."

PURPOSE AND SCOPE

Idaho Partners in Flight focused this plan on restoring healthy ecosystems that will maintain productive and complete bird communities. The plan identifies priority bird species, then uses those species and other information on habitat trends to focus on the highest priority habitats. Thus, this plan takes a habitat-based approach, rather than a species-based approach, to conserving bird populations.

This version of the Idaho Bird Conservation Plan covers in detail four habitats that we consider the highest priority habitats for birds in Idaho: Riparian; Non-riverine Wetlands; Sagebrush Shrublands; and Dry Ponderosa Pine/Douglas-fir/Grand Fir Forests. For each of these habitats, we describe their importance to birds, give habitat descriptions, state objectives and issues, and give strategies and tasks for meeting those objectives. In future versions of the Idaho Bird Conservation Plan, we will address other habitats important to birds. We also discuss non-habitat and cross-habitat threats.

OBJECTIVES

Our objectives are:
In Riparian habitat, 1) Maintain the existing distribution and extent of each riparian system; and 2) By 2025, restore at least 10% of the historical extent of each riparian system within each ecoregion subsection, to conditions that would support productive populations of designated focal species (called "target conditions").
In Non-riverine Wetlands, obtain a net increase in the number of acres (hectares) of wetlands in Idaho, focusing on the same types and amounts that historically occurred here.
In Sagebrush Shrublands, 1) By the end of the 2009 breeding season, reverse declining trends of species associated with sagebrush habitats in Idaho, while maintaining current populations of other associated species, and 2) manage for Sage Grouse numbers as outlined in each Sage Grouse Management Area in the Sage Grouse Management Plan (using Sage Grouse as an umbrella species) by 2007. Statewide, this would result in doubling the 5-year running average number of males that were counted on a representative sample of Idaho leks between 1991 and 1996. Habitat objectives also are given.
In Dry Ponderosa Pine/Douglas-fir/Grand Fir Forests, restore by 2025 as much as possible but at least 10% of the historical range of these forests meeting the conditions needed for White-headed Woodpeckers (a focal species). This comes to approximately 100,000 ac (40,500 ha).

COORDINATION

The presence of a Coordinator position has been crucial to Idaho PIF's success and is crucial to the successful implementation of this Idaho Bird Conservation Plan and coordination with surrounding states and physiographic areas. Continued funding for this position is important and should be encouraged by all Idaho PIF members.

ACKNOWLEDGMENTS

We would like to extend appreciation and thanks to all of the partners who contributed their time and expertise to write this plan. Their hard work and dedication have made this very important endeavor possible. We thank all cooperating government agencies and organizations, including:

Idaho Department of Fish and Game
USDA Forest Service
USDI Bureau of Land Management
USDI Fish and Wildlife Service
Golden Eagle Audubon Society
Coeur d'Alene Audubon Society
USGS Biological Resources Division
Boise Cascade Corporation
Turnstone Ecology
Wildlife and Ecosystem Management Associates
Environmental Science and Research Foundation
Sustainable Ecosystems Institute
University of Idaho College of Forestry, Wildlife and Range Sciences
Idaho State University
Colorado Bird Observatory

The following individuals contributed significantly to the development, writing, and editing of this plan. We especially would like to thank:

Sharon Ritter (Idaho PIF Coordinator)
John Augsburger
Jon Beals
Carol Beardmore
Steve Bouffard
Rita Dixon
Diane Evans
Katie Fite
Robin Garwood
Bruce Haak
Jon Haufler
Pat Heglund
Sandy Jacobson
Sherry Hudson
Kerry Hughes
Mabel Jankovsky-Jones
Jason Karl
Paul Makela
Carolyn Mehl
Chris Paige
Charley Rains
Tim Reynolds
Rex Sallabanks
Helen Ulmschneider

We also would like to thank the following individuals for their participation in conservation planning meetings, information assembly, and/or manuscript review: Bob Altman, John Apel, Jon Bart, Jack Connelly, John Doremus, Susan Earnst, Scott Feltis, Chuck Harris, Tom Hemker, Chris Hescock, James Kumm, Lyle Lewis, Wayne Melquist, Mike Munts, David Pashley, Terry Rich, Scott Robinson, John Rotenberry, Steve Rust, Vicki Saab, Signe Sather-Blair, Greg Schildwachter, Dan Svingen, Colleen Sweeney, Allan Thomas, Chuck Trost, and Charlene Vullo.

TABLE OF CONTENTS

Introduction 5

Geographic Context 6
- Geography and Demography 6
- Vegetation 6
- Opportunities for Bird Conservation 12

Prioritization 12
- Idaho's Avifauna 12
- Idaho PIF Prioritization System 12

Conservation Plan for Priority Birds and Habitats 19
- Riparian Habitat 19
  - Introduction 19
  - Habitat Description 19
  - Bird Conservation Plan for Riparian Habitat 29
- Non-Riverine Wetlands 38
  - Introduction 38
  - Habitat Description 38
  - Bird Conservation Plan for Non-Riverine Wetland Habitat 44
- Sagebrush Shrub 50
  - Introduction 50
  - Habitat Description 50
  - Bird Conservation Plan for Sagebrush Habitat 54
- Dry Ponderosa Pine/Douglas-Fir/Grand Fir Habitat 65
  - Introduction 65
  - Habitat Description 65
  - Bird Conservation Plan for Dry Ponderosa Pine/Douglas-Fir/Grand Fir Forests 69
- Other Habitats 75
  - Alpine 75
  - High-elevation Mixed Conifer Forest 75
  - Lodgepole Pine Forest 75
  - Cedar and Hemlock Forest 76
  - Low-elevation Mixed Conifer Forest 76
  - Juniper/Pinyon Pine/Mountain Mahogany 76
  - Aspen 78
  - Mountain Brush 78
  - Salt Desert Shrub 79
  - Grassland 79
- Non-habitat and Cross-habitat Threats 83
  - Goals and Objectives 83
  - Strategies and Tasks to Meet Goals and Objectives 83

Idaho PIF Coordination 88
- Current Organization 88
- Future Organization 88

How to evaluate progress toward reaching
the objectives in this plan 90

Literature Cited 91

LIST OF FIGURES, TABLES, AND APPENDICES

Figures

1 Physiographic Area Boundaries and Idaho.....7
2 Idaho Federal Land Ownership.....8
3 Idaho State Land Ownership.....9
4 Idaho Political Features 10
5 Major Idaho Waterways.....11
6 Ecoregions.....20

Tables

1 Habitats used in prioritization of birds in Idaho and how they compare to Idaho Gap Analysis wildlife habitats.....15
2 High priority breeding bird species in Idaho, shown by habitat.....16
3 The number of species using each Idaho PIF habitat.....17
4 Annual percentage change in population size of sagebrush species in Idaho and Physiographic Area 89 as estimated from Breeding Bird Survey data.....52

Appendices

1 Birds that are confirmed (B) or suspected (b) to breed in Idaho. Shows 1 to 5 habitat associations assigned by Idaho PIF.....102
2 Prioritization scores for high priority breeding bird species in Idaho.....108
3 Moderate priority breeding bird species in Idaho.....111
4 Idaho breeding bird species list by habitat.....114
5 Species accounts by priority habitat.....122
6 Priority species using non-riverine wetland habitats in Idaho.....146
7 List of some sources of funding, matching funds, and other assistance for wildlife conservation projects that affect wetlands.....149
8 List of land trusts in Idaho.....150
9 Scientific names of plants mentioned in the text.....152

INTRODUCTION

Continental and local declines in numerous bird populations have lead to concern for the future of migratory and resident bird species. The reasons for declines are complex: habitat loss, modification and fragmentation; loss of wintering and migratory habitat; brood parasitism; excessive predation; and other less direct causes. Scientists and the concerned public agreed that they needed a coordinated, cooperative conservation initiative focusing on birds.

In late 1990, the National Fish and Wildlife Foundation brought together federal, state, and local government agencies, foundations, conservation groups, industry, and the academic community to form a program to address the problem. Partners in Flight (PIF) is a voluntary, international coalition of government agencies, conservation groups, academic institutions, private businesses, and citizens dedicated to "keeping common birds common."

Idaho Partners in Flight (Idaho PIF) formed in 1992. Idaho PIF's primary goal is to direct resources to the conservation of birds and their habitats through cooperative efforts in the areas of monitoring, research, management, and education.

Geographically based conservation plans are necessary for all birds, much as the North American Waterfowl Management Plan directs efforts and prioritizes funding for waterfowl. "The Flight Plan" proposed by Partners in Flight forms the strategy for coordinating, developing, and writing Bird Conservation Plans (American Bird Conservancy 1998; Partners in Flight 1998). The plans assemble the best and most current scientific information. They identify species and habitats most in need of conservation, and establish objectives for bird populations and/or habitats in physiographic areas (ecoregions) and states. The plans focus on the types and quality of habitats required by birds at the landscape scale. We recommend needed conservation actions and identify partnerships to accomplish the objectives. PIF bird conservation plans complement the successful North American Waterfowl Management Plan and the recently initiated Shorebird Conservation Plan and North American Waterbird Conservation Plan.

Many people helped develop this Bird Conservation Plan by participating in planning meetings, helping write sections of the plan, and as reviewers. Planning meetings gathered information that formed the core of the plan.

This version of the Idaho Bird Conservation Plan covers in detail four habitats that we consider the highest priority habitats for birds in Idaho: Riparian; Non-riverine Wetlands; Sagebrush Shrublands; and Dry Ponderosa Pine/Douglas-fir/Grand Fir. How we chose these habitats is described below under "Prioritization." Following that section are habitat descriptions, our objectives, and issues, strategies, and tasks for meeting those objectives. In future versions of the Idaho Bird Conservation Plan, we will address other habitats of importance to birds.

GEOGRAPHIC CONTEXT

GEOGRAPHY AND DEMOGRAPHY

Idaho covers 83,564 sq mi (216,432 sq km). Of this land area, 60.6 percent is owned by the federal government. Only Nevada and Utah have higher percentages of their lands owned by the federal government. The Bureau of Land Management manages 18,511 sq mi (47,945 sq km) and the Forest Service manages most of the rest of the federally owned lands, while the National Park Service, Department of Defense, Department of Energy, and Bureau of Reclamation own smaller amounts (Figure 2). The central core of Idaho contains vast wilderness areas providing minimally disturbed, intact bird habitat. The state government also owns land in Idaho (Figure 3). Idaho State Lands owns scattered sections, as well as some larger parcels. The Idaho Department of Fish and Game owns several Wildlife Management Areas. There are three large reservations--the Fort Hall Indian Reservation in southeastern Idaho, the Duck Valley Indian Reservation in southwestern Idaho, the Nez Perce Indian Reservation in northcentral Idaho, and the Coeur d'Alene Indian Reservation in the Idaho Panhandle.

Idaho's estimated population in 1998 was 1,228,684 people (source: U. S. Census Bureau). With the exception of the Coeur d'Alene/Post Falls area in northern Idaho, most of the population centers are in southern Idaho along the Snake River, e.g., Boise/Nampa/Caldwell, Twin Falls, Pocatello, and Idaho Falls (Figure 4).

Mountains dominate Idaho's landscape, except along the relatively flat Snake River Plain in the southern tier of the state. Deeply incised river canyons add diversity wherever they occur. All Idaho rivers and streams eventually empty into the Pacific Ocean. Major rivers and streams are shown in Figure 5. Either rivers or mountains define almost half of the boundary of the state.

Major industries of Idaho, according to the National Geographic Society, are agriculture, tourism, food-processing, lumber and wood products, machinery production, chemical products, paper products, and silver and other mining. Agriculture includes cattle, potatoes (Idaho produces a quarter of the nation's potatoes), dairy products, wheat, sugar beets, and barley.

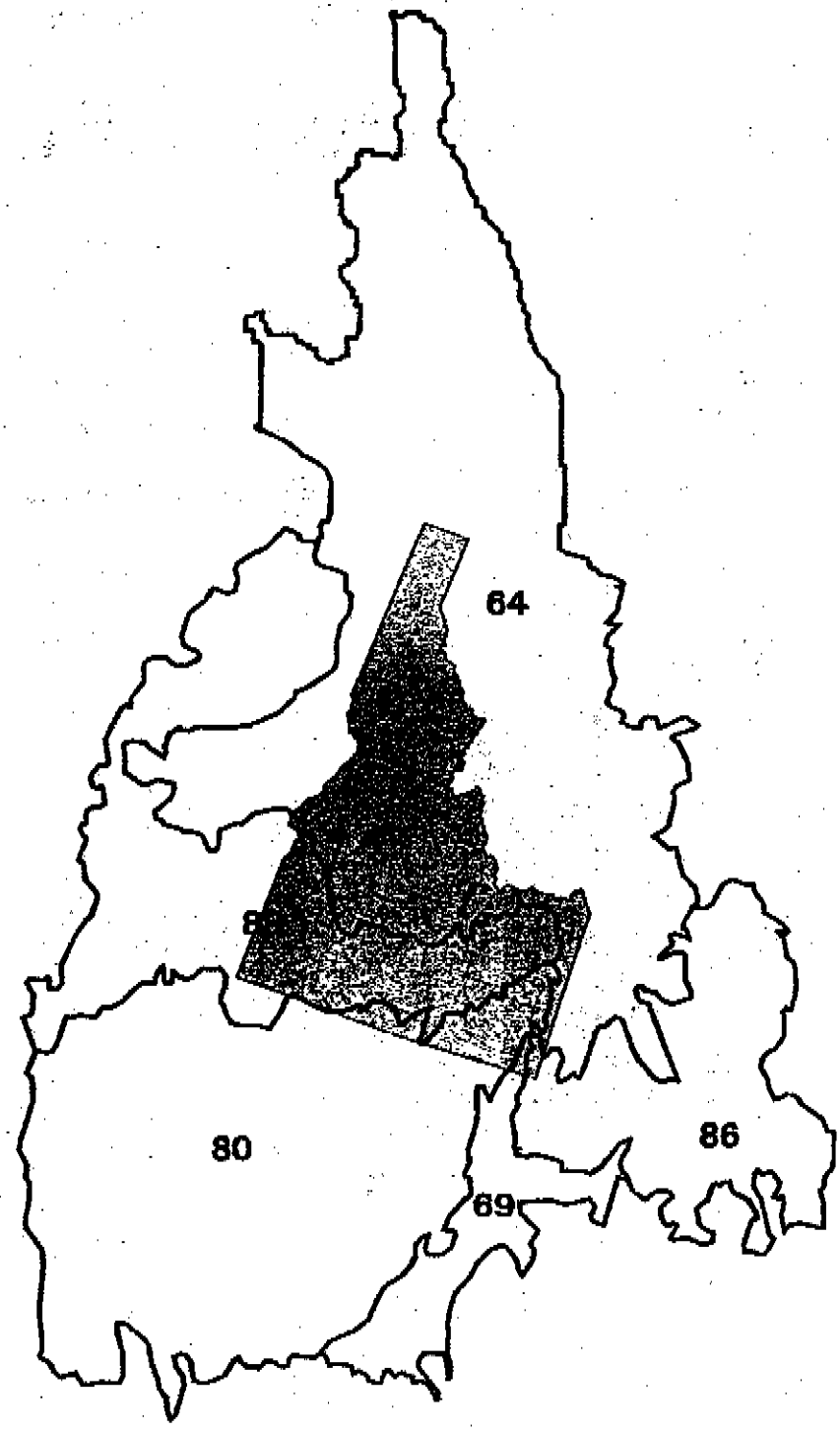
VEGETATION

PIF divided North America into planning units, based on physiographic areas, which in turn were based on biotic communities. Figure 1 shows the boundaries of the physiographic areas that occur in Idaho. Physiographic area 64, the Central Rocky Mountains, covers most of the state. Physiographic area 89, the Columbia Plateau, includes the Snake River Plain of southern Idaho. Physiographic area 80, Basin and Range, comes into the southeastern part of the state while two other physiographic areas, 69--Utah Mountains and 86--Wyoming Basin, include only small areas of eastern Idaho.

The combinations of mountains, climate, soils, latitude, and river systems have created a diversity of vegetation types in the state. The drier southern part of the state has most of the sagebrush, juniper, salt desert shrub, agriculture, and non-native grasslands. The central and northern, moister parts of the state have most of the forests, including western redcedar and western hemlock remnants from an earlier glacial period. Of our priority habitats, sagebrush is restricted to the southern part of the state, riparian habitats are throughout the state, most of the non-riverine wetlands are in the southern part of the state, and most of the ponderosa pine forests are in central Idaho, with some also in northcentral and northern Idaho.

Figure 1.

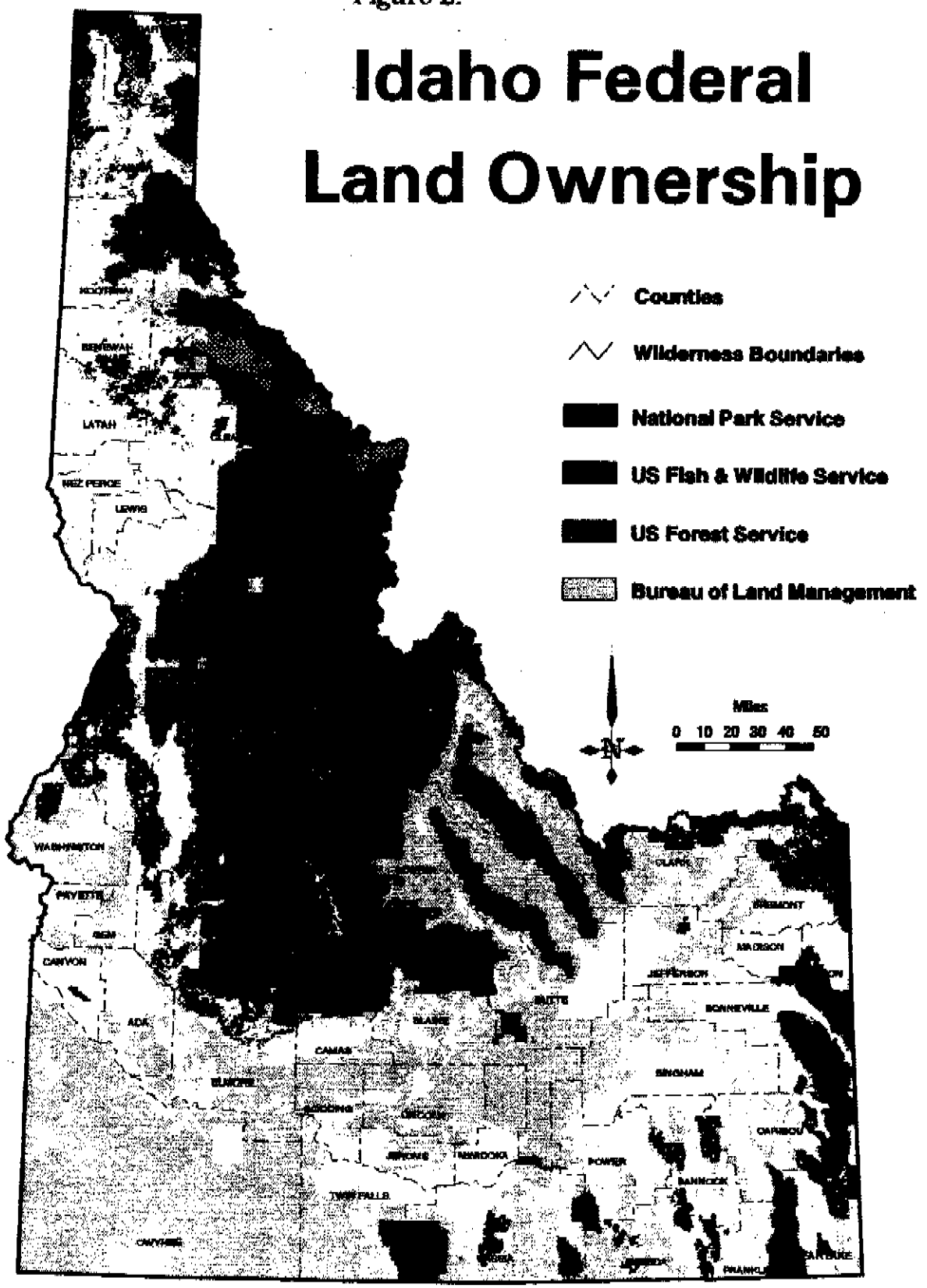
Partners in Flight Planning Units within Idaho



Source: Partners in Flight, MO Dept. of Conservation | /maps/misc/pifight/stids.map | pifight.sml

Cartography by: Kevin Berisenko - Nov 96

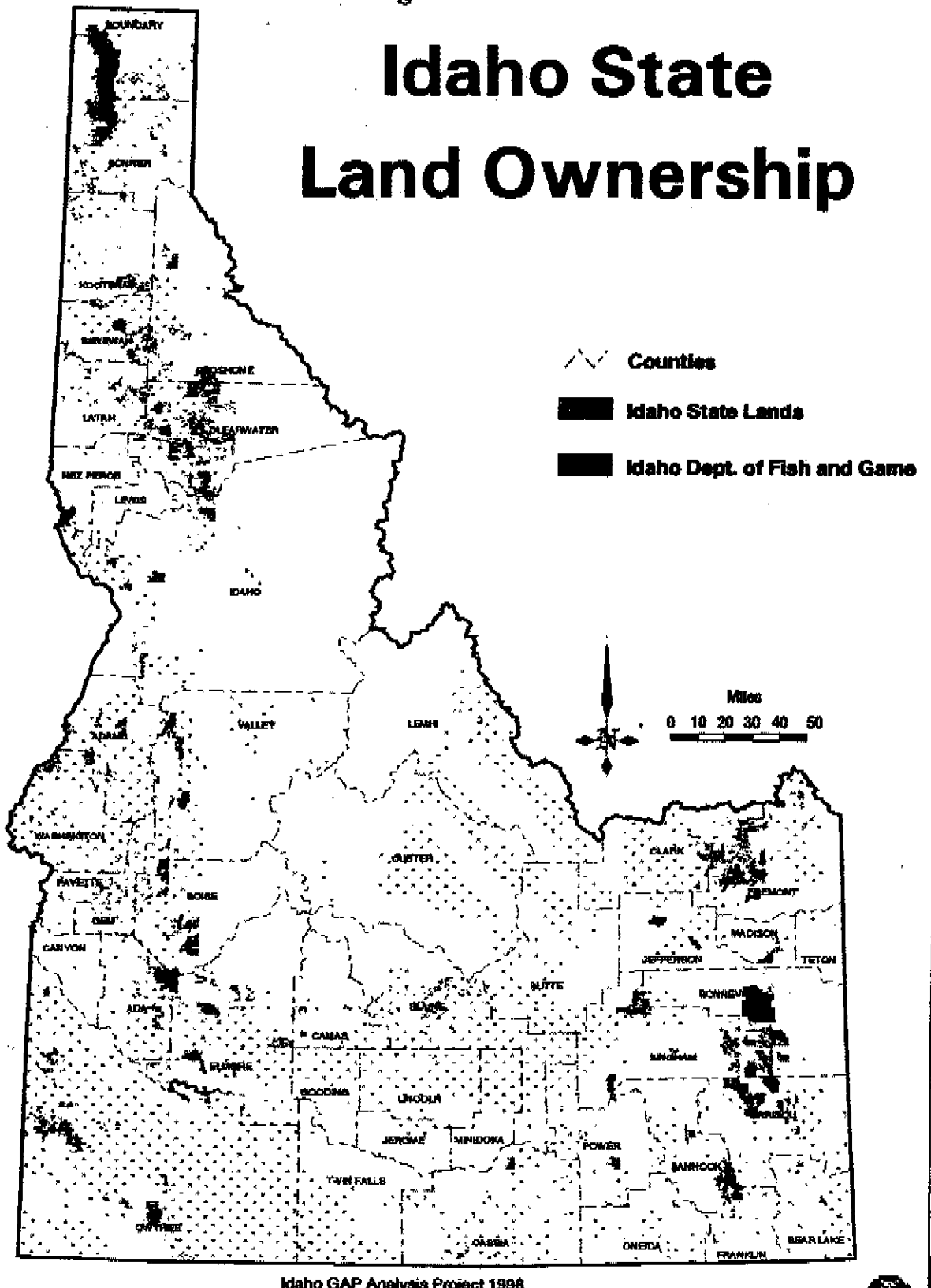
Figure 2.



Idaho GAP Analysis Project 1998
Landscape Dynamics Lab
Idaho Cooperative Fish and Wildlife Research Unit
Map Design: Jason Karl

Map displayed in Idaho Transverse Mercator projection. Latitude lines are curved due to the map projection.

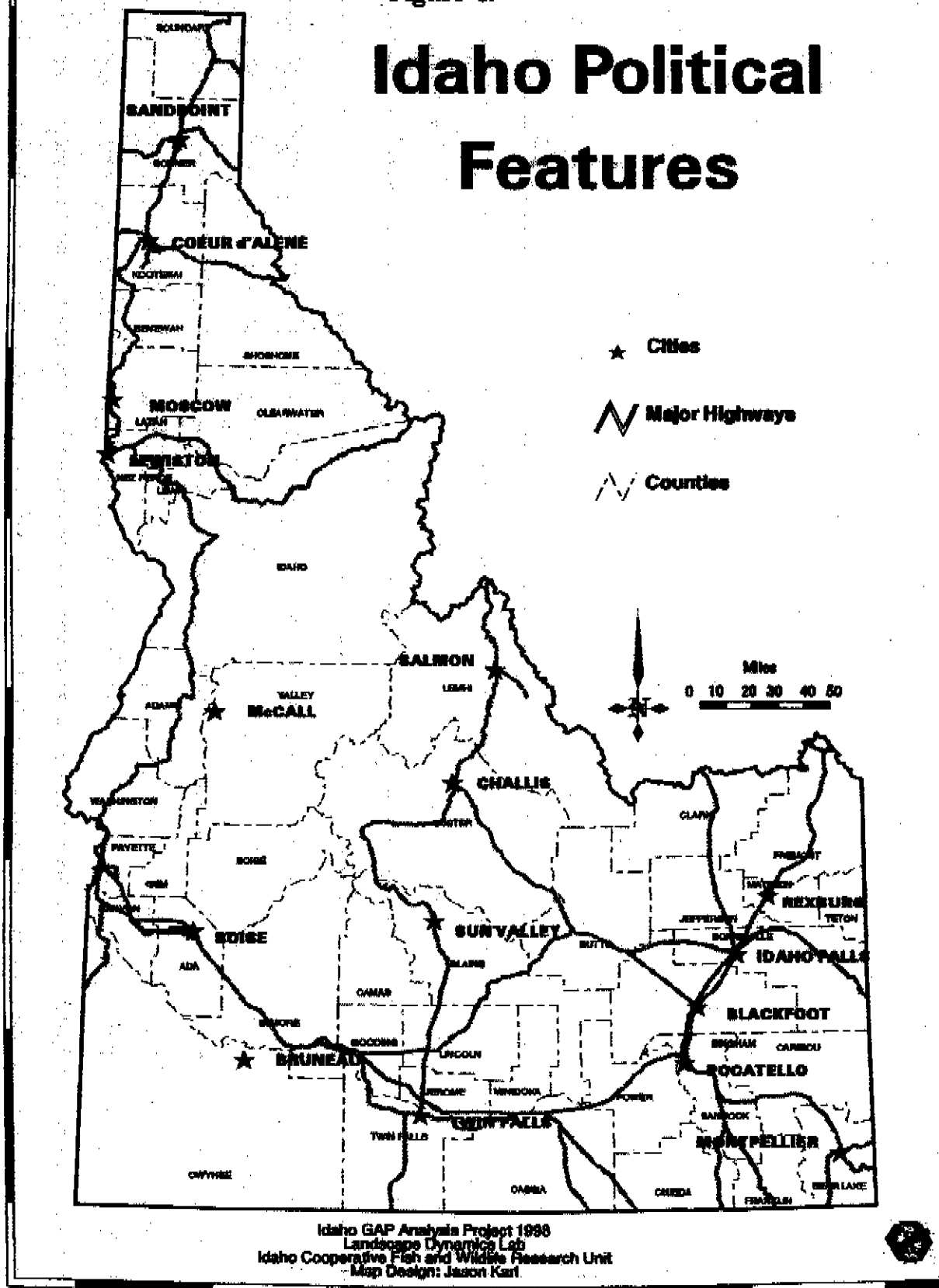
Figure 3.



Idaho GAP Analysis Project 1996
Landscape Dynamics Lab
Idaho Cooperative Fish and Wildlife Research Unit
Map Design: Jason Karl

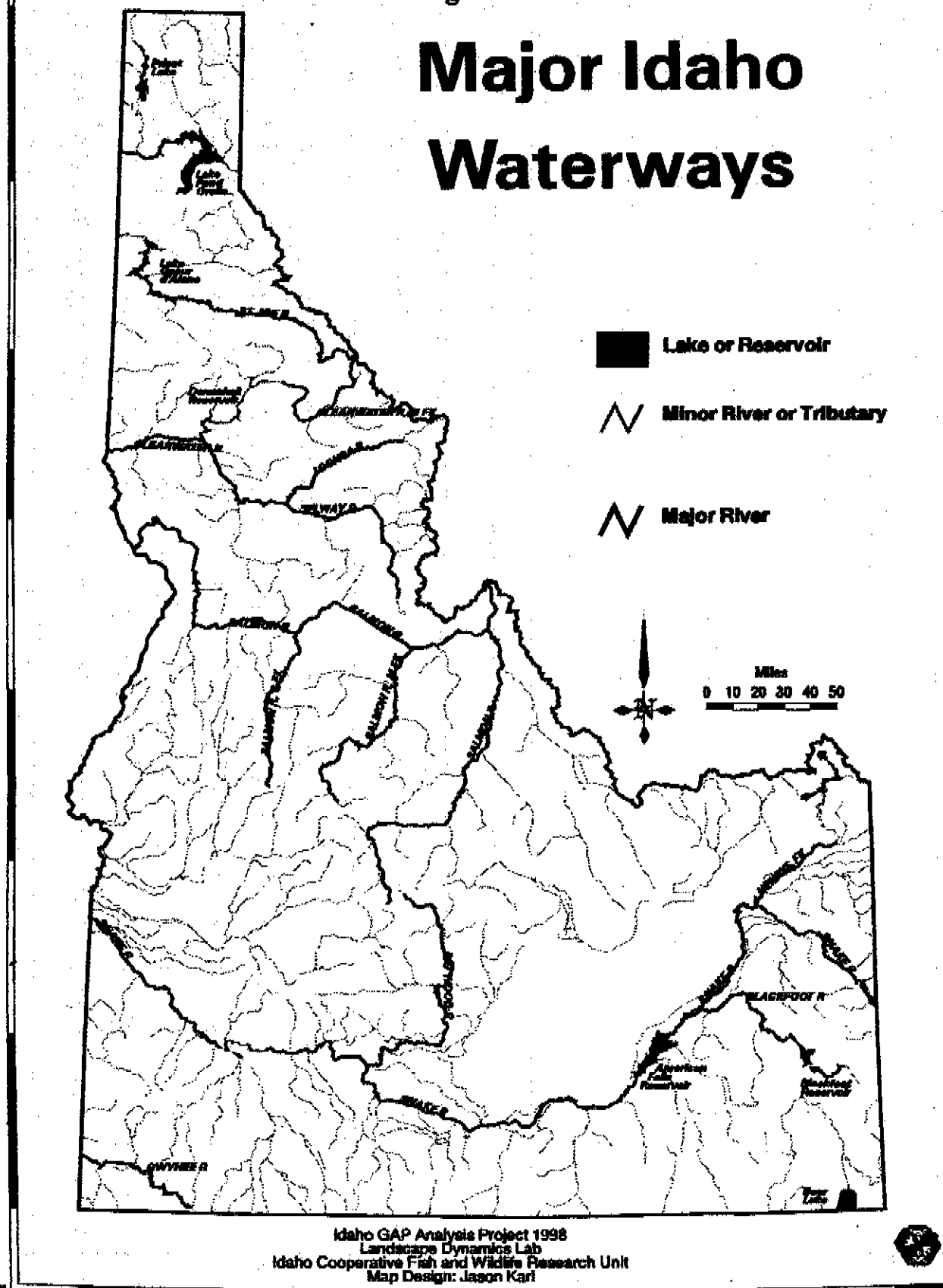
Map displayed in Idaho Transverse Mercator projection. Latitude lines are curved due to the map projection.

Figure 4.



Map displayed in Idaho Transverse Mercator projection. Latitude lines are curved due to the map projection.

Figure 5.



Map displayed in Idaho Transverse Mercator projection. Latitude lines are curved due to the map projection.

OPPORTUNITIES FOR BIRD CONSERVATION

Idaho's state motto fits perfectly with the objectives of this Bird Conservation Plan: "*Esto perpetua*, It is forever." Idaho, because of its wilderness and other undeveloped areas, percentage of federally owned lands, and relatively low population density, is in an excellent position to improve management of its habitats for birds. In most cases, we have not lost our bird habitats. However, many are degraded, that is, they may be in a condition less than optimal for productive bird populations. This means that we still have the chance to reverse declining trends in bird populations by changing how we manage our landscapes.

As we will discuss later in the plan, there are already many existing efforts to improve management of habitats important to birds, although they may not specifically target birds and the conditions they require. For example the Forest Service and Bureau of Land Management have standards, PACFISH and INFISH, to manage fish habitat. These standards often benefit birds. The Idaho Department of Fish and Game, U.S. Fish and Wildlife Service and U.S. Natural Resources Conservation Service work with landowners to improve habitat on private lands on a voluntary, cost-share basis. Many of these improvements benefit birds. Land trusts work with private landowners to set aside lands in permanent conservation easements. There are many more existing programs that we hope to work with and through to improve bird habitat in Idaho.

We envision an Idaho where humans and wildlife can coexist. To do this, we must find voluntary ways for land managers and landowners to work together to maintain, improve, and restore habitats important to birds and other wildlife, while still making a living from the land. This can only be accomplished if we agree on the importance of birds to a healthy ecosystem. *Esto perpetua*.

PRIORITIZATION

IDAHO'S AVIFAUNA

Idaho has 243 species of birds that breed in the state (Appendix 1). Of these, 119 are Neotropical migrants, birds that breed in Idaho but migrate to winter in the Neotropics of Mexico, Central America, the Caribbean, and South America. The diversity of vegetation and topography results in a diversity of species. Some species, such as the Boreal Chickadee, only nest in the boreal forest of far northern Idaho, while others, such as the Scott's Oriole, only nest in pinyon/juniper woodlands of far southern Idaho.

While all birds are important to Idaho both for their roles in the ecosystem and their aesthetic value, not all birds and habitats are equal when it comes to threats to their persistence in the state. Therefore, we used a prioritization system based on birds and threats to habitats to determine on which habitats we should focus our greatest efforts.

IDAHO PIF PRIORITIZATION SYSTEM

Idaho PIF's main reason for prioritizing bird species is to prioritize habitats. We are not interested in a species-by-species approach to bird conservation in Idaho, unless a species is vulnerable to extirpation. Managing habitats to support healthy communities of birds also will benefit other species.

Our first step was to assign habitats to birds. We started with the Gap Analysis habitats and grouped them into 14 Idaho PIF habitats (Table 1). We then assigned one to five habitats to each species. These are considered important breeding or "source" habitats. Breeding habitat can also include important foraging

habitat during the breeding season. Habitat associations are shown in Appendices 1 and 4, along with breeding status in each of the three physiographic areas that have significant area within Idaho. As we only assigned up to five habitats per species, not all habitats in which the species occur will be shown.

After we assigned habitats, Idaho PIF members struggled with use of current vegetation *versus* potential. Some argued that birds respond to existing vegetation, not potential, while others argued that managers use potential habitat types in their management plans. We ended up using potential habitat types for coniferous forest and riparian habitats. However, we did not reassign species to potential habitat types due to lack of time and people to complete the work. This will need to be done prior to working on the remaining coniferous forest types.

The PIF Species Bird Prioritization scheme was developed in 1991, and has been continually reviewed and refined in the years following inception (Carter et al. *in press*). It currently is undergoing further revision. The system ranks each species of North American breeding bird based upon seven measures of conservation "vulnerability." These factors include:

AI = Relative density in a given planning unit compared to the maximum reached within its range (AI stands for Area of Importance; this is an intraspecific score).
PT = Population trend; this score has another score associated with it which is PTU, a measure of uncertainty concerning the data source and sample size
TB = Threats to the species in breeding habitats
RA = Relative abundance; this is an interspecific score
BD = Size of breeding range (BD stands for Bird Distribution)
ND = Size of non-breeding range (ND stands for Non-breeding Distribution)
TN = Threats to the species in non-breeding habitats

Planning units used for prioritizing species in Idaho include the state and physiographic areas 64 (Central Rockies), 89 (Columbia Plateau), and 80 (Basin and Range) (Figure 1). Four of these factors are global measures (i.e., they do not change from area to area), and include RA, BD, ND, and NT. The other three factors, threats to breeding populations (TB), area importance (AI), and population trend (PT), are specific to each physiographic area or state. Each species is given a score of 1-5 in each category, with 1 indicating the least amount of vulnerability with regard to that parameter and 5 the most. Scores in each category are then summed to produce a composite score potentially ranging from 7-35. Species with relatively high overall scores are considered most vulnerable to extinction or extirpation (although they often are not endangered at present) and usually need conservation measures or at least need to be carefully monitored throughout their ranges.

Another measure, besides the PIF scores, of a species' importance in a given planning unit is the percentage of its total population that occurs there. This was calculated for physiographic areas, but not states. Physiographic areas with large percentages ($\geq$10% population for the large physiographic areas that include Idaho) need to take greater conservation responsibility for that species. This criterion is called Percent Population and is calculated from the percent of the total range area, weighted by Breeding Bird Survey relative abundance (see Rosenberg and Wells *in press*; the percent of the total geographic range was used for species with inadequate relative abundance data from the Breeding Bird Survey).

Idaho PIF used the following criteria to designate species as priority species in Idaho:

High priority species are those species scoring $\geq$ 22 total score in the PIF prioritization system using state scores or physiographic area scores, whichever were higher. A high total score indicates high vulnerability of

populations. High priority species also are those species scoring 18-21 in the PIF system, with AI + PT $\geq$ 8. This indicates a species of moderately high vulnerability, and with declining or uncertain population trend in the physiographic area or state for which there is relatively high responsibility. Species without manageable populations in the area (peripheral) are noted. High priority species are listed in Table 2, and their scores are shown in Appendix 2.

Moderate priority species (Appendix 3) are those that, for reasons given below, should be considered in habitat management plans or monitoring plans but are not considered high priority species. They include:

- Species that are on the national Watch List (Muehter 1998). This PIF list includes species with a total score $\geq$ 20 (but using only six criteria, AI excluded), or scoring 18-19 with a PT trend of 5.
- Species for which Idaho and physiographic areas that include Idaho have high responsibility (Percent Population) for the long-term conservation because they reach their greatest abundance in these areas, even if they are not currently threatened.
- Species scoring 18-21 and are specialists (defined as using only one or two habitats (see description of habitat prioritization below). Including two habitats in the definition of a specialist was justified because in most cases, habitats used were very similar (e.g., grassland and sagebrush, or wetland and riparian habitats).
- Species on the federal list of endangered or threatened species that did not meet any of the above criteria.
- Species that Idaho PIF members requested be raised to priority status because of disagreement with scores as given by the Colorado Bird Observatory, and did not meet any of the above criteria.

IDAHO PIF PRIORITY HABITATS

We took several approaches to selecting our priority bird habitats. Table 3 shows the total number of species that use each Idaho PIF habitat, the total number of species that use each Idaho PIF habitat as their primary breeding habitat, and the number of high priority species that use each Idaho PIF habitat as their primary breeding habitat. Based on these figures alone, it appears that our highest priority habitats should be: Riparian; Marshes, lakes, ponds; Low-elevation mixed conifer forest; and Sagebrush/salt desert shrub. Our next highest priority habitats should be: Juniper/pinyon/mt. mahogany; Grassland; High elevation mixed conifer; and Cliff/rock outcrop/talus.

However, in our selection of priority habitats, we also considered: 1) the loss of habitat in quantity and quality; 2) the amount of each habitat currently in the state; and 3) the amount that is in a management status that provides moderate to good protection from degradation. Using information from Caicco et al. (1995) and Noss et al. (1995), we decided that the Low-elevation mixed conifer type is of less immediate concern due to the amount of this habitat in the state and the percent protected, so it was dropped from the list of highest priority habitats. Cliffs were also dropped from the list of next highest priority because cliffs are relatively well protected, and most of the species used other habitats, most of them priority habitats. Juniper and pinyon pine habitat is peripheral to the state, but still of value and should be considered in a later version of the plan. Grassland habitat in northern Idaho is almost completely gone due to plowing. Restoration of this type, listed as critically endangered by Noss et al. (1995), will take centuries and preliminary steps should be taken to encourage such restoration.

We decided to add ponderosa pine to our list of priority habitats to be addressed in this plan because old-growth ponderosa pine comprised 10 percent of Idaho's forest cover pre-European settlement, but is now less than 1 percent, and declining. Noss et al. (1995) list this as an endangered ecosystem in the United States.

Therefore, our priority habitats that we are addressing in detail in this version of the Idaho Bird Conservation Plan are:

- Riparian
- Non-riverine wetlands (marshes, lakes, ponds)
- Sagebrush shrublands (excluding salt desert shrub)
- Ponderosa pine (dry ponderosa pine/Douglas-fir/grand fir)

We will address the other habitats in future versions. We briefly discuss them later in the plan.

Table 1. Habitats used in prioritization of birds in Idaho and how they compare to Idaho Gap Analysis wildlife habitats (Caicco et al. 1995). Names in parentheses are abbreviated names used in Tables 1, 2, and 3 and in the Appendices.

Idaho PIF Avian Habitats	Idaho Gap Analysis Wildlife Habitats[a]
Alpine	Alpine
High elevation mixed conifer forests woodlands; grand fir forests	Whitebark pine forests; mountain hemlock forests/ (Hicon)
Lodgepole pine (LPPine)	Subalpine lodgepole pine forests; montane lodgepole pine forests; lodgepole pine woodlands
Cedar and hemlock (Cedar)	Cedar and hemlock forests
Low elevation mixed conifer forests (Locon)	Western larch forests; Douglas-fir forests; Douglas-fir forests and woodlands
Ponderosa pine (P.Pine)	Ponderosa pine forests and woodlands
Juniper/pinyon/mt. mahogany (Juniper)	Juniper woodlands
Aspen	(not a separate habitat under Gap--mixed in with other habitats)
Mountain brush (Mt. Brush)	Mountain brush; brushfields; clearcuts
Sagebrush/salt desert shrub (Sage)	Mountain big sagebrush w/ trees; mountain big sagebrush w/o trees; tall sagebrush; low sagebrush w/ trees; low sagebrush w/o trees; salt desert shrub
Grassland (Grass)	Canyon grassland; non-native grassland
Marshes, lakes, ponds (Marsh)	Marsh; open water
Riparian	Canyon shrub riparian; cottonwood riparian; willow riparian
Cliffs, rock outcrops, talus (Cliff)	(not a separate habitat under Gap--mixed in with other habitats)

[a] Gap habitats with no Idaho PIF habitat match include sand dunes, agriculture, and urban/industrial.

Table 2. High priority breeding bird species in Idaho, shown by habitat. Species are only shown in the habitat for which it is their primary breeding habitat. See Appendices 1 and 4 for other habitats used by these species.

Riparian
Barrow's Goldeneye
Hooded Merganser
Blue Grouse
Mountain Quail
Black-chinned Hummingbird
Calliope Hummingbird
Rufous Hummingbird
Willow Flycatcher
Dusky Flycatcher
Black-billed Magpie
American Dipper
Yellow Warbler
MacGillivray's Warbler

Low-elevation mixed conifer
Sharp-shinned Hawk
Northern Goshawk
Lewis' Woodpecker
Williamson's Sapsucker
Black-backed Woodpecker
Brown Creeper
Varied Thrush
Townsend's Warbler
Western Tanager

Marshes, lakes, ponds
Western Grebe
American White Pelican
White-faced Ibis
Trumpeter Swan
Cinnamon Teal
Redhead
Sandhill Crane
Killdeer
Black-necked Stilt
American Avocet
Franklin's Gull

Sagebrush/salt desert scrub
Swainson's Hawk
Sage Grouse
Short-eared Owl
Loggerhead Shrike
Rock Wren
Sage Thrasher
Brewer's Sparrow
Lark Sparrow
Sage Sparrow

High-elevation mixed conifer
Olive-sided Flycatcher
Hammond's Flycatcher

Grassland
Sharp-tailed Grouse
Long-billed Curlew
Grasshopper Sparrow

Aspen
Ruffed Grouse

Ponderosa pine
Flammulated Owl
White-headed Woodpecker

Junier/pinyon/mt. mahogany
Ferruginous Hawk
Gray Flycatcher
Plumbeous Vireo
Pinyon Jay
Virginia's Warbler
Black-throated Gray Warbler

Cliff/rock outcrops/talus
Golden Eagle
Prairie Falcon
Black Swift

Cedar and hemlock
Vaux's Swift

Alpine
Black Rosy-Finch

Lodgepole pine, Mountain brush
No high priority species use these types as their primary breeding habitats.

Table 3. The number of species using each Idaho PIF habitat.

Idaho PIF Habitat	# Species Using Habitat	# Species Using Habitat as Primary Habitat	# High Priority Species Using Habitat as Primary Habitat
Riparian	114	61	13
Low elevation mixed conifer	83	34	9
Marshes, lakes, ponds	77	55	11
Sagebrush/salt desert shrub	49	19	9
High elevation mixed conifer	49	16	2
Grassland	48	16	4
Aspen	34	5	1
Lodgepole pine	31	1	0
Ponderosa pine	31	5	2
Juniper/pinyon/mt. mahogany	29	14	6
Cliff/rock outcrops/talus	19	10	3
Mountain Brush	18	3	0
Cedar and hemlock	15	1	1
Alpine	10	3	1

Conservation Plan for Priority Birds and Habitats

Riparian Habitat

RIPARIAN HABITAT

Introduction

Thirteen high priority bird species use riparian habitat as a primary habitat (Tables 2 and 3). However, we consider riparian habitat a high priority for management for other reasons as well--the total number of species that rely on this habitat, the naturally small amount of this habitat that occurs in Idaho and the West, losses of riparian habitat in both quantity and quality, and current and future threats.

Of the 243 bird species breeding in Idaho, 113 (46%) use riparian habitat as nesting habitat. Many of the other 130 species also use riparian habitat as a source of water, as migratory corridors, or for other purposes. Of the 119 neotropical migratory landbirds, 68 (57%) use riparian habitat. Many of Idaho's mammals, amphibians, reptiles, fish, and mollusks also depend on riparian habitat for survival.

Riparian forests, which cover less than 1% of the landscape in arid portions of western North America (Knopf et al. 1988), are biologically diverse and productive systems compared to adjacent uplands. More species of breeding birds are found in this limited habitat than the more extensive surrounding uplands (Saab and Groves 1992). Cottonwood forests provide multiple vegetation layers because of the presence of trees, shrubs, grasses, sedges, and forbs. These are represented in various seral stages under the influence of natural disturbances such as floods. These systems have species that nest in the canopy (e.g., Bullock's Oriole, Yellow Warbler), cavities (e.g., Red-naped Sapsucker, Downy Woodpecker), young tree layer (e.g., Yellow Warbler), shrubs (e.g., Willow Flycatcher), and ground (e.g., Song Sparrow). Some species are canopy feeders (e.g., Yellow Warbler), some forage on tree bark and branches (e.g., Black-capped Chickadee, White-breasted Nuthatch), others forage in the shrubs, grasses, or bare ground (e.g., Calliope Hummingbird, Spotted Towhee). Some species require large patches of intact forest, others do better along the edges or in small patches, and some require early seral stages. All of these conditions result in high species diversity.

Shrub riparian habitat, while lacking the tree layer of the forests, still tends to have higher avian diversity than the surrounding uplands, especially in arid and semi-arid areas. The shrubs provide structural support for nests, territorial singing perches, large invertebrate populations for foraging birds, flowers for hummingbirds, and willow sap for sapsuckers and other species. Because of the narrowly confined floodplains, these systems do not support as many birds per linear mile (kilometer) as those systems with a wider floodplain. However, they still contribute significantly to an area's avian diversity.

Habitat Description

To understand current and historic vegetation patterns, natural disturbance regimes, effects of human-induced changes, and future threats to riparian, or riverine, systems, it is important to understand the geological, hydrological, and climatological characteristics of that system (Brinsom 1993). The geomorphic setting directly influences water storage capabilities and drainage patterns in riparian systems. These features determine what vegetation may be present on a given site. The vegetation in turn determines which wildlife species will be found on those sites.

Idaho PIF riparian habitat and bird community descriptions are based on these hydrogeomorphic features. The first distinction made is based on geomorphology, into wide and narrow valley bottom habitats. Wide valley bottoms are wider, with wider flood plains, and tend to have lower gradients than narrow valley bottoms. These generally are found in lower elevations with higher order streams flowing into them, but some are also found in higher elevations. Narrow valley bottom riparian habitats are found in confined valleys, usually at mid and higher elevations and have lower order streams flowing through them. The second distinction is made on the basis of elevation; both climate and stream size vary with elevation, resulting in different vegetation associations. The third distinction is based on ecological units (ECOMAP 1993; Figure 6), which generally correspond with Physiographic Areas (Figure 1). The following discusses habitat types based on these distinctions. For each habitat type, we discuss its distribution, dominant plant composition, status, role of disturbance, historical and current uses, and impacts and threats.

Broad Valley Bottom (Unconfined) Riparian Complexes

Defining features of these systems are low gradients (0-2% slope), broad unconfined valleys, and unconsolidated sediments. The interaction of these features, existing vegetation, and flood events results in a dynamic stream channel that wanders over the flood plain forming meanders and braided channels. Meander reaches generally consist of a main channel that migrates across the flood plain by erosion and deposition of streambanks (Ward 1998). Common features associated with meanders are side channels, oxbow lakes, and backwater wetlands. Braided segments are characterized by multiple channels, islands, and high sediment loads (Ward 1998). Braided channels are highly unstable; under natural disturbance regimes, islands and gravel bars are highly mobile and temporary features. Stream channel changes over time result in a wide range of water regimes through microsites across the flood plain. Flood magnitude and frequency may vary greatly among years. This variability in time and place contributes to the high vegetative diversity in these riparian zones. The flood plain is usually bordered with gentle upland slopes and terraces. Riparian vegetation often shows zonal patterns from the stream channel toward the uplands (Ward 1998).

Distribution and Amount. The broad valley bottom riparian complex occurs at various elevations where the topographic features are low gradient and broad valleys. An estimate of amount is unavailable, but it frequently is estimated that riparian vegetation covers less than 1% of the landscape in the arid West and in Idaho.

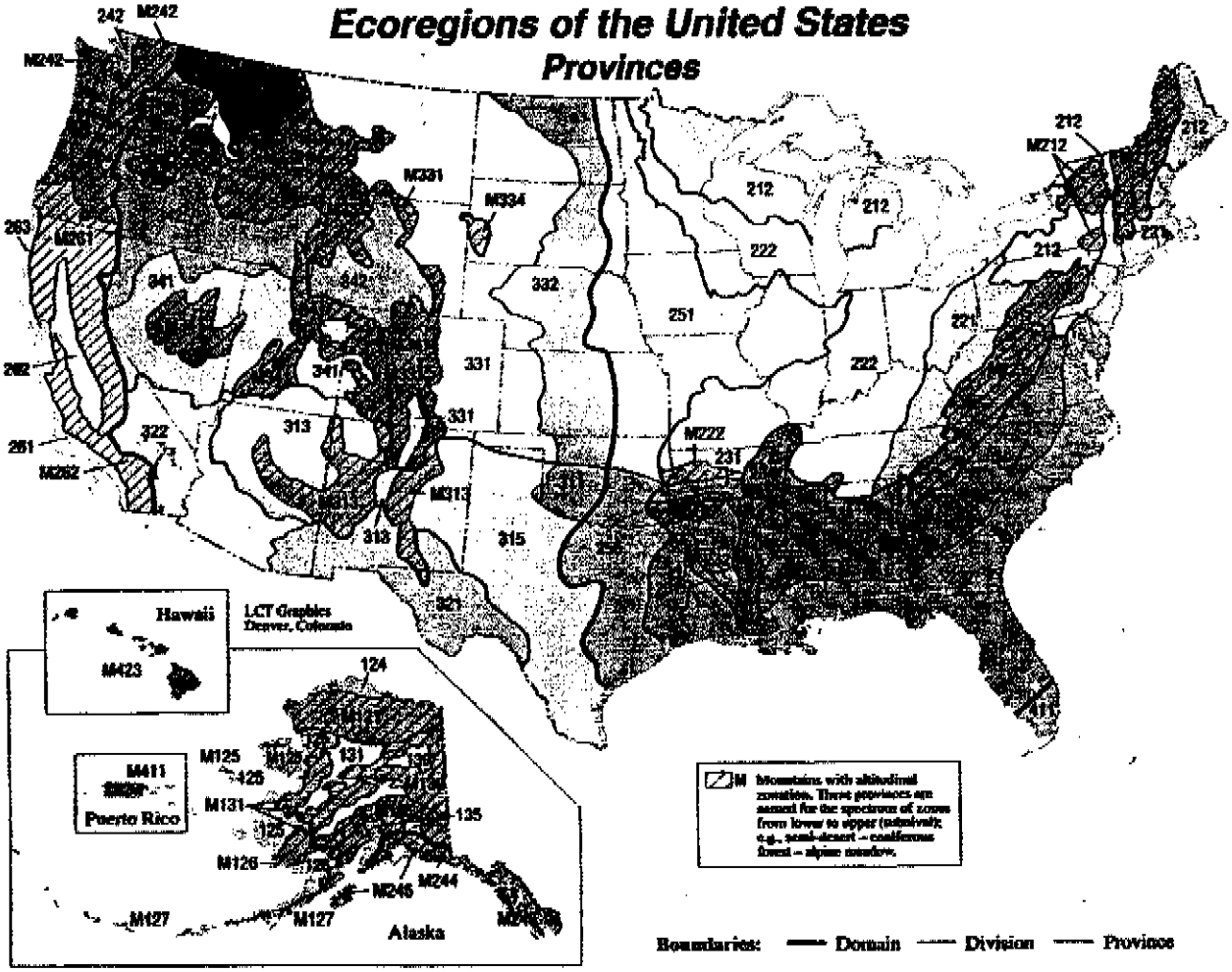
Dominant Composition. The following descriptions of plant species composition were derived from Idaho Conservation Data Center vegetation surveys conducted throughout Idaho.

Region M331-Southern Rocky Mountains Steppe (Overthrust) (PA 80 and part of PA 64)

Low Elevation (Sagebrush Zone): Streams flowing through the Southern Rocky Mountains Steppe in eastern Idaho support extensive forested and shrub bottomlands. Eastern Idaho is within the range of narrow-leaf cottonwood. A diverse suite of riparian shrubs including red-osier dogwood, water birch, American silverberry, and common snowberry are present in both the understory of cottonwood stands and as community dominants. Stands of common cattail, softstem bulrush, creeping spikerush, and bladder sedge are present in backwater sloughs and abandoned channels. One of the most outstanding examples of this habitat is found downstream of Palisades Reservoir on the South Fork Snake River.

Moderate Elevation (Douglas fir/Western Spruce Fir Zone): Shrublands dominated by willows and other shrubs, are widespread in the broad, low gradient valley bottoms of the Preuss, Portneuf, and Caribou Ranges in southeastern Idaho and in tributaries to the Henry's Fork River in eastern Idaho. Shrublands and herbaceous wetlands are associated with low gradient meandering channels dominated by Geyer's and Booth's willows, with lesser amounts of Drummond's, Bebb's, and plane-leaf willows. Herbaceous wetlands are commonly a complex of monocultures dominated by sedge and sedge-like species including bladder sedge, water sedge, Nebraska sedge, small beaked sedge, hardstem bulrush, and creeping spikerush.

Figure 6.



100 Polar Domain

120 Tundra Division
124 Arctic Tundra Province
123 Bering Tundra (Northern) Province
126 Bering Tundra (Southern) Province

M120 Tundra Regime Mountains
M121 Brooks Range Tundra – Polar Desert Province
M122 Seward Peninsula Tundra – Meadow Province
M123 Alaska Mountain Tundra – Meadow Province
M127 Aleutian Oceanic Meadow – Heath Province

130 Subarctic Division
131 Yukon Intermontane Plateau Taiga Province
135 Coastal Trough Humid Taiga Province
136 Upper Yukon Taiga Province

M130 Subarctic Regime Mountains
M131 Yukon Intermontane Plateau Taiga – Meadow Province
M135 Alaska Range Humid Taiga – Tundra – Meadow Province
M136 Upper Yukon Taiga – Meadow Province

200 Humid Temperate Domain

210 Warm Continental Division
212 Laurentian Mixed Forest Province

M210 Warm Continental Regime Mountains
M212 Adirondack – New England Mixed Forest – Coniferous Forest – Alpine Meadow Province

220 Hot Continental Division
221 Eastern Broadleaf Forest (Oceanic) Province
222 Eastern Broadleaf Forest (Continental) Province

M220 Hot Continental Regime Mountains
M221 Central Appalachian Broadleaf Forest – Coniferous Forest – Meadow Province
M222 Ozark Broadleaf Forest – Meadow Province

230 Subtropical Division
231 Southeastern Mixed Forest Province
232 Outer Coastal Plain Mixed Forest Province
234 Lower Mississippi Riverine Forest Province

M230 Subtropical Regime Mountains
M231 Ouachita Mixed Forest – Meadow Province

240 Marine Division
242 Pacific Lowland Mixed Forest Province

M240 Marine Regime Mountains
M242 Cascade Mixed Forest – Coniferous Forest – Alpine Meadow Province
M244 Pacific Coastal Mountain Forest – Meadow Province
M245 Pacific Gulf Coastal Forest – Meadow Province

250 Prairie Division
251 Prairie Parkland (Temperate) Province
255 Prairie Parkland (Subtropical) Province

260 Mediterranean Division
261 California Coastal Chaparral Forest and Shrub Province
262 California Dry Steppe Province
263 California Coastal Steppe, Mixed Forest, and Redwood Forest Province

M260 Mediterranean Regime Mountains
M261 Sierran Steppe – Mixed Forest – Coniferous Forest – Alpine Meadow Province
M262 California Coastal Range Open Woodland – Shrub – Coniferous Forest – Meadow Province

300 Dry Domain

310 Tropical/Subtropical Steppe Division
311 Great Plains Steppe and Shrub Province
313 Colorado Plateau Semi-Desert Province
315 Southwest Plateau and Plains Dry Steppe and Shrub Province

M310 Tropical/Subtropical Steppe Regime Mountains
M313 Arizona-New Mexico Mountains Semi-Desert – Open Woodland – Coniferous Forest – Alpine Meadow Province

320 Tropical/Subtropical Desert Division
321 Chihuahuan Semi-Desert Province
322 American Semi-Desert and Desert Province

330 Temperate Steppe Division
331 Great Plains-Palouse Dry Steppe Province
332 Great Plains Steppe Province

M330 Temperate Steppe Regime Mountains
M331 Southern Rocky Mountains Steppe – Open Woodland – Coniferous Forest – Alpine Meadow Province
M332 Middle Rocky Mountains Steppe – Coniferous Forest – Alpine Meadow Province
M333 Northern Rocky Mountains Forest-Steppe – Coniferous Forest – Alpine Meadow Province
M334 Black Hills Coniferous Forest Province

340 Temperate Desert Division
341 Intermountain Semi-Desert and Desert Province
342 Intermountain Semi-Desert Province

M340 Temperate Desert Regime Mountains
M341 Nevada-Utah Mountains Semi-Desert – Coniferous Forest – Alpine Meadow Province

400 Humid Tropical Domain

410 Savanna Division
411 Everglades Province

M410 Savanna Regime Mountains
M411 Puerto Rico Province

M420 Rainforest Regime Mountains
M422 Hawaiian Islands Province

Source: R.G. Bailey [Ecoregions of the United States. USDA Forest Service (scale 1:7,500,000, revised 1994)]

Region M332 - Middle Rocky Mountains Steppe (southern part of PA 64)

Low Elevation (Sagebrush/Dry Ponderosa Pine zone): Riparian complexes supporting a mosaic of forested, scrub-shrub, and herbaceous vegetation are present in moderately wide valley bottoms at lower elevations in central Idaho. High quality stands are structurally diverse and narrow-leaf cottonwood, black cottonwood, or quaking aspen, along with red-osier dogwood, alder, water birch, and willow species, are usually well-represented (though cottonwood or aspen may sometimes be absent). Backwater sloughs and former channels may support open water or stands of bladder sedge, Nebraska sedge, common cattail, hard-stem bulrush, and Baltic rush. In central Idaho, examples of this habitat include the Big Wood River, Lemhi River, Pahsimeroi River, Big Lost River, and Salmon River (near the town of Salmon).

Moderate Elevation (Douglas Fir/Western Spruce Fir Zone): At moderate elevations in central Idaho, shrublands are common in areas where valleys widen and stream gradient decreases. Broad shrublands dominated by Booth's willow and Geyer's willow, with lesser amounts of bog birch, are associated with active beaver ponds. Openings in the shrublands may be dominated by bladder sedge, Baltic rush, and small beaked sedge on a wet to dry gradient. These stands may be interrupted by slightly higher gradient reaches supporting alder, cottonwood, aspen, or conifers. Examples of this habitat are found on Trail Creek (Blaine County), Upper Reaches of the Big Wood River, Star Hope Creek, and Wildhorse Creek.

High Elevation (Sub-alpine Fir Zone): At upper elevations in central Idaho, dense stands of low willows are present in broad valley bottoms. Plane-leaf willow, Wolf's willow, short-fruit willow, bog birch, and shrubby cinquefoil form a shrub layer approximately 3 ft (1 m) in height. Large patches of sedges, Baltic rush, or tufted hairgrass are usually present. Examples of this habitat are present in alpine glaciated valleys in the Pioneer and White Knob Mountains.

Region M333 - Northern Rocky Mountains Steppe (northern part of PA 64)

Low elevation (Douglas-fir Zone): Low elevation valleys in northern Idaho support stands of black cottonwood with an understory dominated by common snowberry, alderleaf buckthorn, Pursh's buckthorn, and red-osier dogwood. Cobble bars and islands are common and support stands of stunted cottonwoods and dusky willow. Emergent habitats dominated by native species are uncommon and small. Most emergent habitats are dominated by the exotics reed canary grass and creeping bent grass. Most rivers in low elevation valleys in northern Idaho have been altered by a long history of land use. On some rivers, islands support the only remaining native habitat. Examples of this habitat group are found on the St. Joe River, North Fork Coeur d'Alene River, and Kootenai River.

Moderate Elevation (Grand Fir/Western Hemlock/Western Red Cedar Zone). This is an uncommon type. It is former cedar bottomlands, currently composed of dense shrublands with cedar skeletons and no cedar regeneration after the 1910 and subsequent fires. This riparian system, while important to birds, is lower in priority for bird populations than the other described types.

Region 342 - Intermountain Semi-desert (Columbia Plateau) (PA 89)

Low Elevation (Sagebrush Zone): The Snake River is a major river system that carves its way across southern and western Idaho. Riparian habitat includes a complex mosiac of forested, scrub-shrub, and emergent habitat. In eastern Idaho narrow-leaf cottonwood is present. A diverse suite of riparian shrubs including red-osier dogwood, water birch, American silverberry, smooth sumac, and common snowberry, are present in both the understory of cottonwood stands and as community dominants. Stands of common cattail, softstem bulrush, creeping spikerush, and bladder sedge are present in backwater sloughs and abandoned channels. Historically the broad floodplain of the Snake River above American Falls Reservoir was several miles wide. The floodplain is now confined by levees placed up to 0.5 mi (0.8 km) away from the main channel. Cottonwood forests are well developed on islands and channel banks within the levees. Examples of this type are Fort Hall Bottoms and the Snake River below Heise.

Mid Elevation (Douglas-fir Zone): Shrublands dominated by willows and other shrubs are present along tributaries to the Henry's Fork River in eastern Idaho. Shrublands and herbaceous wetlands are associated with low gradient meandering channels dominated by Geyer's and Booth's willows, with lesser amounts of Drummond's, Bebb's, and plane-leaf willows. Black hawthorne may also be present. Herbaceous wetlands are commonly a complex of monocultures dominated by sedge and sedge-like species including beaked sedge, water sedge, Nebraska sedge, soft-leaved sedge, hardstem bulrush, and creeping spikerush. Examples of this habitat include the Teton River in eastern Idaho.

Region 331 - Great Plains - Palouse (part of PA 64)

This riparian system, while important to birds, is lower in priority for bird populations than the other described types.

Status. The broad valley bottom riparian complex represents the most heavily degraded riverine system throughout the western United States. Actual estimates of the status or historical change in area of the broad valley bottom riparian complex are lacking in Idaho. Nationwide, there has been a greater than 70% loss of riparian forests since presettlement times (Brinson et al. 1981) and a 23% loss of riparian forest since the 1950s (Abernethy and Turner 1987). Many, if not most, have experienced some form of degradation resulting from various human influences including agricultural conversion, construction of roads, mining, logging, grazing, urbanization, damming, water diversion, channelization, and other factors (Chaney et al. 1990). Almost all riverine cottonwood forests on big rivers of southern Idaho lack recruitment of younger age classes, mostly from dams eliminating spring flooding (Noss et al. 1995). The actual form of degradation is often related to the location of these systems on the landscape (i.e., elevation, physiographic region, etc.), and the size of the stream in question.

Role of Disturbance. Riverine systems represent the most dynamic ecosystems present on the western landscape under historical conditions (Knopf and Scott 1990). Flood events, beaver activity, and fire combined to shape the plant and animal communities, which would adapt to the varied intensity and frequency of disturbance patterns within these systems. The broad valley bottom riparian complex in particular was often the most substantially affected by the role of historical disturbance in the riverine systems of Idaho.

Riverine systems are flood-dependent ecosystems and the flood plains are an integral part of these

systems. The broad valley bottom riparian complex represents the most flood-influenced and flood-maintained portion of the system (Minshall 1993). The plants and animals that occur here apply an amazing array of adaptive strategies to exploit the spatio-temporal dynamics common to these systems under natural disturbance regimes (Ward 1998). The effects of natural flood patterns have not been well documented, particularly over long periods. However, natural flood events are considered critical to the maintenance of biodiversity and ecosystem processes within riverine systems (Franklin 1992). Natural disturbances during flood events are often described as either chronic (i.e., annual flood events) or episodic (i.e., debris flows or landslides). Annual flood events play a role in minor year-to-year altering of the riparian zone and stream channel; however, episodic events are more likely to cause major changes to the riparian zone resulting from moving woody debris, debris jams, and shifting stream channels (Franklin 1992).

The influence of historical beaver activities on the broad valley bottom riparian systems of Idaho has not been well studied. However, historical trapping data and anecdotal information suggest that beaver were an integral part of Idaho's broad valley bottom riparian complexes. Within riverine systems, the low gradient, slow water conditions characterizing the broad valley bottom riparian complexes are considered excellent beaver habitat where adjacent vegetation supports dam-building material and an adequate food supply. Under historical conditions, beaver activities are believed to have influenced a large proportion of streams across the landscape. The resulting ecosystem alterations, in many instances, remained as part of the landscape for years if not centuries (Johnston and Naiman 1987). Naiman et al. (1986, 1988) reported that beaver dams can have significant effects on the hydrology and dynamics of riverine systems. Some of these influences include raising the water table and thereby expanding the area of flooded or saturated soils, decreasing stream velocity, modifying plant species composition, creating and maintaining wetlands, retaining sediment and organic matter, and changing the annual discharge regime within the stream course.

Johnston and Naiman (1988) summarize the affect of beaver activity on riverine ecosystems as follows:

> "Where beaver were present in small streams (i.e., approximate order 1-4) there were numerous reaches with open canopy, large accumulations of detritus and nutrients, and expanded wetted areas. In middle-order streams (i.e., orders 5-8), beaver-cut wood from upstream and the immediate riparian zone augmented local allochtonous inputs. Debris accumulations resulted in massive storage of sediment and detritus in the main channel, often forming small islands. In large rivers (i.e., orders greater than 9) beaver utilized floodplains and backwaters, where they constructed dams and canals and cut large amounts of wood. Although these activities diversified stream habitat in the short term, centuries of sediment deposition behind beaver dams may have reduced floodplain complexity (Rutten 1967). These alterations (both short term and long term) had a substantial effect on the ability of stream ecosystems to resist and recover from disturbance."

An additional consideration in historical disturbance regimes is the occurrence of "catastrophic" beaver dam failures. A dam subjected to unusual stress may collapse, releasing the water held behind it almost instantaneously (Hillman 1998). The resulting "wave" can have enormous consequences for riparian and wetland systems in its path. These events are usually preceded by unusually high rainfall events or spring run-off events (Townsend 1953). There is no information available on the frequency of such occurrences under historical disturbance regimes.

Fire regimes in adjacent habitats had an influence on the riparian zone as well. Fire partially entered the riparian zone in some years, causing a mosaic of successional stages, particularly at the perimeter. It probably reduced conifer encroachment. Aspen, narrowleaf cottonwood, and to a lesser extent black cottonwood all will resprout following moderate-intensity fires, although seedlings and saplings may not survive such fires. Most of the understory and early successional shrub species are able to resprout after light to moderate fires. Willow shrubs sprout best after quick, hot fires move through a stand

(Hansen et al. 1995).

Historical and Current Uses. The broad valley bottom riparian complex represents the most heavily used component of riverine systems in Idaho. Both Native Americans and Euro-Americans have a long history of concentrated use within the riverine system. Native Americans often traveled along riverine systems and established both temporary and permanent camps within the broad valley bottom reaches of these systems. They would also hunt and fish in these diverse habitats and those with horses grazed the large expanses of lush grasses and sedges often associated with the broad valley bottom riparian complexes.

Euro-American settlement brought considerable changes in the use of the broad valley bottom riparian zone. This is particularly true at low to mid-elevations and within those portions of the landscape most heavily influenced by agriculture or urbanization. Historically, many of these sites were cleared and drained for homesteads, agriculture, and livestock grazing. Concentrations of homes on these sites would later lead to the establishment of towns and communities. Expansion of agricultural sites to upland areas resulted in dam building and water diversions to provide the necessary irrigation through the dry summer months and to provide power. Early logging practices often used riverine systems to move logs to mill facilities located on broad valley bottom sites. The discovery of gold in central Idaho in the mid- to late-1880s resulted in much of the placer mining and hydraulic mining activity being concentrated within broad valley bottom reaches. The gentle terrain characterizing these sites also contributed to the concentration of roads and railroad construction in these areas. In more recent years, the expansion of urbanization, primarily in the form of residential subdivisions and road systems, continues to demonstrate a preference for the broad valley bottom reaches.

Impacts and Threats. The natural hydrographs of nearly all major rivers in Idaho have been altered by channelization, dams/reservoirs, and water diversions. Prior to settlement, most large rivers throughout Idaho spread across wide valley bottoms and supported forested and shrub wetlands, ponds, wet meadows, and marshes. Throughout the last century, dikes or levees were constructed in many of these systems to contain spring floods. Cottonwood forests were removed and wetlands were drained or filled for agricultural development. Many cottonwood forests and shrublands that were once plentiful and dynamic within these systems are now restricted to relatively small streamside bands within the levees or to islands within the river (Jankovsky-Jones 1997).

Recent studies indicate that suppression of high flows and normal flooding within the broad valley riparian system has dramatically altered plant communities that would occur under normal disturbance regimes (Merigliano 1996). Riparian plants have adapted to disturbance events and require them for long term persistence. Normal flooding regimes and sediment loads create islands and sandbars for colonization by riparian plant species. Some species such as cottonwoods require this bare substrate for regeneration. Regulating flows for irrigation, power production, and flood control have altered the natural regeneration process. Remnant riparian communities are old-aged and lack regeneration; in the extreme case they die out. Without resumption of periodic flood flows, additional cottonwood forest may disappear. Dams cause other problems. Riparian zones are flooded, and the shoreline is often sparsely vegetated, instead of developing new riparian vegetation. Dams halt the downstream movement of sediments necessary to maintain islands and sandbars.

The ability of normal flood processes to occur is further complicated by alteration of the floodplain. The U.S. Army Corp of Engineers has altered the width of the floodplain on many major rivers throughout Idaho to control flood events. In many instances these flood control projects have involved channel clearing, alignment changes, levee construction, and bank protection (USACOE 1995). The levees are

usually designed to contain 100-year floods and can be placed up to 0.5 mi (0.8 km) from the channel. While in some instances this may allow partial channel migration and persistence of riparian vegetation, spatial extent and successional diversity are often greatly reduced from those present under historical disturbance regimes. Levees allow whatever wetland vegetation lying outside the levees to be converted to agriculture and urban development.

The impacts of the widespread removal of beaver during the 1800s from riverine systems throughout the West, have not been well studied (Knopf and Scott 1990). However, based on our current understanding of the effects of beaver activity on riverine systems, the impacts of their removal can be surmised. The more obvious impacts include lower water tables, release of sediments and nutrients from impounded systems, a decrease in forest canopy resulting from tree cutting, less diversity of successional stages often resulting from dam breakage/abandonment and subsequent exposure of mudflats, and a preponderance of riverine systems less resistant to disturbance events. Clearly, beaver were an integral component of the broad valley bottom riparian complex in Idaho under historical conditions. Additional studies are needed to better understand the implications of beaver removal on the plant and animal communities and disturbance processes of the broad valley bottom riparian complex.

Fire suppression has allowed dead vegetation to accumulate in many riparian areas (Hansen et al. 1995), which results in higher-intensity fires when they do occur. Fires are important for aspen regeneration and to kill encroaching conifers. As mentioned earlier, most of the overstory and understory deciduous species are able to resprout following light to moderate fires.

Pasture development and the elimination of willows has converted large portions of the broad valley bottoms of the Caribou and Preuss ranges from dominance by scrub-shrub vegetation to dominance by emergent vegetation. Seeding with nonnative grasses and ditching has altered the structure of meadows. Grazing also suppresses cottonwood and willow regeneration. Cottonwood communities have been degraded, sometimes severely, from cattle or domestic sheep in many areas. Grazing can eliminate cottonwoods or reduce age-class diversity. Grazing decreases the vigor and biomass of riparian shrubs, and alters species composition and diversity in riparian communities (Bryant et al. 1972; Ames 1977). Knopf and Cannon (1982) found that excessive cattle grazing significantly altered the size, shape, volume, and quantities of live and dead stems of willows. Cattle grazing also influenced spacing of plants and the width of the riparian zone.

Grazing can also affect channel morphology by widening the streambed and making it more shallow, gradual stream channel trenching, or braiding, depending on soils and substrate composition (Marcuson 1977; Platts 1979). Water quality can also be altered by increasing water temperatures, nutrients, suspended sediments, bacterial counts, and by altering the timing and volume of water flow (Platts 1979; Kauffman and Krueger 1984).

Distributions of breeding birds were influenced by livestock grazing, recreational activities, and cottonwood patch sizes (Saab 1998). Ground-nesting species, the Veery and Fox Sparrow, were most susceptible to disturbances created by livestock grazing and also were most sensitive to fragmentation of riparian habitats. Five species, the American Goldfinch, Yellow Warbler, Veery, Black-headed Grosbeak, and Gray Catbird, were unaffected by patch size in unmanaged areas, but showed significant area effects (increases in probability of occurrence with increases in forest area) in grazed and/or recreation sites. These results suggest that conservation of large patches is particularly important where riparian forests are managed for grazing and recreation (Saab 1998).

Human activities including grazing and ground disturbance may create conditions suitable for the

establishment of non-native species. A number of non-native graminoid species, including quack grass, creeping bentgrass, foxtail barley, Kentucky bluegrass, and fowl bluegrass, may become established as the dominant understory species in riparian habitats. The shallow-rooted grasses lack the soil- and bank-stabilizing characteristics of native species. Reed canary grass is a tall grass species that, when once established, may inhibit the establishment of native shrubs and trees.

Establishment of noxious weeds in riparian habitats may simplify the vegetation structure. Leafy spurge and spotted knapweed are noxious weeds that are well established on riparian terraces and benches in portions of Idaho. Purple loosestrife may become established in backwater sloughs and other moist swales. Other noxious weed species that may be problematic within and adjacent to riparian habitats include pepperweed whitetop, Russian knapweed, Canada thistle, poison hemlock, henbane, and dalmatian toadflax.

Improper timber harvest removes woody materials that are needed by riparian systems for nutrients, and for coarse debris to slow water run-off and create habitat for fish and invertebrates. Improper timber harvest has also increased run-off and sediment-loading in streams. Adjacent timber provides shade, preventing water temperature fluctuations that can harm aquatic life (Mehann et al. 1977).

Development of second homes and ranchettes is common along most rivers in Idaho. Riparian corridors are popular for development and create areas that restrict wildlife migration from uplands to wetlands, restrict migration along riparian corridors, and create the need for flood control measures to protect properties.
Impacts due to road construction and home building will likely surpass agricultural impacts as population increases and economies switch from agricultural-based to service-based.

Many developed campgrounds have been built in riparian areas. Soil compaction and loss of vegetation, including snags and downed wood, are common at these sites. Dispersed camping sites are commonly found in riparian areas as well, with similar impacts as occur at developed sites.

Agriculture in and adjacent to riparian areas has varied effects. Irrigation diversions that dewater streams or decrease stream flows affect the health of riparian vegetation. Hayfields or plowed croplands directly remove riparian vegetation, and indirectly affect some riparian bird species that prefer a riparian area within a matrix of natural vegetation (e.g., sagebrush, juniper, pines) rather than monotypes. Dissolved salts and residues from agricultural chemicals have moved into many riparian areas (Hansen et al. 1995).

Roads and railroads tend to follow riparian areas as the route of least resistance. This has resulted, in many cases, in restricting the floodplain. It has also resulted in increased sediment loading in streams and fragmentation of riparian systems.

Past mining activity has resulted in degraded water quality and channel alterations in some areas. Current mining continues to threaten some areas, mainly from accidents and chemical spills. Sewage treatment plans for some communities are located in this riparian type and discharge effluent.

Narrow Valley Bottom (Confined) Riparian Complexes

Narrow valley bottom reaches are usually constrained by geological controls that severely limit channel

migration within the narrow floodplain. Surface water generally flows through these systems in a relatively straight course and a true floodplain is often lacking. Riparian vegetation is often limited to a narrow corridor immediately adjacent to the flowing water.

Distribution. Narrow valley riparian complexes occur throughout Idaho where topographic features create moderate to high gradient streams or confinement of streams. An estimate of the extent of this habitat is unavailable. In mountainous regions the extent is often under-represented in broad-scale mapping efforts as it is included with upland forest habitats. It is estimated that riparian vegetation covers less than 1 % of the landscape in the arid west.

Region M331-Southern Rocky Mountains Steppe (Overthrust) (PA 80 and part of PA 64)

Moderate Elevation (Douglas-fir/Western Spruce Fir Zone): High gradient on moderate elevation streams may limit riparian vegetation to narrow streamside bands. The stringers are commonly monocultures that correspond to subtle changes in bed material and/or slope. Riparian corridors may be lined by alder, water birch, red-osier dogwood, and occasional cottonwood species or quaking aspen. Examples of these habitats include Burton Canyon, Game Creek, Gibson Jack Creek, and Big Elk Creek.

Region M332 - Middle Rocky Mountains Steppe (southern part of PA 64)

The Low Elevation (Sagebrush/Ponderosa Pine Zone), Moderate Elevation (Douglas-fir/Grand Fir/Spruce Zone), and High Elevation (Subalpine Fir Zone) riparian systems, while important to birds, are lower in priority for bird populations than the other described types.

Region M333 - Northern Rocky Mountains Steppe (northern part of PA 64)

This system includes cottonwood, birch, dogwood, conifer, and alder stringers. Examples are the Moyie River, and tributaries to the St. Joe and Coeur d'Alene Rivers. This riparian system, while important to birds, is lower in priority for birds than the other described types.

Region 342 - Intermountain Semi-desert (Columbia Plateau) (PA 89)

Low elevation (low gradient; Sagebrush Zone): Confined, low-elevation, low-gradient stream habitat occurs throughout the Columbia Plateau where low gradient channels carve their way through basalt flows. Riparian vegetation is typically poorly developed due to channels being confined within shallow to deep basalt canyons. A fringe of coyote willow, creeping spike-rush, syringa, arroyo willow, or red-osier dogwood is often present along channels. Examples of this habitat include the Middle Snake River, Owyhee River, Camas Creek downstream of Magic Reservoir, Little Wood River below Carey, and Little Jacks Creek.

Moderate elevation (moderate gradient; Douglas-fir Zone): These riparian habitats have little floodplain development due to high gradient, which limits over-bank flooding. The channels may be subject to avulsion due to tree fall or rock fall. Examples of this habitat in Idaho includes tributaries

(South Leigh) to the Teton River, and Tex Creek in southeast Idaho.

Region 331 - Great Plains - Palouse (part of PA 64)

This riparian system, while important to birds, is lower in priority for bird populations than the other described types.

Status. Actual estimates of the status or historical change in area of the narrow valley bottom riparian complex are lacking in Idaho. Similar to the broad valley bottom complexes, many, if not most, have experienced some form of degradation resulting from various human influences including agricultural conversion, urbanization, damming, and improper methods of road construction, mining, nearby logging, and grazing (Chaney et al. 1990).

Role of Disturbance. The role of flooding in narrow valley bottom riparian complexes is similar to that mentioned above for broad valley bottom complexes. The main difference between the role of flooding in broad and narrow valley systems is that flashy episodic events are more frequent in the narrow valley systems.

Beavers likely had less of an influence on narrow valley bottom complexes because of lack of food and dam-building materials, the higher gradient, and the lack of a floodplain in which to form a pond.

The role of fire was probably similar to that mentioned above for broad valley bottom complexes.

Historical and Current Uses. Livestock grazing, mining, and road construction and use have occurred and continue to occur in this type.

Impacts and Threats. Livestock grazing, mining, and road construction and use frequently cause negative impacts due to the fragile nature and vulnerability to erosion of this type. These areas also are susceptible to effects from high intensity storms. These effects can be exacerbated by the grazing, mining, and roads in and near riparian areas. See the Impacts and Threats Section for the Broad Valley Bottom complexes for a description of how these activities can affect riparian systems in general. The degree of impact depends on how activities are carried out.

Bird Conservation Plan for Riparian Habitat

In this section, we present goals, habitat objectives, strategies, and tasks for identifying habitat conditions needed to restore and maintain these declining species, carry out the needed work, and monitor effectiveness.

Overall Goals

1) No additional loss of riparian habitat.
2) Maintain and restore a dynamic riparian ecosystem, encouraging a return of natural disturbance regimes or finding adequate methods for mimicking those disturbances.
3) Where feasible, restore lost or degraded riparian habitats to maximize the benefits to riparian species.

Habitat Objectives

We chose a focal-species approach to setting habitat objectives for riparian habitat. A focal species is a specialist of either a habitat or a component of the habitat, and represents features necessary for the other species of the community. Some focal species may represent one seral stage or habitat component, some represent others. The focal species for each channel geomorphology type/ecoregion subsection/elevation level are shown under "target conditions." Appendix 5 describes the best conditions to meet the needs of each focal species. Our habitat objectives are:

1) Maintain the existing distribution and extent of each riparian system; and

2) By 2025, restore at least 10% of the historical extent of each riparian system within each ecoregion subsection, to conditions that would support the long-term persistence of the focal species (referred to as "target conditions"). These conditions are given below for each riparian system. Distribution should be as close to historical distribution as can be determined or is possible.

Clarification: We encourage efforts to reach higher than 10%. By setting a goal of at least 10%, we do not imply that our end goal is to have only 10% of riparian habitats meet the target conditions within each of these riparian systems. This is a short-term objective (25 years) and takes into account feasibility of accomplishing the objective. For example, within ecoregion subsection M332, there are 1,741 mi (2,801 km) of the broad valley bottom system and 4,020 mi (6,468 km) of the narrow valley bottom system. Ten percent of these would be 174 mi (280 km) and 402 mi (647 km), respectively, a significant effort.

Assumptions

Meeting the habitat requirements for the focal species will adequately meet the habitat requirements for the entire bird community that would be expected for each riparian system.

Species that do not require the more restrictive habitat conditions represented by the focal species have adequate habitat available either within the same habitats as the focal species or within habitats that are in less suitable conditions. For example, edge-specialists would not do as well in large patches managed for the Veery, but there is no, and will not be, a shortage of edge habitats under expected future conditions.

Target Conditions. Target conditions are based on information for the species accounts listed in Appendix 5. These are the focal species and target conditions for the following riparian systems:

Floodplain:	***Location:***	***Elevation:***
Broad Valley Bottom	*Southern Rocky Mountains Steppe (M331)* *Middle Rocky Mountains Steppe (M332)* *Northern Rocky Mountains Steppe (M333)* *Intermountain Semi-Desert (342)*	*Low*

Focal species: Veery, Song Sparrow, Red-naped Sapsucker

Target conditions:

- Dense understory of grasses and deciduous shrubs (willow, dogwood, alder, currant, water birch,

wild rose).
- In seral stages that include trees, open tree canopy (cottonwood, aspen, birch, willow) with mature trees, recruitment trees, and some snags.
- The landscape matrix should include as much natural upland vegetation as possible.
- Patches of forested habitat should be as large as possible.
- Cowbird parasitism rates should be controlled by managing cattle and residential development.

Floodplain:	***Location:***	***Elevation:***
Broad Valley Bottom	***Southern Rocky Mountains Steppe (M331)***	***Moderate***
	Middle Rocky Mountains Steppe (M332)	
	Intermountain Semi-Desert (342)	

Focal species: Veery, Willow Flycatcher, Yellow Warbler

Target conditions:
- Dense willow or other deciduous shrubs (60-80% crown cover) at least 6 ft (1.8 m) tall.
- Shrub patches should be at least 20 ac (8 ha) in size, but should include scattered openings for flycatcher foraging.
- Cowbird parasitism rates should be kept below 20% by managing cattle and residential development.

Floodplain:	***Location:***	***Elevation:***
Broad Valley Bottom	***Middle Rocky Mountains Steppe (M332)***	***High***

Focal species: Lincoln's Sparrow, White-crowned Sparrow

Target conditions:
- Dense ground cover of sedges, grasses, and moss, but some bare ground for foraging should be patchily distributed.
- Dense, mixed deciduous shrubs.
- Cowbird parasitism rates should be controlled by managing cattle and residential development.

Floodplain:	***Location:***	***Elevation:***
Broad Valley Bottom	***Northern Rocky Mountains Steppe (M333)***	***Moderate***

Focal species: Willow Flycatcher, Calliope Hummingbird, Yellow Warbler, and Red-naped Sapsucker (sapwells only)

Target conditions:
- Some dense patches of willows and other deciduous shrubs and some open willow meadows.
- Abundant flowering plants.
- Cowbird parasitism rates should be controlled by managing cattle and residential development.

Floodplain:	***Location:***	***Elevation:***
Narrow Valley Bottom	***Southern Rocky Mountains Steppe (M331)***	***Moderate***

Focal species: Dusky Flycatcher (if trees are present), Black-chinned Hummingbird

Target conditions:
- Open forest with pole-size to large trees (aspen, cottonwoods, willow, and for Dusky Flycatcher, conifers).
- Low to moderate density understory shrub component, with some bare ground.
- Landscape matrix should have as much natural upland vegetation as possible.
- Abundant flowering plants.
- Cowbird parasitism rates should be controlled by managing cattle and residential development.

Floodplain:	***Location:***	***Elevation:***
Narrow Valley Bottom	***Intermountain Semi-desert (342)***	***Low***

Focal species: Song Sparrow, Yellow Warbler, Yellow-breasted Chat

Target conditions:
- Moderate to dense grass and deciduous shrub understory.
- Open tree canopy.
- Landscape matrix should have as much natural upland vegetation as possible.
- Cowbird parasitism rates should be controlled by managing cattle and residential development.

Floodplain:	***Location:***	***Elevation:***
Narrow Valley Bottom	***Intermountain Semi-desert (342)***	***Moderate***

Focal species: Yellow-breasted Chat, Sharp-tailed Grouse (winter).

Target conditions:
- Tall, dense shrubs (hawthorn, snowberry, chokecherry, serviceberry).
- Cowbird parasitism rates should be controlled by managing cattle and residential development.

Strategies and Tasks for Meeting Objectives

Riparian Issue A: We have a poor understanding of the distribution, population trends, and habitat requirements of riparian-associated bird communities present in each of the priority riparian systems.

Riparian Strategy A.1.: Determine the potential bird communities within each riparian system.

> Riparian Task A.1.a. Create a potential bird species list for each system using published and unpublished data, and opinions of ornithologists and other birders.

Riparian Strategy A.2.: Determine the habitat requirements and habitat associations of focal and priority bird species and the effects of management activities and land use.

Riparian Task A.2.a. Using published and unpublished data, determine habitat requirements and population trends of focal and priority species, emphasizing site-specific information where available, or data collected in riparian systems similar to the priority systems.

Riparian Task A.2.b. Using published and unpublished data, determine the effects of management activities and land use practices on focal and priority species.

Riparian Task A.2.c. For species lacking adequate information, initiate research and monitoring programs (see Research and Monitoring Needs below).

Riparian Issue B: We don't know the historical or current extent and distribution of riparian habitats in Idaho. Having this knowledge would help us prioritize future restoration/management projects and help us prioritize work.

Riparian Strategy B.1.: Accumulate information on the current and potential distribution of each riparian system.

Riparian Task B.1.a. Contact Roly Redmond at the University of Montana and the equivalent person at Utah State University to determine what the Geographic Information System (GIS) can provide for each riparian system. Also check on use of a model that models streams by gradient/confinement (used by Carolyn Mehl).

Riparian Task B.1.b. Add these layers to GIS, and designate a data depository:
- land ownership and management
- Breeding Bird Survey routes and other research/inventory sites
- Land use, including dams and diversions
- Ecoregion Unit and Subsection boundaries
- Important Bird Area boundaries

Riparian Task B.1.c. Pursue the National Wetland Inventory (NWI) mapping of riparian habitats and complete the NWI for the part of the state not yet completed (ecoregion subsection M332).

Riparian Task B.1.c. Subtask 1. Contact the USFWS to determine the timing and cost of completing the current NWI and additional costs of conducting the riparian inventory, and update any NWIs that are badly out-of-date (Boise, Teton Valley, Coeur d'Alene areas).

Riparian Task B.1.c. Subtask 2. Prioritize areas of the state for mapping riparian habitat.

Riparian Task B.1.c. Subtask 3. Seek sources of funding for completing the NWI.

Riparian Issue C: While we recognize there are gaps in knowledge about current and historical

riparian system distribution and amount, we know there are important riparian systems in each ecoregion subsection, that would benefit from immediate protection or restoration.

Riparian Strategy C.1.: Identify places in Idaho where we will describe what good quality riparian systems should look like and how to restore or maintain these through management. Do this by contacting federal and state agency biologists and other organizations to develop the list.

Riparian Task C.1.a. Compile a list of good quality *broad valley bottom, low elevation* riparian areas to use as initial restoration project sites by adding to this preliminary list:
Subsection 342:
- Lower Henry's Fork
- Lower Snake River below Swan Falls
- Main Stem of the Snake River
- Lower Bruneau River
- South Fork Snake River

Subsection M331:
- South Fork Snake River
- Bear River

Subsection M332
- Big Wood River
- Boise River
- Lower Payette River
- Salmon River from Challis to the Narrows
- East Fork Salmon River
- Lemhi River
- Pahsimeroi River
- Big Lost River

Subsection M333
- St. Joe River
- North Fork Coeur d'Alene River
- Kootenai River

Riparian Task C.1.b: Identify places in Idaho where we will describe what good quality *broad valley bottom, moderate to high elevation systems or of narrow valley bottom, low to moderate elevation systems* should look like and how to get there through management.

Riparian Task C.1.c. Prioritize the above lists for management action based on the following criteria:

- feasibility of successful restoration
- land ownership (private, state, federal) and willingness of landowners/managers to participate in restoration
- surrounding land management that enhances restoration success (e.g., no salt blocks within 0.5 mi (0.8 km)
- compatibility of the adjacent upland matrix (or if degraded, if it is also targeted for improvement/restoration/maintenance), based on the following order of preference:

1) Beneficial land uses with good management include: natural habitat not used for commodity production (e.g., wilderness); unimproved parks or open space; and managed habitat (e.g., commercial forest)

2) Beneficial or detrimental land uses depending on the variety of crops and cultivation techniques used: row crops; and permanent crops.

3) To be avoided because they support and attract cowbird and predator populations: horse/cow pasture; improved parks, golf courses; ranchettes; and intensive urban or suburban development.

- risk of change or conversion of the adjacent upland matrix to a less compatible land use
- existing conditions
- size of existing patches (for broad valley bottom, low elevation riparian systems, patches that are at least 25 ac (10 ha) in size or have the potential to be restored to that patch size should have the highest priority; for broad valley bottom, moderate elevation riparian systems, patch size needs to be determined)
- distribution across the landscape
- feasibility of restoring or mimicking historical disturbance regimes (e.g., riparian habitat protection and restoration sites with natural hydrology intact, or those that include restoration of natural hydrology (such as levee removal or levee setbacks) are preferable over those without)
- proximity to existing high quality sites
- proximity to other sites that have the potential to be restored to high quality

Riparian Task C.1.d. Identify for each site any existing initiatives and partnerships to approach about restoration projects and/or funding; add to this list as needed:

- Henry's Fork Foundation (Henry's Fork Watershed Inititiative)
- Land Trusts (See Appendix 8)
- Federal land management agencies that use PACFISH and INFISH to protect Threatened/Endangered/Sensitive fish species and game fish.
- North American Waterfowl Management Plan Intermountain West Joint Venture
- Bull Trout Conservation Plan
- Idaho Rivers United
- Trout Unlimited
- The Nature Conservancy's ecoregional planning program
- Environmental Protection Agency
- Bureau of Reclamation--Snake River Review
- Bring Back the Natives (fish mostly), a BLM, multi-agency program of watershed restoration
- Land and Water Conservation Fund, federal acquisition program using congressionally appropriated funds
- Bonneville Power Administration, funding for mitigation of impacts of dams, focuses on anadromous fish, resident fish, and wildlife.
- Watershed Councils
- Natural Resources Conservation Service's programs: Conservation Reserve Program, Wildlife Habitat Incentives Program, Environmental Quality Incentive Program, Wetland Reserve Program, Natural Resources Conservation Tax Credit
- Idaho Soil Conservation Commission's Resource Conservation and Rangeland Development Program
- Idaho Department of Fish and Game's Habitat Improvement Program
- U.S. Fish and Wildlife Service's Partners for Wildlife Program

Riparian Task C.1.e. Approach leaders of each initiative and discuss options. Where multiple initiatives would have an interest in a project, set up a series of collaborative meetings with them and other interested parties to explore feasible options for meeting our objectives and theirs. Provide each initiative with a copy of our Bird Conservation Plan and offer to speak to their membership.

Riparian Issue D: Many riparian systems are so changed from historical conditions, many people in Idaho are unaware of what a riparian area in properly functioning ecological condition should look like. They are also unaware of what they can do to improve their riparian habitat for birds. We need to define "properly functioning ecological condition."

Riparian Strategy D.1.: Identify areas in riparian systems, in each ecoregion subsection if possible, that are considered in properly functioning ecological condition and that support the community of birds expected for that system. Use these as demonstration areas.

Riparian Task D.1.a. Contact the Conservation Data Center, The Nature Conservancy (ecoregional planning), offices of the USFWS, BLM, BuRec, USFS, and IDFG, and Idaho Rivers United to identify sites known or suspected to be good examples of riparian systems in properly functioning ecological condition. These may include exclosures.

Riparian Task D.1.b. Set up public and media tours of functioning riparian systems. Conduct these tours in May or June so that riparian bird species are present for viewing and hearing. If possible, pair these tours with tours of poorly functioning systems.

Riparian Task D.1.b. Subtask 1. Obtain outside funding to provide transportation and refreshments for tour participants and presenters. Partner with nongovernmental organizations to run and fund these tours.

Riparian Task D.1.b. Subtask 2. Prepare a media packet for distribution prior to the tours.

Riparian Strategy D.2.: Continue to disseminate *Riparian Riches: Habitat Management for Birds in Idaho* (Idaho Partners in Flight 1998) to landowners and land managers throughout Idaho.

Riparian Task D.2.a. Place news releases in newspapers and newsletters throughout Idaho to make people aware of the availability of *Riparian Riches: Habitat Management for Birds in Idaho*.

Riparian Task D.2.b. Contact the state biologist of the Natural Resources Conservation Service to assess response to the previous release of *Riparian Riches: Habitat Management for Birds in Idaho*, and assess the need for more copies.

Riparian Task D.2.c. If demand is high enough, the Idaho Department of Fish and Game should reprint *Riparian Riches: Habitat Management for Birds in Idaho*, seeking additional funds as needed to cover costs of reprints.

Riparian Issue E: Nest parasitism by Brown-headed Cowbirds is a major threat to bird species in riparian systems.

Riparian Strategy E.1. Prepare and/or distribute a 4-page brochure or leaflet on how best to manage residential areas and cattle/horse operations to reduce opportunities for cowbirds to parasitize nests in riparian areas. Also put this on the Internet.

Riparian Task E.1.a. Contact other state PIF groups to find out if such a publication is already available or planned, and seek financial and other support for producing the brochure if not.

Riparian Task E.1.b. If there is a need, and funding is available, contract to a writer/biologist to produce the brochure.

Riparian Task E.1.c. Disseminate the brochure, and arrange to give talks at City/County planning meetings and Idaho Cattle Association meetings.

Riparian Issue F: A PIF Riparian Committee needs to be established and needs to know if planned actions and established priorities are being implemented and if desired results are being achieved.

Riparian Strategy F.1. The Idaho PIF Riparian Steering Committee will conduct an annual review of planned tasks and implementation of recommendations by land management agencies and other parties involved in planned actions.

Riparian Task F.1.a. Establish a Riparian Steering Committee.

Riparian Task F.1.b. Establish a communication process for Committee members to follow-up on assigned tasks and gain input from agency offices to track planned actions and success.

Riparian Task F.1.c. Revise tasks and planned actions as needed to achieve desired intent of outlined actions.

Research and Monitoring Needs

For riparian systems lacking good information on presence/absence and distribution of birds, conduct inventories to determine presence/absence.

Where we are lacking specific information on the habitat requirements of focal and priority species, recommend research to determine them.

Encourage pursuit of Challenge Cost-Share Projects, mitigation funds, and other sources of funding to

complete inventory and research on riparian bird species.

Specify by December 1999 detailed information needs by priority bird species for monitoring and research. Then disseminate those needs to agencies and non-governmental organizations that provide matching funds for bird projects. Encourage those agencies and non-governmental organizations to use the Idaho PIF needs assessment as a basis for selecting projects to fund.

Conservation Plan for Priority Birds and Habitats

Non-Riverine Wetland Habitat

NON-RIVERINE WETLANDS

Introduction

Like riparian habitats, wetlands are among the most important habitats for birds, supporting a large number of species and individuals, including many high priority species. Wetlands are also important habitat for many amphibian, fish, and plant species, some of which may be rare or listed species. Idaho PIF recognizes that there are other wildlife values, but will concentrate on values for birds. More information on each wetland type's importance to birds is given below.

Wetlands are one of the more valuable habitats to humankind. The value of non-wildlife wetland functions may exceed their value as wildlife habitat. Wetlands function as nutrient and sediment traps. The value of wetlands to improve water quality is being more appreciated. Wetland complexes, including shallow marsh, are now being constructed to serve as nutrient and sediment traps. Wetlands reduce flooding and drought by dampening extreme flows. They contribute to groundwater recharge, and they provide aesthetics, recreation, transportation, and energy generation. They provide harvestable products such as fish, shell fish, reeds, and trees, and protect shorelines from erosion.

Habitat Description

Non-riverine wetlands are those where the primary water source is subsurface groundwater flow or overflow from lakes as opposed to overflow from channels. Idaho PIF has identified three types of non-riverine wetlands based on water source: 1) lacustrine; 2) slope; and 3) depressional wetlands. Depressional and slope wetlands receive the majority of their water from groundwater and/or direct precipitation, while lacustrine wetlands are influenced by lake levels.

The Idaho PIF classification of wetlands is based on hydrogeomorphic origin, rather than vegetative structure. This varies from classification systems, such as that of Shaw and Fredine (1956), where vegetation structure was the basis for classification, regardless of water source or geological conditions. The Idaho PIF classification may include several vegetative types in any system, i.e. shallow marsh could occur in slope, depressional, and lacustrine systems.

This plan will describe wetland types, then make recommendations for actions that will benefit any type of wetland, rather than on a type-by-type basis. Because wetlands tend to be mosaics of different vegetation types, conservation actions at any particular site should favor a wide variety of birds.

Status of Non-riverine Wetland Systems

Like most states, Idaho has lost a large portion of its wetlands. Fifty-six percent of the wetlands in Idaho have been lost in the past 200 years (Dahl 1990). Wetlands now comprise only 0.7% (385,700 ac; 156,200 ha) of the surface area of Idaho (Dahl 1990). Conversion to agriculture, drainage, and flooding by reservoirs are the main causes of wetland losses. Wetland loss, overgrazing, urban sprawl, and invasion by non-native plants are the main threats to wetlands today. Shallow wetlands and meadows have suffered the greatest losses.

Lacustrine Wetlands

Lacustrine wetlands are associated with lakes and large ponds. The margins or fringes of lakes and large ponds support wetlands that are maintained by lake levels. Lakeshore wetlands are best developed where shorelines are sheltered from wind and waves. Water may enter the lakes via rivers or from groundwater sources. Where lakes are entirely driven by groundwater (e.g., kettle lakes), inlets and/or outlets may be lacking or insignificant. Organic matter frequently accumulates in these wetlands and may create floating mats of moss and vegetation (Smith et al. 1995). Open water zones support submerged vegetation. Small lacustrine wetlands are indistinguishable from depressional wetlands.

Distribution and Amount of Lacustrine Wetlands. Lacustrine wetlands are distributed throughout Idaho. In north Idaho the wetlands are associated with both large lakes and with glaciated kettle lakes. In central Idaho, this habitat most frequently occurs in high mountain lakes left behind by alpine glaciation. In the southern part of the state, examples of this habitat include Henry's Lake and Bear Lake. Reservoirs developed on the Snake River System also provide lacustrine habitat. There currently is no estimate of area covered by this type.

Dominant Composition of Lacustrine Wetlands. Lacustrine wetlands are a mix of habitats, usually in concentric bands correlated with water depth, and include open water, emergent habitats, scrub-shrub, and forested wetlands. Open water wetlands may have bare substrates, or support submerged and floating-leaved vegetation. The substrate is permanently flooded, although some of the bottom may be intermittently or seasonally exposed. Oligotrophic waters may have little submergent vegetation, while mesotrophic and eutrophic waters usually support submergent plants. Typical plant species include pondweeds, milfoils, bladderworts, coontails, muskgrass, and other submergent plants. Submergent plant growth is limited by light penetration. In exceptionally clear water, plants may grow in depths to 65-100 ft (20 or 30 m), but in Idaho, 16 ft (5 m) is a more likely maximum depth. In highly eutrophic waters, filamentous and planktonic algae may dominate, shading out the more desirable vascular plants. Vegetative parts, seeds, rhizomes, and tubers of vascular plants provide food for water birds. Submergent vegetation is used for escape cover by fish. The surface of vascular plants is usually covered with periphyton, a thin coating of algae. Aquatic macroinvertebrates feed upon the periphyton and use the vegetation as escape cover. The aquatic invertebrates serve as prey items for birds, or for fish which in turn are prey for piscivorus birds. Replacement of submergent macrophytes by filamentous and unicellular algae significantly reduces the value of submergent habitat for birds and fish.

Stands of tall emergent plant species including hardstem bulrush, bladder sedge, common cattail, burreeds, water potato, water horsetail, and ladysthumb occur adjacent to open water habitats. The non-native species wild rice is well established and widespread in the extensive wetlands in the Coeur d'Alene system. Soils are usually flooded for most, or all of the year and vegetation is often rhizomatous. Vegetation may range from 1 ft (30 cm) to over 6.5 ft (2 m) tall. Submergent plant species may occur beneath the emergent plants. These habitats are highly productive of vegetative biomass; the vegetation grows throughout the growing season.

Shallow marsh, the driest habitat associated with lakes, is dominated by hardstem bulrush, small-fruit bulrush, bladder sedge, water sedge, rushes, and common cattail along with some grasses and forbs. Soils in shallow marshes are usually saturated and may be flooded seasonally or semipermanently. The vegetation is characterized by rhizomatous species that form a dense sod. Vegetation may range from 1 ft (30 cm) to over 3.3 ft (1 m) tall. These habitats are highly productive of vegetative biomass.

In northern, Idaho peatlands may form on the margins of lakes with soft (acidic) water and often create

floating or quaking mats. Peatlands develop on glacial lakes that are well protected from wind and wave action and lack major inflows or outflows. The peat soils are accumulations of sphagnum moss. Sphagnum moss forms lawns with only scattered vascular plants, such as sundews and bog cranberry. Other areas of peatlands may support stands of vascular plants including slender sedge, bladder sedge, mud sedge, common cattail, bog birch, and Douglas spiraea. The open water zone adjacent to peatlands frequently support pond lily and water shield. Peatlands are of conservation concern in Idaho due to rarity and fragility. Over 15 plant species of concern are associated with north Idaho peatlands. Manipulation of water levels and nutrient inputs are among threats that may alter peatlands to a point where restoration is not possible. A complete discussion on peatlands in the northern Rocky Mountains is available in Chadde et al. (1998).

Hydrological Regime of Lacustrine Wetlands. Water levels in lakes fed by river channels peak during the spring months and drawdown later in the year. Relatively constant water levels are maintained in lakes that are fed by groundwater flow. The extent of the development of lakeshore wetlands reflects in part the stability of lake levels. Most lakes in Idaho, including some of the smaller kettle lakes, have impoundments to maintain lake levels for designated beneficial uses.

Role of Disturbance in Lacustrine Wetlands. Beaver activity may help to maintain lake levels in smaller lakeshore systems when dams are placed along outlets. Beaver will also build huts in emergent lakeshore habitat. When muskrat populations erupt they can remove nearly all the emergent vegetation.

Due to saturated conditions, it is unlikely that fire has played a large role in maintaining lacustrine wetlands, although charcoal deposits have been noted in some areas. Most species are capable of resprouting following fire.

Impacts, Threats, Historical and Current Uses of Lacustrine Wetlands. Lacustrine open water wetlands are used for irrigation storage, fishing, and water sports. All of the larger lakes in Idaho and many of the smaller lakes have dams that maintain lake levels. Lake levels may be stabilized or manipulated at any time of the year for recreation, power, and irrigation. Altered hydrological regimes often reduce wetland habitat or convert it to a different type. Fluctuating levels in response to power or irrigation demands on some reservoirs have created steep eroding banks on islands and lake shores with little emergent habitat. Water fluctuations during the nest season can be detrimental, either by flooding nests or by leaving them dry and more exposed to mammalian predators. Fluctuations can cause some birds to abandon their nests. Boating can displace wildlife from open water habitats. Disturbance problems can be alleviated to some degree by providing refuge areas and by limiting human use during sensitive periods. Open water habitat is also threatened by non-native plants, such as Eurasian water milfoil, drainage, pollution, and sedimentation.

Land use in emergent wetlands adjacent to open water habitat is limited due to accessibility. The main threats to these habitats include sedimentation, non-native species such as purple loosestrife, drainage, and pollution. These wetlands are difficult to use for agriculture unless they are drained. Some of the habitats in Idaho are also susceptible to flooding and drying, because water storage rights are owned by irrigation or power companies.

Seasonally or semipermanently flooded wetlands are used for grazing and are often drained to be used for farming and haying. Filling has resulted in the loss of these wetlands also. The non-native reed-canary grass often creates large monocultures in seasonally flooded wetlands that have been drained or have had high sediment inputs.

Importance of Lacustrine Wetlands to Birds. Open water habitat is used by Common Loons, Western and Clark's Grebes, American White Pelican, Trumpeter Swan, Wood Duck, Cinnamon Teal, Canvasback, Redhead, Ring-necked Duck, Barrow's Goldeneye, Bufflehead, Hooded Merganser, Ruddy Duck, Wilson's Phalarope, Franklin's and California Gulls, and Forster's and Black Terns for feeding and roosting. In areas without human disturbance, large numbers of waterfowl may use open water sites for molting. Open water sites often support large waterfowl concentrations during spring and fall staging and migration. Drawdowns in mid and late summer, a period of high irrigation demand, exposes mudflats providing feeding sites for migrating shorebirds. One such area on American Falls Reservoir has been designated as Shorebird Reserve of Regional Importance by the Manomet Center for Conservation Sciences under the Western Hemisphere Shorebird Reserve Network. The Manoment Center for Conservation Sciences currently is writing a nationwide shorebird conservation plan; Idaho is in the Intermountain West planning region of that plan.

Permanently flooded emergent vegetation adjacent to open water is used for nesting by Western and Clark's Grebes, American Bittern, White-faced Ibis, Trumpeter Swan, Canvasback, Redhead, Ring-necked Duck, Ruddy Duck, Franklin's Gull, Forster's and Black Terns, Marsh Wren, and Yellow-headed Blackbird. It is used for feeding by American Bittern, Marsh Wren, and Yellow-headed Blackbird. These areas furnish valuable escape cover for waterfowl broods and for molting waterfowl and cranes; these species molt all their flight feathers at once and are flightless for about a month. Permanently flooded emergent vegetation is important for some fish species as spawning and nursery areas and for escape cover. Large populations of aquatic macroinvertebrates may be present. Emergent vegetation stems are used by emerging aquatic insects to crawl out of the water to molt to adults, making deep marsh a good source of insect prey for birds.

Semipermanently flooded to seasonally flooded emergent vegetation is used by a wide variety of high priority birds. Species that nest in this habitat type include American Bittern, Cinnamon Teal, Sandhill Crane, and American Avocet. Species which feed in shallow marsh include American Bittern, Cinnamon Teal, White-faced Ibis, Sandhill Crane, Long-billed Curlew, and Killdeer. Shallow marsh provides a fertile environment for the growth of aquatic macroinvertebrates that are the prey base for many birds. This habitat type is very important for amphibian reproduction also, as fish are often absent and water is often present long enough for the tadpoles to develop into adults.

Slope Wetlands

Slope wetlands occur on steep hillsides, in ravines, and on low-gradient slopes. The primary water source for slope wetlands is groundwater. Lesser amounts of water enter slope wetlands from precipitation (Jankovsky-Jones in preparation). Steep gradient slope wetlands usually occupy small areas and are usually covered with trees or shrubs. Even though these wetlands are small in area, they do provide important habitat for a variety of wildlife. Those that are dominated by aspen will be covered in a future edition of this Bird Conservation Plan. Some of the recommendations made in the riparian section of this plan cover these steep gradient slope wetlands, as do recommendations in *Riparian Riches: Habitat Management for Birds in Idaho* (Idaho Partners in Flight 1998).

Of much greater extent, and the focus of discussion here, are low-gradient slope wetlands. Low-gradient slope wetlands are often referred to as meadows and include some of Idaho's fens. These wetlands occur in broad valleys where soils overlay an impermeable layer.

Distribution and Amount of Slope Wetlands. Low-gradient slope wetlands are distributed

throughout Idaho. They reach their greatest extent in broad mountainous valleys of central and eastern Idaho. There currently is no estimate of area covered by this type.

Dominant Composition of Slope Wetlands. A diverse mosaic of plant communities can occur in low-gradient slope wetlands depending on the timing, depth and length of soil saturation, and on water and soil chemistry. Communities present can include scrub-shrub, forested, and emergent vegetation. Rhizomatous species usually dominate. These habitats are highly productive in terms of vegetative biomass and the vegetation has adequate moisture to maintain growth throughout the growing season. Scrub-shrub vegetation (willows, water birch, and mountain alder) occurs in association with somewhat poorly drained soils along channels. Soils that dry out seasonally (temporarily flooded) support scrub-shrub vegetation dominated by low shrubs including bog birch, shrubby cinquefoil, and greasewood. Forested vegetation is infrequently present with quaking aspen being the most common tree. Emergent vegetation stands on very poorly drained soils are dominated by water sedge, bladder sedge, Nebraska sedge, common spikerush, Baltic rush, and common cattail. Temporarily flooded emergent vegetation is dominated by grasses and sedges including tufted hairgrass, basin wildrye, mat muhly, western wheatgrass, and short-beaked sedge.

Slope wetlands include calcareous fens, or rich fens. Examples of fens include Birch Creek Fen in east-central Idaho and portions of the Teton Basin in eastern Idaho. Valley soils become mildly to strongly alkaline from runoff through dolomite and limestone deposits. The high pH of fen wetlands supports unique assemblages of plant species, including many rare species. Preservation of fens and other peatlands is important due to their botanical value and their value to birds. Additional information on the ecology of fens and peatlands in the Northern Rocky Mountains is included in Chadde et al. (1998).

Hydrological Regime of Slope Wetlands. Slope wetlands in Idaho may experience two pulses. A peak in flow in the early spring occurs due to snow melt. The flows may pulse again in the fall due to lag time in percolation from the mountains, underflow from the ground watershed, or the end of irrigation. Overbank flows that occur in most stream systems associated with spring run-off are typically lacking. Rather, slope wetlands become saturated or inundated when water rises in the soil profile (Rabe et al. 1994).

Water entering sloped wetland systems is stored in areas of low topographic relief, in the soil profile, and on the surface. Most of the water leaves the system through surface run-off with lesser amounts lost to evapotranspiration and underflow (Jankovsky-Jones in preparation).

Role of Disturbance in Slope Wetlands. The lack of woody materials for dam building limits the abundance of beaver in low-gradient slope wetlands. While occasionally present, they do not seem to play a critical role in the maintenance of these wetlands.

It is unknown what role fire plays in low-gradient slope wetlands. Portions of the wetlands will dry out by mid-summer and fire may play a role in maintaining grasslands and rejuvenating mature willow stands. Fire that removes shrub or tree cover could increase evapotranspiration rates.

Impacts, Threats, Historical and Current Uses of Slope Wetlands. Slope wetlands are easily altered and converted to economic uses, thus many have been affected by agriculture activities and water developments. The wetlands sometimes are used for grazing, haying, and farming, with the drier sites being more frequently hayed and farmed. Farming destroys most of the wildlife value for nesting, but may provide some feeding habitat. Drainage has allowed some sites to be converted from wetland to dry upland for farming. Light to moderate grazing may not have much effect, but heavy grazing can

significantly reduce wildlife habitat value, converting the wetland to a habitat unsuitable for wildlife or at least for certain species of wildlife. Heavy grazing may convert tall vegetation to bare ground or bare shoreline, making wetlands more suitable for other species such as Killdeer and Long-billed Curlews. Irrigation can maintain sloped wetlands, and expand their extent, but alters their natural water regime. In parts of Idaho housing developments are replacing slope wetlands. Impoundment is another threat; besides flooding existing habitat, it alters wetland functions and may impact hydrology. This includes blasting potholes for waterfowl.

Non-native species are a major threat to slope wetlands. Grazing can favor non-native plant species. Farming and altered water regimes can provide seed beds for non-native invasive plants, such as Canada thistle and hoary cress. Besides replacing native plant species, non-natives often provide inferior nest and foraging cover, and may support fewer invertebrates which form the prey base for many birds. Non-native pasture grasses, including Kentucky bluegrass, common timothy, and smooth brome, are frequently seeded into seasonally saturated wetlands to improve forage production. Invasion of the wetter areas by the non-native reed canary grass, purple loosestrife, and two species of tree, salt cedar and Russian olive, is a threat in some areas. Salt cedar and Russian olive thrive best in warmer areas, while loosestrife is present throughout the state.

Importance of Slope Wetlands to Birds. Slope wetlands are used by many birds, including many high priority species. White-faced Ibis and Sandhill Cranes feed in some of these wetlands and Cinnamon Teal and other waterfowl, Willet, Wilson's Phalarope, Short-eared Owl, and Bobolink nest in them. These areas also support a high diversity of small mammals and herptiles.

Depressional Wetlands

Depressional wetlands occur in landforms that are essentially closed basins. These wetlands are catchment areas for surface runoff. Water may also enter the wetlands from precipitation or via groundwater flow. Landforms, such as kettle holes formed by glacial activity and vernal pools, are also depressional wetlands. These wetlands may lack or have very minor inlets and/or outlets. Larger depressional wetlands with significant amounts of open water are indistinguishable from lacustrine wetlands.

Distribution and Amount of Depressional Wetlands. Depressional wetlands are distributed throughout Idaho. In northern Idaho depressional wetlands include small lakes and kettle holes left behind by retreating glaciers. Vernal pools are shallower, and occur in southern Idaho in association with volcanic plains and plateaus. There currently is no estimate of area covered by this type.

Dominant Composition of Depressional Wetlands. Vernal pools may be devoid of vegetation or support terrestrial vegetation that grows after the pool dries. Lake beds may flood to a depth of almost 3.3 ft (1 m) in the spring and are frequently dry and hard at the surface by mid-summer. Lake beds may be vegetated with common spikerush, western wheatgrass, mat muhly, and silver sagebrush.

Kettle ponds in northern Idaho may be small depressions dominated by emergent and scrub-shrub vegetation with no open water, or larger ponds and pools with open water surrounded by emergent wetlands. These wetlands are dominated by northern mannagrass, inflated sedge, bladder sedge, common spikerush, and floating-leaved pondweed. The drier perimeter of wetlands is frequently surrounded by stands of Douglas spiraea with occasional quaking aspen. Open water is sometimes present and supports pond lily and pondweeds.

Hydrological Regime of Depressional Wetlands. Vernal pools are flooded in the spring from precipitation and surface runoff. All or part of the pool may be dry by mid-summer. Water levels in kettle holes are mostly maintained by groundwater and may decrease later in the summer.

Role of Disturbance in Depressional Wetlands. Beaver may place dams along outlets of kettle holes or build huts in emergent habitat. Beaver are not present in vernal pool systems. Muskrats affect stands of emergent vegetation by creating openings within the vegetation and by providing nest sites for waterfowl and cranes. When muskrat populations erupt they can remove nearly all the emergent vegetation. It is unknown what role fire plays in depressional systems.

Impacts, Threats, Historical and Current Uses of Depressional Wetlands. Hydrological manipulation and livestock grazing are threats to vernal pools. The sites usually are dry by mid-summer, providing access to green forage for livestock in otherwise arid landscapes. In the Lost River Valleys of south-central Idaho, vernal pools of the Little Lost and Birch Creek drainages seldom flood due to water diversion.

Increased sediment inputs and establishment of non-native plant species threaten habitat provided by kettle holes. Sediments may enter these wetlands from logging or road building and may result in emergent plant species being replaced by shrub species such as Douglas spiraea or by non-native species such as reed canary grass.

Importance of Depressional Wetlands to Birds. Vernal pools provide important feeding and roosting sites for both migrating and nesting waterfowl and shorebirds. Vernal pools often support unique plant and aquatic invertebrate communities. Vernal pools are often important breeding sites for amphibians, including the Great Basin spadefoot toad. Kettle holes within coniferous forests provide openings in the canopy that benefit species such as the Olive-sided Flycatcher, and they provide habitat for waterbirds such as Sora and waterfowl.

Bird Conservation Plan for Non-Riverine Wetland Habitat

This plan will focus on actions that benefit wetlands as a whole, rather than focus on individual species to guide conservation actions. Nevertheless, there are many high priority species in Idaho that are dependent on wetlands. These are listed in Appendix 6 with a simplified list of habitats they use.

Objectives

The objective of the bird conservation plan for non-riverine wetlands is a net increase in the number of acres (hectares) of wetlands in Idaho, focusing on the same types and amounts that historically occurred here. This will be done through coordinating with agencies, conservation groups, and other interested parties, and by influencing existing programs. We aim to have the Idaho PIF priority species list adopted by other agencies and organizations and used as follows:

- as a ranking factor in wetland restoration and acquisition projects they review for funding,
- as a factor to be considered in projects affecting wetlands, and
- as an item in mitigation projects.

Strategies and Tasks for Meeting Objectives

Idaho PIF efforts will focus on influencing existing programs or building partnerships with others in bird conservation, rather than initiating new programs. Wetland habitats usually occur as complexes of several types, so Idaho PIF strategies for non-riverine wetlands will generally not concentrate on a single habitat type. Most of the larger wetlands are already owned and managed by the Idaho Department of Fish and Game (IDFG) or the U.S. Fish and Wildlife Service (FWS). Many existing laws and Executive Orders protect wetlands under the jurisdiction of a variety of state and federal agencies. For example, Section 404 of the Clean Water Act is administered by the U.S. Army Corps of Engineers. This act reviews permits that can result in wetland loss. Every project using federal funding must complete an Environmental Impact Statement assessing, among other things, effects on wetlands. Many conservation organizations also are working to conserve wetlands and many also manage wetland habitats.

Already most agency and organizational programs give some thought to nongame bird conservation. This bird conservation plan and the species priority list will help them focus efforts on the highest priority species. For example, North American Waterfowl Conservation Act (NAWCA) grant proposals consider effects on nongame birds in their rating system. Other potential partners for wetland conservation and management in Idaho include Ducks Unlimited, The Trumpeter Swan Society, local and regional land trusts, Pheasants Forever, Manomet Center for Conservation Sciences and the Western Hemisphere Shorebird Reserve Network, Bonneville Power Planning Council, the Intermountain Joint Venture of NAWCA, The Nature Conservancy, U. S. Army Corps of Engineers, U. S. Bureau of Reclamation, Idaho Conservation Data Center, Desert Fishes Council, the International Crane Foundation, American Fisheries Society, and the Waterbird Society.

Many other conservation groups can be included that have wider conservation goals than only wetlands, such as the Idaho Conservation League, Greater Yellowstone Coalition, Idaho Native Plant Society, Idaho Rivers United, National Audubon Society, and the National Fish and Wildlife Foundation.

Several public agencies have programs to assist private landowners with wildlife conservation practices on their lands. Idaho Department of Fish and Game has the Habitat Improvement Program (HIP), the U.S. Fish and Wildlife Service has Partners for Wildlife, and the Natural Resources Conservation Service (NRCS) has a number of different programs. The Farm Services Administration (FSA) holds mortgages on thousands of acres (hectares) of farm lands. FSA and NRCS can work together to forgive debt by the owner granting wildlife conservation easements on those lands. Lands foreclosed upon by FSA must be reviewed for wetland habitats by NRCS and U.S. Fish and Wildlife Service. Those areas having wetlands will have easements placed upon them before being released for public sale or the title may be transferred to U.S. Fish and Wildlife Service or the state conservation agency.

Idaho PIF strategies will focus on working through and influencing these existing programs. See Appendix 7 for a list of some sources of funding, matching funds, and other assistance for wildlife conservation projects that affect wetlands, and Appendix 8 for a list of land trusts in Idaho.

Wetland Issue A: No one is responsible to carry out these tasks.

Wetland Strategy A.1. Appoint an Idaho PIF committee responsible to oversee the completion of these tasks.

Wetland Task A.1.a. Appoint a committee of 3-5 people to oversee wetland issues (Idaho PIF Wetland Committee).

Wetland Issue B: Many agencies and organizations are managing lands and/or granting funds for habitat manipulation without adequate consideration for wetland-associated birds. Many of these groups will have their own objectives for management, but they may be able to benefit wetland-associated birds without detriment to their own objectives if they have better information.

Wetland Strategy B.1. Maintain a current priority list of wetland bird species

Wetland Task B.1a. Update the priority list annually or as often as data are received from the Colorado Bird Observatory.

Wetland Strategy B.2. Write habitat management recommendations for wetland birds modeled on *Birds in a Sagebrush Sea*.

Wetland Task B.2.a. Submit a pre-proposal to the National Fish and Wildlife Foundation to pay for writing and printing the guidelines. Submit proposals to the BLM, FWS--Portland Office, USFS, and other agencies and foundations by their deadlines.

Wetland Tasks B.2.a. Subtask 1. Set up a partnership with other state PIF groups for writing these guidelines, as they will be applicable to other states.

Wetland Task B.2.b. Write draft habitat management guidelines for wetland habitats. Send out for review to Idaho PIF members, other PIF groups, and agencies with responsibility for managing wetlands, then publish and disseminate to land management agencies, organizations, and interested land owners. Place news releases in newspapers and newsletters throughout Idaho to make people that these guidelines are available.

Wetland Strategy B.3. Work with groups that grant matching funds for habitat management proposals to incorporate effects on high priority wetland bird species into their grant-rating schemes.

Wetland Task B.3.a. Identify and contact these groups, to encourage them to use Idaho PIF priority species in their ranking schemes.

Wetland Task B.3.b. Annually seek additional groups and provide previously contacted groups with updated priority species lists.

Wetland Strategy B.4. Ensure that songbird conservation is considered in review of Environmental Impact Statements and 404 Permit applications.

Wetland Task B.4.a. Contact agencies responsible for reviewing these documents, provide them with habitat management guidelines, and encourage them to consider proposed project impacts on wetland-associated birds.

Wetland Task B.4.b. Review 404 permit applications and environmental impact statements

for effects on wetland associated birds.

Wetland Issue C: We do not know the historical or current extent and distribution of wetland habitats in Idaho. Having this knowledge would help us prioritize future restoration/management projects and help us prioritize work.

Wetland Strategy C.1. Accumulate information on the current and potential distribution of each wetland system.

Wetland Task C.1.a. Complete the National Wetland Inventory (NWI) mapping for parts of the state not yet completed (ecoregion subsection M332).

Wetland Task C.1.a. Subtask 1. Contact the USFWS to determine the timing and cost of completing the current NWI and additional costs of conducting the riparian inventory.

Wetland Issue D: Many managers and land owners are unaware of programs that are available to assist and/or fund habitat management practices for wildlife.

Wetland Strategy D.1. Maintain a database of programs, sponsors and contacts that fund habitat management.

Wetland Task D.1.a. Draft a list of agencies and groups that assist and/or fund habitat management, restoration, and preservation. Use Appendix 7 as a starting point.

Wetland Task D.1.b. Make this information available to Idaho PIF members, land managers, land owners and other interested parties, by hard copy and by Internet.

Wetland Issue E: Many of the Federal conservation programs are dependent on reauthorization of existing laws and annual appropriations.

Wetland Strategy E.1. Provide information to voters on re-authorization of existing laws and the need for annual appropriations for Federal conservation programs.

Wetland Task E.1.a. Provide information through news releases and newsletters.

Wetland Issue F: The Waterbird Society and the Manomet Center for Conservation Sciences are writing monitoring and management plans for waterbirds and shorebirds and need Idaho PIF participation.

Wetland Strategy F.1. Contact the Waterbird Society and Manomet Center for Conservation Sciences

to coordinate with them.

Wetland Task F.1.a. Appoint or select a representative from Idaho PIF to coordinate with these groups until their plans are complete.

Wetland Issue G: The public perceives wetlands as waste areas and does not recognize their true value.

Wetland Strategy G.1. Work with Project Wild and Project Wet to incorporate more bird and wetland conservation activities in future training manuals.

Wetland Strategy G.2. Include wetland activities in International Migratory Bird Day celebrations and encourage creation of birding festivals.

Wetland Strategy G.3. Invite local planning and zoning boards and local government officials on tours of wetlands.

Wetland Issue H: There are many birders whose enjoyment of their sport depends on bird conservation, but are not involved with bird conservation.

Wetland Strategy H.1. Find a way to get them involved in conservation.

Wetland Task H.1.a. Request that the Idaho Audubon Council make this an agenda item at the 1999 Annual Meeting and offer to discuss possibilities, and reasons for non-involvement, at that meeting.

Wetland Task H.1.b. The Wetlands Committee should compile a list of opportunities for volunteers, including such opportunities as being a proponent of an Important Bird Area, participating in the FWS refuge system's Friends Initiative, or being active in Audubon's Adopt-a-Refuge program.

Wetland Issue I: The PIF Wetland Committee needs to know if planned actions and established priorities are being implemented and if desired results are being achieved.

Wetland Strategy I.1. The Idaho PIF Wetland Steering Committee will conduct an annual review of planned tasks and implementation of recommendations by land management agencies and other parties involved in planned actions.

Wetland Task I.1.a. Establish a communication process for Committee members to follow-up on assigned tasks and gain input from agency offices to track planned actions and success.

Wetland Task I.1.b. Revise tasks and planned actions as needed to achieve desired intent of outlined actions.

Research and Monitoring Needs

Because many species of waterbirds are poorly monitored, coordinate with the Waterbird Society, Manomet Center for Conservation Sciences, and other agencies and groups to adopt standardized monitoring procedures and to establish data repositories so local monitoring data can be summarized in one location to provide continent-wide population trends.

Support research to refine grazing guidelines in meadows and emergent wetlands.

The historical importance of fire in wetlands is not well understood, and many land-managing agencies are using prescribed fire with increasing frequency. Determine what data gaps there are, then support research on fire effects on wetland flora and fauna.

Non-native plants and animals are invading wetlands and reducing their value for native species. Determine what data gaps there are, then support research on effects of non-native plant species and control methods.

Conservation Plan for Priority Birds and Habitats

Sagebrush Habitat

Introduction

Approximately 100 bird species and 70 mammal species can be found in sagebrush habitats (Braun et al. 1976; Trimble 1989). Some of these are sagebrush obligates (dependent on sagebrush habitat) or near-obligates (occurring in both sagebrush and grassland habitats). Sagebrush obligate birds include the Sage Sparrow, Brewer's Sparrow, Sage Thrasher, and Sage Grouse. Several mammals and a reptile are also sagebrush obligates: pygmy rabbit, sagebrush vole, sagebrush lizard, and pronghorn.

We are most concerned about the shrublands dominated by various subspecies of big sage. Species with lower growth forms, such as low sage and black sage, are less valuable to bird species. This is because their growth form doesn't provide structure for nesting either in the shrub or underneath and their leaves aren't used as often as a food source by birds. The lower growth forms also are less threatened than the big sage species. Therefore, this bird conservation plan focuses on big sagebrush.

Sagebrush itself, and the native perennial grasses and forbs of the shrubsteppe, are important sources of food and cover for wildlife (Dealy et al. 1981). During winter, the evergreen foliage of sagebrush often provides the only available green vegetation, and its protein level and digestibility are higher than most other shrubs and grasses (Peterson 1995). Pronghorn, pygmy rabbits, and Sage Grouse often exclusively eat sagebrush in winter, and sagebrush also becomes a major portion of mule deer and elk diets. Taller sagebrush provides cover for mule deer and Sage Grouse (Dealy et al. 1981), and the crowns of sagebrush break up hard-packed snow, making it easier for animals to forage on the grasses beneath (Peterson 1995). Throughout the rest of the year, sagebrush provides food for pygmy rabbits and Sage Grouse, protective cover for fawns, calves, rabbits, and grouse broods, and nesting sites for many shrub-nesting birds. The Sage Thrasher, Brewer's Sparrow, Sage Sparrow, and Sage Grouse nest most frequently in or beneath sagebrush.

Habitat Description

Distribution and amount. Sagebrush shrub habitat is a fairly xeric type with shrubs and grasses co-dominant or shrubs dominant. The vegetation types included, the total number of acres (hectares) in Idaho, and the percentage of Idaho are (from Caicco et al. 1995):

montane sagebrush and antelope bitterbrush mosaic; 359,071 ac (145,373 ha); 0.7%
threetip and mountain sagebrush mosaic; 205,531 ac (83,211 ha); 0.4%
mountain and low sagebrush mosaic; 3,298,406 ac (1,335,387 ha); 6.2%
low and mountain sagebrush mosaic; 334,176 ac (135,294 ha); 0.6%
low and black sagebrush mosaic; 360,822 ac (146,082 ha); 0.7%
low and fringed sagebrush mosaic; 31,974 ac (12,945 ha); 0.1%
low and big sagebrush* mosaic; 1,020,120 ac (413,004 ha); 1.9%
early low sagebrush; 239,716 ac (97,051 ha); 0.4%
black sagebrush/western (or Utah) juniper mosaic; 107,314 ac (43,447 ha); 0.2%
big sagebrush* on lava fields; 546,927 ac (221,428 ha); 1.0%
big* and low sagebrush mosaic; 5,622,649 ac (2,276,376 ha); 10.5%
canyon shrub; 291,413 ac (117,981 ha); 0.5%

* big sagebrush is predominantly the Wyoming subspecies, with small amounts of the Great Basin subspecies.

Total area in this habitat is 12,418,120 ac (5,027,579 ha), 23% of the state (Caicco et al. 1995). A little over 45% of this type is in the big and low sagebrush mosaic. The next biggest component is the mountain and low sagebrush mosaic (27%).
Most of the Sagebrush Shrub habitat type occurs in the southern half of Idaho, mostly in Physiographic Areas 89 (Columbia Plateau) and 80 (Basin and Range). It also occurs in the southeastern portion of Physiographic Area 64 (Lemhi, Custer, Blaine, Butte, and Clark Counties). Historically, there was some sagebrush in canyons of northcentral Idaho.

Dominant Composition. Hironaka et al. (1983) listed 11 species, subspecies, and forms of sagebrush. These occur from semi-desert lowlands to subalpine meadows. Six of these species are dwarf sagebrushes, four are subspecies and forms of big sagebrush, and the last is threetip sagebrush. Wyoming big sagebrush and mountain big sagebrush are the most common and widespread species of sagebrush in Idaho. It is often important to differentiate between sagebrush species and subspecies to: classify rangeland types, understand site potential, palatability to livestock and wildlife, and response to fire; and to manage vegetation. However, for many birds the species of sagebrush is less important than its height, density, cover, and patchiness (Paige and Ritter 1999).

West (1988) refers to the sagebrush in the northern part of the Intermountain region as sagebrush steppe, where sagebrush is co-dominant with perennial bunchgrasses. Because of differences in soil, climate, topography, and other physical processes, there is a wide variety of vegetation community types within the sagebrush landscape (Tisdale and Hironaka 1981; West 1988). Natural and human-induced disturbances also play a role. Usually a single species of sagebrush is dominant in a community, but communities differ widely in understory plants. Understories are usually dominated by one or more perennial bunchgrasses, such as bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass, Thurber needlegrass, needle-and-thread, bottlebrush squirreltail, or Indian ricegrass. Forbs, such as phlox, milk-vetch, and fleabane, are less common, but can be abundant in moist areas or in drier sagebrush habitats that have not been overgrazed.

Stands of sagebrush may be dense, patchy, or sparse. In tall sagebrush types, sagebrush cover may range from 5% to 30% (Dealy et al. 1981), or greater on some sites. Stands may vary from expanses of single species to multi-species mosaics where sagebrush is intermixed with other shrubs, most commonly rabbitbrush and antelope bitterbrush, but also greasewood, shadscale, winter fat, and spiny hopsage. Other shrub communities often occur adjacent to sagebrush shrublands, especially at higher elevations, such as those dominated by serviceberry, mountain-mahogany, wild cherry, Ceanothus, and snowberry. Grassy openings, springs, seeps, moist meadows, riparian streamsides, juniper woodlands, copses of aspen, and rock outcrops also add to the sagebrush mosaic, and these habitats help attract a broad diversity of birds and wildlife.

Biological soil crust (also known as cryptobiotic crust, microbiotic crust, or cryptogamic soil) is an integral and sometimes overlooked component of sagebrush shrublands. It creates a rough crust on the soil surface in semi-arid habitats. Biological soil crusts are better developed on fine-textured soils such as silts and clays than on areas with a higher percentage of surface rock or sand (Anderson et al. 1982). Biological soil crust is a fragile microfloral community composed of blue-green algae, bacteria, fungi, diatoms, mosses, and lichens. The diversity and function of crust communities has been little understood and underappreciated (St. Clair et al. 1993; J. Kaltenecker pers. comm.). Many biologists think these crust communities may play an important role in dry regions by stabilizing soils from wind and water erosion, contributing to soil productivity, influencing nutrient levels, retaining moisture, altering soil temperature, and aiding seedling establishment (Belnap 1993, 1994; St. Clair and Johansen 1993; Kaltenecker 1997). Where crust communities are well established in a healthy shrubland, they help

prevent the invasion of cheatgrass and, because crusts do not provide much fuel, they also slow the spread of wildfire (Kaltenecker 1997).

Status. Sagebrush communities have suffered severe degradation and loss, and the future for the remaining sagebrush steppe in particular is bleak. The ecology, natural disturbance patterns, and vegetation communities have been altered by agricultural conversion, invasion of non-native plants, extensive grazing, development, sagebrush eradication programs, and changes in fire regimes (Paige and Ritter 1999). Within the Interior Columbia River Basin, for example, sagebrush and bunchgrass cover types experienced greater losses (30.5% decrease in area) than any other habitat and will probably continue to decline with the cumulative impacts of present land uses (Saab and Rich 1997).

Noss et al. (1995), citing others, reported that 4.9 to 5.7 million ac (2 to 2.3 million ha) of sagebrush-grass steppe in the western Snake River basin has been converted to exotic annual vegetation, primarily cheatgrass and medusahead. Hironaka et al. (1983) reported that more than 99% of the subspecies basin big sagebrush type in the Snake River Plain has been converted to agriculture. Noss et al. (1995) listed the subspecies basin big sagebrush type and ungrazed sagebrush steppe in the Intermountain West as critically endangered ecosystem types in the United States.

Reclaiming degraded sagebrush habitat may not be possible with current technology and funding. What has been lost may be gone forever, making preservation of remaining habitat more crucial. Restoring areas infested with exotic annual grasses is exceedingly difficult. There is no good way to control sprouting of the exotic grasses; viable seed may survive in the soil for many years. New chemical control methods are now being tested, but the technique is still experimental. Even if it were an effective control method, the cost may be prohibitive. Seeds of native grasses and forbs are scarce and very expensive, making it unlikely that large areas could be restored at a time. Germination and survival of native plant seedings is dependent on precipitation, something that is highly unpredictable in the Intermountain West. Perhaps new developments will make restoration more effective and cheaper in the future. But in the meantime, it is usually more practical and less expensive to protect and improve existing sagebrush habitats.

Role of disturbance. Before European settlement, spotty and occasional wildfire probably created a patchwork of young and old sagebrush stands across the landscape, interspersed with grassland openings, wet meadows, and other shrub communities (Paige and Ritter 1999). Peters and Bunting (1994) state that on the upper Snake River Plain (east of a line from Arco to American Falls), fire was frequently reported by early scientists in the region and was an important factor in vegetation development. Fire intervals were probably 20-100 years. In the lower Snake River Plain, fire appears to have been less common. Peters and Bunting (1994) attribute this to the lower forage (fine fuels) produced by the vegetation. Because of drier conditions, during most years, perennial grass production was low and while wildfires could occur, fires were generally limited by low fuel loading.

After a fire, big sagebrush must be re-established by wind-dispersed seed or seeds in the soil. However, sagebrush seeds are short-lived, so there typically is not much of a seed bank in the soil and dispersal is usually required for re-establishment after a fire (J. Anderson, pers. comm.). Depending on the species, sagebrush can re-establish itself within five years of a burn, but a return to pre-burn densities can take 15 to 30 years (Bunting 1984; Britton and Clark 1984), or longer (J. Anderson, pers. comm.).

Historical and Current Uses. Grazing has been the primary use of sagebrush shrublands in Idaho. From the 1930s through the 1960s, and to a much lesser extent today, land managers controlled sagebrush on degraded rangeland on much of its range in the west by burning, plowing, chaining,

disking, and spraying herbicides to increase livestock forage on sites where the native grasses had been lost. Many areas were seeded with crested wheatgrass, a non-native perennial bunchgrass, to provide forage. In addition to the thousands of acres (hectares) (rangewide) where non-native grasses are mixed with sagebrush, approximately 10% of native sagebrush steppe has now been completely replaced by invasive annuals or by intentionally seeded non-native grasses (West 1988, 1996). Another 10% of the sagebrush steppe has been converted to dryland or irrigated agriculture (West 1988, 1996).

Other uses include mining, oil/gas development, conversion to residential and urban developments, and recreation, especially hunting and use of off-road vehicles.

Impacts and Threats. The invasion of non-native grasses and forbs is a major threat to remaining sagebrush habitats, and in some areas overshadows all other concerns. Controlling these invaders is perhaps the most difficult and perplexing problem facing range managers

The introduction of cheatgrass and medusahead to Idaho in the first half of the 20th century significantly altered the dynamics of sagebrush shrublands by changing the fire regime and successional patterns (Peters and Bunting 1994). Cheatgrass invasion alters fire and vegetation patterns in sagebrush habitats. Unlike native bunchgrasses, cheatgrass creates a bed of continuous, fine fuel that readily carries fire. Where cheatgrass dominates the understory, the grass carries fire over great distances and the range burns far more frequently—at intervals of three to five years. Cheatgrass also matures and dries earlier than native bunchgrasses, increasing the chance of fire earlier in the season while native species are still actively growing and therefore more susceptible to fire damage and mortality (Young and Evans 1978; Whisenant 1990; Knick and Rotenberry 1997). Once non-native annuals dominate an area, the native perennial species are very unlikely to recur on the site without human intervention. However, perennials can withstand invasion from annuals following fire if they are not subject to multiple disturbances, such as fire in two consecutive summers or grazing the first season after a fire (S. Bouffard pers. comm.).

Because sagebrush may take several years to mature before producing seed, repeated, frequent fires can eliminate sagebrush entirely. As the fire cycle escalates, cheatgrass persists and on some sites is eventually replaced by medusahead and other non-native annuals, causing a downward spiral toward permanent dominance by non-native species and deterioration of the site. Cheatgrass dominance eventually creates a uniform annual grassland perpetuated by large, frequent fires and void of remaining patches of native plant communities (Whisenant 1990).

Areas of shrub-steppe habitat that were seeded with monocultures of crested wheatgrass were thought to support few species of birds. Horned Larks seeming to be the only species that use them to any extent (Reynolds and Trost 1979, 1980, 1981). However, with the loss of native grassland habitats, these seedings seem to be providing replacement grassland habitat. Breeding and nesting Long-billed Curlews, Burrowing Owls, and Short-eared Owls routinely use certain seedings and cheatgrass-dominated areas in southcentral Idaho. Grasshopper Sparrows are also being found to be relatively common in these grassland habitats and breeding populations of Columbian Sharp-tailed Grouse are pioneering into these habitats on both sides of the Snake River between Minidoka Dam and Massacre Rocks State Park (S. Bouffard and J. Augsburger, pers. commun.). Nesting Ferruginous Hawks also occupy some seedings, contingent on the presence of adequate nesting substrates (P. Makela pers. commun.). However, there is experimental evidence that shrubsteppe birds prefer to eat native grass seeds rather than cheatgrass or medusahead (Goebel and Berry 1976; Kelrick et al. 1986).

Vast acreage of shrubsteppe habitat in the Snake River Plains, and the Great Basin in general, have

been lost to the combined impacts of cheatgrass invasion and wildfire. To counteract this, researchers are investigating methods of breaking this cycle of fire-maintained annual grasslands. Current knowledge uses combinations of native and non-native perennial grass, forb, and shrub seedings to establish a more fire-resistant plant community (Monsen and Kitchen 1994). In time, these seedings should be repopulated by the native sagebrush species and provide a new version of shrubsteppe habitat. With sagebrush cover present, Sage Grouse nest success was not affected by having a non-native rather than a native grass understory (Apa 1998). Should restoration of native sagebrush rangelands prove to be impossible or impractical, some of the native bird populations will still be viable in shrubsteppe habitat with a healthy, mostly exotic perennial grass understory. However, it is unknown if this is true of all of the sagebrush obligates.

Livestock grazing also influences sagebrush habitats. As cattle graze sagebrush steppe, they first select grasses and forbs and avoid browsing on sagebrush, which can have a toxic effect on the microorganisms in their rumen (Young 1994). Even light grazing can put pressure on the herbaceous plants that livestock favor (West 1996), but the effect of grazing in any particular region depends on season of use, intensity, type of livestock, and the plant species themselves (Tisdale and Hironaka 1981). Where grazing removes the herbaceous understory altogether, the balance is tipped in favor of shrubs, allowing sagebrush to spread and creating overly dense sagebrush stands with a sparse understory of annuals and unpalatable perennials (Tisdale and Hironaka 1981). This situation ultimately discourages livestock use, and throughout this century range managers have used fire, herbicides, chaining, and other methods to remove dense sagebrush stands and re-establish grass forage, often reseeding with introduced grass species.

Sagebrush steppe can take time to recover from excessive grazing, especially on drier sites. A study on the Idaho National Engineering and Environmental Laboratory grounds found that twenty-five years after the heavily-depleted range had been closed to cattle and sheep grazing, both perennial grass and big sagebrush cover had nearly doubled, but the most rapid recovery of grasses occurred after a lag period of fifteen years (Anderson and Holte 1981). Even if livestock are removed, the presence of invasive weeds, an overly dense stand of sagebrush, or heavy browsing by rodents and rabbits can inhibit recovery of grasses and forbs (Tisdale and Hironaka 1981). Anderson (pers. comm.) stated that recovery of depleted sagebrush rangelands depends heavily on precipitation and on the presence of remnant populations of native species. In many cases, removal of livestock has not resulted in much improvement in condition because populations of native species were so depleted that there was essentially nothing left to respond. There is even less response when this is combined with dry conditions.

Other threats include water developments, insecticides, recreation, habitat fragmentation, farming, mining and oil/gas development, invasion by junipers, and residential and urban development.

Bird Conservation Plan for Sagebrush Habitat

High priority and target bird species for management in sagebrush habitat are the Sage Grouse, Ferruginous Hawk, Sage Sparrow, Long-billed Curlew, Gray Flycatcher, Brewer's Sparrow, Swainson's Hawk, Sharp-tailed Grouse, Burrowing Owl, Sage Thrasher, Loggerhead Shrike, Prairie Falcon, and Western Meadowlark. The Prairie Falcon is included because over 32% of the population of Prairie Falcons occur in Physiographic Region 89 (Columbia Plateau), giving Idaho high responsibility for this species. See Appendix 5 for accounts for high priority species. Other species that use sagebrush habitat and were identified in Saab and Rich (1997) as species of concern within the Columbia River

Basin are the Lark Bunting, Lark Sparrow, Black-throated Sparrow, and Brewer's Blackbird. Of all of these species, we are most concerned about the sagebrush obligates because of their dependence on sagebrush: Sage Grouse, Sage Sparrow, Brewer's Sparrow, and Sage Thrasher.

Table 4. Annual percentage change in population size of sagebrush species in Idaho and Physiographic Area 89 as estimated from Breeding Bird Survey data (Sauer et al. 1997).

Species	Idaho 1968-96	Idaho 1980-96	PA 89 1968-96	PA 89 1980-1996
Swainson's Hawk	ns[1]	+6.7*[2]	ns	ns
Ferruginous Hawk	nd[3]	nd	+6.0****	ns
Prairie Falcon	nd	nd	ns	ns
Sage Grouse	nd	nd	nd	nd
Sharp-tailed Grouse	nd	nd	nd	nd
Long-billed Curlew	+6.5****	ns	+4.3***	ns
Burrowing Owl	nd	nd	+16.1***	+19*
Gray Flycatcher	nd	nd	+9.3*	+15.4****
Loggerhead Shrike	nd	nd	-2.7****	ns
Sage Thrasher	ns	ns	+1.1*	ns
Brewer's Sparrow	-6.0****	-4.5***	-4.8****	-3.4**
Lark Sparrow	ns	-3.8*	-2.5****	-5.1****
Black-throated Sparr.	nd	nd	-7.8**	ns
Sage Sparrow	nd	nd	ns	ns
Lark Bunting	nd	nd	nd	nd
Western Meadowlark	-1.4***	-2.5****	-0.6*	-2.6****
Brewer's Blackbird	-2.5***	-5.7****	-1.3*	-3.4****

[1] ns = sufficient sample size to determine trend, trend not significant

[2] * = significant at P≤ 0.2, ** = significant at P≤ 0.1, *** = significant at P≤ 0.05, **** = significant at P≤ 0.01

[3] nd = insufficient sample size to determine trend.

Breeding Bird Survey data are available for landbird species that breed in sagebrush habitat of southern Idaho. The point estimates for six species indicate declining populations (Table 4). The evidence of declining populations is compelling (i.e., statisically significant at P≤ 0.05) for Loggerhead Shrike, Lark Sparrow, Brewer's Sparrow, Western Meadowlark, and Brewer's Blackbird. In addition, data from other sources indicate declines in Sage Grouse and Sharp-tailed Grouse populations. Sage Grouse populations in Idaho have shown a decline of about 40 percent from the long-term average (Idaho Sage Grouse Task Force 1997). Rangewide, the Sharp-tailed Grouse is restricted to less than 10 percent of its former range; the majority of remaining birds occur in Idaho (Ulliman et al. 1998). The Breeding Bird Survey estimates for some other species are not statistically significant and for others there just aren't enough data to determine trends. However, the pattern across species indicates that populations of landbird species breeding in sagebrush habitats in southern Idaho generally are declining.

In this section, we present goals, population and habitat objectives, strategies, and tasks for identifying

habitat conditions needed to restore and maintain these declining species, carry out the needed work, and monitor effectiveness.

Overall Goals

1) Maintain and restore a dynamic sagebrush ecosystem.
2) No net loss of sagebrush habitat.
3) Restore fragmented and degraded sagebrush habitat to a more healthy condition with distribution matching historical patterns.
4) Link existing and restored sagebrush habitat.

We recognize that because of the degree of loss and degradation, restoration in many areas must be considered a long-term process.

Population Objective

By the end of the 2009 breeding season, reverse declining trends of species associated with sagebrush habitats in Idaho, while maintaining current populations of other associated species.

As explained below under "Habitat Objectives," we chose the Sage Grouse as an umbrella species. Therefore, we also have as a population objective the objectives stated in the Sage Grouse Management Plan--1997 (Idaho Sage Grouse Task Force 1997): Manage for Sage Grouse numbers as outlined in each Sage Grouse Management Area in the plan by 2007. Statewide, this would result in doubling the 5-year running average number of males that were counted on a representative sample of Idaho leks between 1991 and 1996.

Habitat Objectives

We chose an umbrella-species approach to setting habitat objectives for sagebrush habitat. We chose the Sage Grouse because it is a sagebrush obligate, it has a large home range and requires expanses of intact sagebrush habitat, and we assume its habitat requirements generally encompass those of the other sagebrush obligate species (See Appendix 5).

Some advantages to taking this approach are:

- There are existing efforts to manage Sage Grouse in Idaho, including the recently prepared Sage Grouse Management Plan--1997, there are planned local Sage Grouse Working Groups, and state and federal wildlife agencies have long had an interest in managing for Sage Grouse.
- The Sage Grouse Management Plan--1997 divides the state into Sage Grouse Management Areas, which would result in a good distribution of sagebrush habitat in desired conditions.
- There is more known about the habitat requirements and demographics of this species than the other sagebrush species.
- Sage Grouse have an additional group of proponents--upland game bird hunters.
- Recent efforts to list the Sage Grouse under the Endangered Species Act will increase interest in managing habitat to prevent listing, and will increase funding for habitat management projects.

- Sage Grouse require seeps, springs, and riparian areas that are important to other wildlife species such as amphibians, invertebrates, antelope, and other bird species.
- Sage Grouse populations are already being monitored (and have been for a longer time than songbirds) using lek counts, and brood and harvest surveys.

Some disadvantages to taking this approach are:

- Our assumption may be wrong that the Sage Grouse's habitat requirements encompass those of the other sagebrush obligate species.
- Some species have special needs within sagebrush (e.g., cliffs) that are in addition to those conditions provided by managing for Sage Grouse.
- Home ranges of Sage Grouse may encompass areas (e.g., agricultural fields) that are unsuitable for other sagebrush obligate species.

Overstory Objectives. In each Sage Grouse Management Area, over the long term, provide at least 25% of each major sagebrush community (especially big sagebrush) in an early-seral stage, 25% in a mid-seral stage, and 25% in a late-seral stage. Local biologists should provide quantitative definitions for early, mid-, and late seral stages. For example, in big sagebrush, definitions of early, mid-, and late seral stages might be <15%, 15-25%, and >25% canopy cover.

Block sizes should be as large as possible, starting with the largest blocks currently available and creating larger blocks as opportunities arise. Ensure that areas in each seral stage are well-distributed across ecological conditions relevant to birds (e.g., moisture and elevational gradients).

Assumptions

Sage Grouse and most other sagebrush species require the structure and cover provided by mid- to late-seral stages, but we recognize the need to maintain or restore historical disturbance patterns that result in some early seral communities.

Early seral communities are important to other species in sagebrush habitats that require more open conditions (e.g., Long-billed Curlew, Burrowing Owl).

Understory Objectives. In big sagebrush ecological sites, maintain or restore a healthy bunchgrass community. Native bunchgrass species of particular importance include bluebunch wheatgrass, Idaho fescue, and various members of the genus *Stipa*, although specific species assemblages will vary depending on site potential. Ideally, the plant community also will contain a mix of other native grasses and forbs.

During 1 May to 15 July, maintain adequate ground cover of non-senescent grasses and forbs to conceal ground nests and support an adequate food base for nesting passerines. In general, this requirement will be met if the area is managed under a rest-rotation or deferred-management system and by maintaining current season growth through 15 July. Local biologists should evaluate this criterion and revise it as appropriate for particular sites.

Assumptions

A healthy native grass and forb understory will provide nesting cover, insect and other prey populations, and seed sources for birds. However, we recognize that in situations where it is not yet economically feasible to restore lost native bunchgrasses or to control cheatgrass on large areas, rehabilitation with less expensive introduced species mixtures, or mixtures of introduced species with selected native species, may be the

only alternative. Such a practice would provide an understory competitive with cheatgrass, would still provide herbaceous structure, and would serve to break the cheatgrass-fire-cheatgrass cycle, thus allowing the re-establishment of shrubs. Alternative introduced and native species used successfully on lower elevation sagebrush sites in southern Idaho include thickspike wheatgrass, western wheatgrass, crested wheatgrass, Russian wildrye, Siberian wheatgrass, and tall wheatgrass (P. Makela pers. comm.).

Current and residual understory cover is important for ground nesting species. Saab et al. (1995) recommended maintaining current season growth through 15 July, and allowing more than 50% of the annual vegetative growth of perennial bunchgrasses to persist through the following nesting season. We assume that proper use of rest-rotation or deferred-grazing will meet these conditions, although not every year on every area.

Special Habitat Objectives. Maintain at least 30% of natural springs in condition suitable for use by Sage Grouse during chick-rearing.

Assumption
Sage Grouse and other wildlife species require springs and seeps for a water source and a source of insects.

Strategies and Tasks for Meeting Objectives

Sagebrush Issue A: We currently have little idea of the extent and existing condition of shrubsteppe habitat in Idaho.

Sagebrush Strategy A.1. Assess existing condition and extent of shrubsteppe habitat in Idaho at three levels: statewide, administrative unit, and management unit.

Sagebrush Task A.1.a. Conduct a Statewide, Broad-scale Assessment.
Using best available technology (e.g., remote sensing), USFS Land Use/Land Cover maps, and knowledge of local landowners and land managers, develop a shrubsteppe habitat map for Idaho. Delineate broad-scale "presence/absence" areas where shrubsteppe habitat is:

- Intact or apparently intact, needing little attention, in terms of having large, relatively contiguous areas of shrub cover or being in late-seral condition (e.g., Craters of the Moon, portions of Big Desert/Minidoka Desert, INEEL, Owyhees). These would be designated as "Monitor" or "Retention" areas. (*Note: we realize understory conditions would vary, and not necessarily be ideal, but for a large scale analysis of shrubsteppe, this approach may be sufficient).*
    - In need of management intervention (e.g., shrubs lacking on broad landscape; obvious large areas of cheatgrass/ medusahead, large recent wildfires, large seeded areas). These would be designated

as "Focus" or "Opportunity" areas, where we might concentrate management actions in a broad sense. Some areas lacking shrubs may be just early seral stands following wildfires; we would need to assess how these fit into our habitat objectives.

- Irretrievably lost (e.g., agriculture zones, urban areas). These would be large agriculture/urban zones with basically no opportunity for management intervention. While we would not seek to manage/promote these areas for shrubsteppe restoration, mapping this component now would provide a baseline for study of future urban/agriculture expansion.

Sagebrush Tasks A.1.a. Subtask 1. The state biologist for the BLM, a forest ecologist or biologist for the USFS, a biologist for IDFG or the Conservation Data Center, Jon Bart from the USGS, the NRCS biologist, and a biologist from the State Lands office should meet with vegetation mapping experts to decide on a definition for "contiguous," whether we should have categories of contiguous cover (e.g., less than 300 ac, 300-999 ac, 1000-5000 ac, >5000 ac; less than 120 ha, 120-405 ha, 405-2025 ha, >2125 ha), identification of adjacent matrix, and other relevant queries and themes.

Sagebrush Tasks A.1.a. Subtask 2. The Nature Conservancy, through their Ecoregional Planning process, has already identified large, intact stands of sagebrush. View the draft maps and report to decide if those areas identified meet our needs.

Sagebrush Task A.1.a. Subtask 3. Develop Challenge Cost-Share proposals to provide ground-truthing of the map.

Sagebrush Tasks A.1.a. Subtask 4. After completion of the map, provide the map and a written report to BLM Resource Areas, USFS District offices, Idaho PIF members, and others within the area.

Sagebrush Task A.1.b. Conduct Administrative Unit Scale Assessment.
Sagebrush Steering Committee members should inquire about and pull together mapping efforts that have been done at the Administrative Unit scale.

Sagebrush Task A.1.b. Subtask 1. Contact the Sage Grouse Task Force to coordinate mapping efforts and determine if their "habitat condition" maps would suffice for our purposes.

Sagebrush Task A.1.b. Subtask 2. If needed, develop other Challenge Cost-Share proposals, similar to the one in the Snake River (Burley) and Malad Resource Areas, for other BLM Resource Areas and FS Districts.

Sagebrush Task A.1.b. Subtask 3. For each Resource Area, FS District, USFWS Refuge, NPS area, IDFG Wildlife Management Area, or other entity, create or

acquire additional mapping themes delineating the following unique or crucial areas, using local expertise or other sources as needed:

- Currently "healthy" shrubsteppe ecosystems for monitoring, research and conservative management or protection.
- Important Bird Area boundaries.
- BBS and "mini-BBS" Routes and other research/inventory sites (Jon Bart--USGS, and Tim Reynolds will add and digitize BBS routes).
- Areas with management status that would be especially conducive to improving condition of sagebrush habitat (e.g., Areas of Critical Environmental Concern, Research Natural Areas, National Parks or Monuments, Wilderness Areas)
- Other unique habitats (basin big sagebrush sites, springs and seeps, others as identified)
- Known current and past Sage Grouse and Sharp-tailed Grouse leks.
- Known locations of Ferruginous Hawk nest sites. Due to the sensitive and proprietary nature of these data, this theme would not be made available for widespread distribution but would be limited to local Agency/Idaho PIF Sagebrush Steering Committee use.
- Ecoregion Unit and Subsection boundaries

Sagebrush Task A.1.c. Conduct Management Unit Scale Assessment.
Using the finer scale GIS or other mapping model, overlay allotment boundaries onto 1:24,000 quads at the Resource Area/FS District/other management entity level. Identify, within specific allotments, areas with the following management concerns/constraints:

- Shrub-limited areas (lack of cover)
- Conversions (seedings needing shrub structure)
- Annual grasslands/invasive exotics (cheatgrass, medusahead)
- Poor understory condition
- Juniper expansion areas

Sagebrush Task A.1.c. Subtask 1. Prioritize these areas for management based on statewide priority and need, surrounding matrix, feasibility of managing to improve conditions, surrounding land management, location, and other factors that affect manageability.

Sagebrush Issue B: There is a need to increase emphasis on managing shrubsteppe habitat to benefit bird species.

Sagebrush Strategy B.1. Start implementing and monitoring programs to reach habitat management objectives, and encourage land managers to follow recommendations for managing shrubsteppe for bird populations.

Sagebrush Task B.1.a. Establish an Idaho PIF Sagebrush Steering Committee to coordinate with the Sage Grouse Task Force.

Sagebrush Task B.1.a. Subtask 1. Meet with the coordinator of the Sage Grouse

Task Force to formalize a mutual relationship.

Sagebrush Task B.1.a. Subtask 2. Sagebrush Steering Committee members should participate in Sage Grouse working groups, or at least stay in touch with or network with the progress of various working groups.

Sagebrush Task B.1.a. Subtask 3. The PIF Sagebrush Steering Committee will conduct an annual review of planned Sagebrush Tasks and implementation of recommendations by land management agencies and other parties involved in planned actions by:

- establishing a communication process for Committee members to follow-up on assigned Tasks and gain input from agency offices to track planned actions and successes; and
- revising the Sagebrush Tasks and planned actions as needed to achieve the desired intent of the actions.

Sagebrush Task B.1.a. Subtask 4. Conduct an annual or semi-annual Idaho PIF Sagebrush Steering Committee/Sage Grouse Task Force meeting to:

- discuss progress of the Sage Grouse groups;
- develop Challenge Cost-Share proposals in cooperation with Sage Grouse groups;
- monitor progress of sagebrush tasks and revise when necessary; and
- provide an annual report to the Idaho PIF Coordinator.

Sagebrush Task B.1.b. Increase awareness of the value of sagebrush shrublands and methods of managing them to improve habitat for birds.

Sagebrush Task B.1.b. Subtask 1. Disseminate *Birds in a Sagebrush Sea: Managing Sagebrush Habitats for Bird Communities* to land managers and land owners. Develop a scaled-down, more user friendly version to reach more landowners.

Sagebrush Task B.1.b. Subtask 2. Prepare articles for newsletters, newspapers, and local magazines about sagebrush and birds. Prepare a nongame leaflet about sagebrush wildlife, targeting 5th grade and higher students.

Sagebrush Task B.1.b. Subtask 3. Conduct local tours, for the public, land owners, and media, of good- and poor-condition sagebrush habitat and annual grasslands. Conduct these tours in May or early June so that sagebrush bird species are present and audible.

Sagebrush Task B.1.b. Subtask 4. Conduct informational briefings for BLM Managers and Resource Advisory Council members, USFS Rangers, USFWS Refuge Managers, and others, to introduce sagebrush bird conservation issues, the Bird Conservation Plan, *Birds in a Sagebrush Sea*, and their use for agency decisions and planning. If possible, combine this with discussions on the plans for Sage Grouse and Sharp-tailed Grouse.

Sagebrush Task B.1.c. The Sagebrush Steering Committee should arrange for members or the Idaho PIF Coordinator to give presentations to the planning teams in the various agencies and non-governmental organization. The presentations should discuss the objectives of the Idaho Bird Conservation Plan and guidelines from *Birds in a Sagebrush Sea*.

Sagebrush Task B.1.d. Establish specific statewide priority areas for Sage Grouse habitat management. In cooperation with Idaho Department of Fish and Game, determine the areas where there is the greatest need for site-specific habitat management. These will be:

a) areas currently with the best populations of Sage Grouse that must be safe-guarded from habitat loss or fragmentation;
b) areas with good populations that appear to be undergoing current threats to habitat loss that must be immediately reversed, protected and/or managed;
c) areas with declining populations that have good potential for recovery through pro-active management, e.g., improved grazing management, reconnecting fragmented habitats, reinvigorating sagebrush stands by thinning and/or improving quality of the understory, and reducing bird loss by hunting or other direct mortality events;
d) areas where potential for recovering Sage Grouse populations is low or impossible and management efforts should be minimal; and
e)areas intermediate between c and d where recovery opportunities are moderate, but if improvements can be made without impacting higher priority needs, they will be pursued.

This statewide perspective will provide a large-scale perspective and need evaluation to guide regional and local planning priorities.

Sagebrush Task B.1.e. BLM: In accord with the Idaho Standards for Rangeland Health (BLM), and using the above habitat map and/or existing knowledge, identify site-specific project areas and incorporate objectives and suggestions from the *Idaho Sage Grouse Management Plan, Birds in a Sagebrush Sea*, and Idaho PIF Shrubsteppe Objectives into planning for each BLM allotment by 2008. *Note: In 1998, Idaho BLM began an effort to identify grazing management problems and implement management changes to restore or improve rangeland/riparian health and Sensitive/Threatened/Endangered Species habitats. The objective is to complete 10 percent of the BLM allotment acreages each year, over the next ten years.*

Sagebrush Task B.1.e. Subtask 1. The Idaho PIF Sagebrush Steering Committee should review the maps produced under Strategy 1 and recommend to each BLM Resource Area Manager areas with high value or high potential that should be moved up in the schedule.

Sagebrush Task B.1.f. FS: Using the above habitat map and/or existing knowledge, incorporate objectives and suggestions from the *Idaho Sage Grouse Management Plan, Birds in a Sagebrush Sea*, and Idaho PIF Shrubsteppe Objectives into planning for each FS allotment and into Forest Service land and resource management plans as they are revised.

Sagebrush Task B.1.f. Subtask 1. The Idaho PIF Sagebrush Steering Committee should review the maps produced under Strategy 1 and recommend to each Forest Service District Ranger areas with high value or high potential that should be targeted.

Sagebrush Task B.1.g. USFWS Refuges, NPS Monuments, IDFG Wildlife Management Areas, Idaho Parks and Recreation sites, areas protected or managed by The Nature Conservancy or other land trusts, and other similar management units: Using the above habitat map and/or existing knowledge, incorporate objectives and suggestions from the

Idaho Sage Grouse Management Plan, Birds in a Sagebrush Sea, and Idaho PIF Shrubsteppe Objectives into planning for upland areas on each Refuge/NPS Monument/Park etc. in Idaho, as appropriate.

Sagebrush Task B.1.g. Subtask 1. The Idaho PIF Sagebrush Steering Committee should review the maps produced under Strategy 1 and recommend to each management unit manager areas with high value or high potential that should be targeted.

Sagebrush Issue C: Some of areas important to sagebrush obligates other than Sage Grouse might not be covered in the Sage Grouse Management Plan.

Sagebrush Strategy C.1. Assess the Sage Grouse and Columbian Sharp-tailed Grouse management areas as outlined in the Sage Grouse and Columbian Sharp-tailed Grouse management plans and if it appears some areas or sagebrush obligates are likely to be overlooked, set up new management areas to cover them.

Sagebrush Task C.1.a. During discussions with the Sage Grouse Task Force as discussed above, determine if some areas important to sagebrush obligates are not targeted for management because of lack of Sage or Sharp-tailed Grouse.

Sagebrush Task C.1.a. Subtask 1. If deficiencies are discovered in review of Task C.1.a, develop an action plan, or establish a subcommittee to develop a plan, to accomplish needed management on important areas previously overlooked in the planning process

Research and Monitoring Needs

We need more information regarding population trends of shrubsteppe birds in Idaho. Beginning in 1999, establish at least one "mini-BBS" route in shrubsteppe habitat in each BLM Resource Area, Forest Service District, FWS Refuge and other areas (INEEL, Craters of the Moon, etc.) in Idaho. Use Sage Grouse management areas described in the statewide Sage Grouse Management Plan, as sampling strata. Use Jon Bart's monitoring design. Collect information on vegetation at each site to characterize each site into one of 6 to 8 sagebrush health categories. Bird species presence and abundance will be correlated with sagebrush health categories to determine sagebrush ecological condition with shrubsteppe bird status. Results of these surveys will be used to develop optimal/target habitat types for key species. Conduct these surveys for 3 years, capturing at least 1,000 total points and at least 100 points per sagebrush category.

Recruit agency biologists and volunteers to be trained to run the mini-BBS routes each year. Raise outside funding (i.e., outside local offices) to pay for the training sessions and travel costs of participants and presenters.

In spring 1999, conduct two 2-day training sessions. The sessions would be for agency personnel and volunteers and would cover the point-count method, shrubsteppe bird identification (sight and sound), vegetation assessments, hearing test, and selection of routes. Jon Bart would organize this. As requested by participants, follow up these sessions with a 1-day spring or summer session for bird and vegetation

identification.

Using the best representative sites inventoried using the mini-BBS routes mentioned above, develop a long-term monitoring protocol in which sites would be resampled annually to determine trends of key species' populations. Determine the minimum number of routes and points needed to track the trends.

Set up a monitoring system in a sample of areas we have targeted for management to monitor success of management changes.

Refine knowledge of shrubsteppe bird use of post-settlement (young) and old-growth Utah and western juniper, and representative stand densities/crown closures (e.g. scattered, open, closed).

Determine nest productivity and density of shrubsteppe obligates (Brewer's Sparrow, Sage Sparrow, Sage Grouse, Sage Thrasher) in sites with sagebrush/cheatgrass *vs.* sagebrush/healthy native and sagebrush/crested wheatgrass. (Assume similar coverages of sagebrush and other controllable factors). Conduct baseline studies on INEEL or Craters of the Moon or other areas where grazing is not a confounding factor for comparison with data from grazed sites to determine the impacts of grazing on habitat use and productivity.

Construct Habitat Suitability Index Models and test existing ones for priority species. Use USGS-BRD modelers at Fort Collins or elsewhere. Construct a shrubsteppe guild model for some of these species. Test overlap of the Sage Grouse HSI model (developed for Utah) with these, to determine if Sage Grouse can indeed be considered an umbrella species for shrubsteppe birds. The HSI models for the sparrows etc., would greatly aid us in describing/refining suitable habitat objectives.

Conduct periodic (5 year) assessments of broad-scale vegetation changes in Idaho shrubsteppe via GAP analysis.

Determine impacts of spring, summer, and late fall grazing and types of grazing systems on the nesting success and productivity of priority/key shrubsteppe obligates.

Determine cover and understory requirements for shrubsteppe obligates (e.g., vegetation cover, vegetation structure, ground cover, species composition), and thresholds of these parameters upon which priority species occur and do not occur in these habitats.

Determine the role of Great Basin big sagebrush communities in shrubsteppe bird ecology/management. Identify remaining communities (via finer scale GIS mapping or local knowledge).

Expand research on control and restoration methods for cheatgrass, medusahead, and other exotics. Include chemical, biological, and mechanical control methods.

Research planting methods for native grasses, forbs, and shrubs, working with the Natural Resources Conservation Service.

Determine the effects of prescribed burns on sagebrush bird species.

Determine impacts of fragmentation on specific species of sagebrush obligate birds. Determine minimum patch size thresholds for species to breed successfully. Determine impacts of distance between patches on use and productivity of these species.

Conservation Plan for Priority Birds and Habitats

Dry Ponderosa Pine/Douglas-Fir/Grand Fir Habitat

DRY PONDEROSA PINE/DOUGLAS-FIR/GRAND FIR HABITAT

Introduction

Of the 243 bird species breeding in Idaho, 31 use the dry ponderosa pine/Douglas-fir/grand fir as nesting habitat. Two of the high priority species use this habitat as a primary habitat. We consider these forests important habitat for management because dry ponderosa pine/Douglas-fir/grand fir forest in Idaho represents a significant component of this forest type worldwide. It also has declined in both quantity and quality.

Habitat Description

The dry ponderosa pine/Douglas-fir/grand fir potential vegetation group incorporates 19 habitat types known to occur within Idaho. For a more detailed description of the individual habitat types encompassed in this group, refer to Steele et al. (1981) and Cooper et al. (1991). This group of potential vegetation types encompasses those sites that were historically characterized by old-growth ponderosa pine forests but are poorly represented on the landscape today. An additional forest group, the cool, moist Douglas-fir/grand fir/cool, dry Douglas-fir, also had some stands that were influenced by an understory fire regime and characterized by old-growth ponderosa pine and/or Douglas-fir conditions. However, the effects of disturbance in these forests were more complex and are not discussed here.

While the dry ponderosa pine/Douglas-fir/grand fir group is characterized by similar forest conditions under historical disturbance regimes, under current conditions they are very different in both overstory and understory characteristics. Understanding those differences will be important for developing appropriate restoration programs, and assessing the impacts of restoration efforts on existing bird communities.

Distribution. The dry ponderosa pine/Douglas-fir/grand fir forest group is most commonly associated with the west-central Idaho landscape (Steele et al. 1981), but is also a minor component of the northern Idaho landscape (Cooper et al. 1991). These low elevation forests represent the warm, dry end of the forest environmental gradient. Typically, ponderosa pine types represent the transition zone between the sagebrush/grassland vegetation and forests. In west-central Idaho, ponderosa pine forests may occur as low as 3,000 ft (900 m) in elevation and extend extend to about 6,500 ft (2,000 m) on steep, dry, southerly aspects.

Of the three types, Douglas-fir is the most geographically extensive and characterizes the warm, mild environments of low to mid-elevation forests, but may also extend upward to about 6,500 ft (2,000 m) on dry, southerly aspects. For both the ponderosa pine and Douglas-fir types, geology and terrain are limiting factors because of their influence over sufficient soil moisture.

Grand fir types occur primarily in the western third of central Idaho along the southern and eastern boundary of forests experiencing the moderating effects of the Pacific maritime influence. They also occur in northern Idaho. They range from about 4,300 ft (1,300 m) in elevation to about 6,400 ft (1,950 m) and are often found on the dryer upper slopes and ridges adjacent to and at higher elevations than the Douglas-fir types.

Dominant Vegetation. Under the historical frequent low intensity, understory fire regime, dominant overstory vegetation was almost exclusively ponderosa pine (Steele 1994, Sloan 1998a, Sloan 1998b). The frequency of understory fires maintained an open, park-like forest. Stand structure was dominated by a low

density of multi-aged, large (>20 in; >51 cm DBH) ponderosa pines. Studies in central Idaho indicated that 36 (Sloan 1998a) and 84 (Sloan 1998b) trees per acre (0.4 ha) were average conditions on Douglas-fir and grand fir potential vegetation types, respectively. Approximately 33% of these were trees less than 20 in (51 cm) DBH (Sloan 1998b). The density of trees on ponderosa pine potential vegetation types were generally less than those observed for Douglas-fir types due to the limiting effects of reduced soil moisture and nutrient availability. Density estimates for ponderosa pine on these sites ranged from 5 to 20 trees per acre (0.4 ha; Steele 1994, unpubl. rep.). Individual tree form was characterized by an "open grown" condition, with wide crowns and with large diameter branches often within 10 ft (3 m) of the ground (Sloan 1998a).

The occurrence of Douglas-fir and grand fir, within their respective potential vegetation types, was limited to protected topographic features such as north aspects, moist draws, and canyon bottoms. In northern Idaho, they were more widely distributed because of the more mesic conditions in the north; they therefore will occur on south aspects in the north. Clumps of trees also occurred but were more susceptible to disease, insects, and crown fire (Sloan 1998a). Snags are thought to have occurred at low density (relative to moister sites with higher tree densities) as trees became the occasional victims of insects, disease, fire, and lightning strikes (Harrod 1998). Old-growth pine snags remained standing for relatively long periods of time, due to the amount of pitch in their boles.

In general, forests that experienced frequent burning schedules, such as those in the dry ponderosa pine/Douglas-fir/grand fir forest type, would not be expected to support a diversity of plant communities because there is very little opportunity for successional development (Steele 1994). Most historical information available for these sites supports this assumption (Agee 1993, Boise National Forest 1993). Historically, understory vegetation in this forest group was dominated by bunchgrasses. Stand descriptions from historical cruise data indicated a predominance of grass in the understory (Boise Cascade Corp. unpublished data from 1915). Local residents refer to descriptions by parents and grandparents as "grass so tall it rubbed the horses' underbelly" (Bruce Reay pers. comm.). Grasses common to this forest group included Idaho fescue, bluebunch wheatgrass, pinegrass, western needlegrass, and elk sedge. Shrubs are typically less resistant to frequent fires and are therefore expected to have occurred on more protected sites such as moist draws, north slopes, and canyon bottoms. Shrubs common to these forest types include ceanothus, ninebark, snowberry, spirea, and mountain big sagebrush.

Status. Current estimates indicate that greater than 75% of the historical old growth ponderosa pine ecosystems have been lost across the Interior Columbia River Basin landscape (USFS and USBLM 1997). Noss et al. (1995) listed old-growth ponderosa pine forests as endangered (85-95% decline) in the northern Rocky Mountains, Intermountain West, and eastside Cascade Mountains. Specific numbers for the loss of this forest group in Idaho are not available at this time. However, it is important to note that the types of dry ponderosa pine forest in Idaho represent a significant component of their worldwide distribution.

Role of Disturbance. The dry ponderosa pine/Douglas-fir/grand fir forest group represents the most frequently disturbed habitat types within Idaho prior to Euro-American settlement. This frequency of disturbance was almost exclusively maintained by fire at return intervals ranging from 5 to 30 years (Crane and Fisher 1986, Steele et al. 1986, Sloan 1998a and b). The frequency of fire in this group resulted in low fuel loading of the forest floor and understory that in turn reduced the ability of fire to reach the overstory and completely destroy the stand. The result was an overall reduction in the intensity of the fires. Fire-tolerant species, adapted to a regime of frequent understory burning, were favored (ponderosa pine in the overstory and perennial bunchgrass in the understory). These fires generally burned extensively throughout these low- to mid-elevation forests, and were often only extinguished by fall rains or lack of fuel due to previous fires. The potential for stand-destroying wildfire (Agee 1993), insects, and disease events were low in this forest group (Steele 1994, Steele unpublished report). Small, localized crown fires were very

isolated and of relatively minor acreage/extent in central Idaho, occurring mostly on the north and/or moist slopes (R. Steele, Pers. Commun.). These resulted in patches of dead trees. Mixed severity fires occurred infrequently, resulting in thinning of forests through random killing of trees (Sloan 1998b; Steve Arno, Pers. Commun.).

Historical and Current Uses. Prior to Euro-American settlement, Native Americans used these low elevation forests for both food and building materials for many thousands of years. However, their most significant influence on these forests was their propensity to intentionally start fires. Reasons for these fires have been proposed as improving desired wildlife habitat, increasing desired vegetation species, driving game animals into traps, and opening transportation routes (Gruell 1985). Since Euro-American settlement, these low-elevation forests have represented some of the most heavily utilized forests in Idaho. Primary uses include grazing, mining, timber harvest, and recreation. In northern Idaho, the flatter, drier sites are being used increasingly for home sites.

Impacts and Threats. The primary effect of past forest management activities on overall acres of ponderosa pine has been the significant change in the historical fire regime. Three types of management activities have had the most influence on changing the historical fire regime: 1) fire exclusion policies; 2) grazing of livestock; and 3) harvesting of trees (Covington and Moore 1994, Agee 1996).

The most common result of fire exclusion in these forests has been the development of an increasingly homogeneous landscape characterized by large, stand-replacing fire regimes. For nearly 100 years, the combined influence of fire exclusion and grazing has altered the forest structure and species composition of this forest group in Idaho (Crane and Fischer 1986). Since the early 1900s, efforts to exclude fire, among other influences, have lengthened the fire return interval in these forests. Today, forests of the dry ponderosa pine/Douglas-fir/grand fir group no longer exhibit conditions that would support a low intensity understory fire. Many of these forests have not burned since the 1800s and contain a considerable amount of fuel in the understory. The Douglas-fir and grand fir potential vegetation types have progressed to a late successional condition of Douglas-fir and Douglas-fir/grand fir, respectively (Steele 1994). All potential vegetation types are experiencing tree densities far outside the historical range of conditions for these sites (Covington and Moore 1994, Sloan 1998a and b), with different species composition. Dense understory conditions provide a “ladder” for fire to reach the overstory, which in turn increases the severity of the fire. Intense, stand-replacing fires are abnormal disturbance events in this forest group and have resulted in severe modifications of the historical forest ecosystem and to biodiversity. Prior to 1900, the high fuel conditions typical of today’s forest were limited to forests growing in and around protective topographic features such as north aspects, moist draws, and canyon bottoms.

Grazing impacts began in the late 1800s and early 1900s when enormous herds of domestic sheep and cattle were allowed to graze freely throughout these low elevation forests. The result was substantial damage to soils and vegetation, especially where herds were concentrated. Perennial bunchgrasses, in particular, are still recovering from the severe overgrazing of the early days (Steele et al. 1981). This level of grazing also functioned to suppress fires by reducing the continuity of the understory vegetation and preventing low intensity fires from spreading in their normal pattern across the landscape (Covington and Moore 1994). Today, grazing continues but at much lower densities. Localized damage to vegetation and soils may still occur where animals concentrate, particularly in riparian areas and forest openings. Similarly, grazing still appears to affect the forest ecology of these sites in terms of forest structure and species composition. Specific observed influences on forest structure are increased tree numbers, decreased native grasses, increased accumulation of downed woody material, increased spread of exotic and noxious weeds, and increased forest floor duff. These influences, in combination with fire suppression, enhance conditions for high intensity, stand-replacing fires and reduce conditions that would support the low intensity fires that

historically occurred in these forests (Zimmerman and Neuenschwander 1984).

The effects of timber harvest on this forest group have changed over the years. Early timber harvests usually targeted the largest trees, which in most instances were ponderosa pine, and to a much lesser extent Douglas-fir and western larch. This form of harvest, coupled with fire suppression, has allowed smaller, shade-tolerant, late-successional species such as Douglas-fir to capture the growing space (Sampson et al. 1994). The result has been a rapid shift on many sites from forests dominated by seral species to forests dominated by late successional species, and from open stands of old growth trees to dense stands of young trees. This changes the habitat available to birds associated with the open stands found under a historical understory fire regime. More recently, timber management programs have used more intensive harvest practices such as clearcutting. Clearcut areas tend to recover slowly from logging disturbance and efforts to reforest clearcuts have been, on average, less than successful (Steele et al. 1981). Today, selective harvest with natural regeneration is considered the more ecologically responsible harvest method in these forests.

Although fire exclusion, grazing, and timber harvest, alone or in combination, have resulted in and continue to cause the loss of the old-growth ponderosa pine forests, the most immediate threats to the future viability of these forests are stand-replacing fire occurrences and within-stand dynamics.

Very little area representing historical old-growth ponderosa pine forest conditions, where old-growth is generally defined as trees older than 200 years, remains today (Hamilton 1993). Many stands still contain old-growth ponderosa pine; however, tree densities and fuel accumulations present a significant risk to their long-term survival and future restoration. Lightning-caused and accidental fires have the potential to burn with unprecedented and uncontrollable intensity and magnitude. Allowing these forests to burn under a stand-replacing fire regime to "reset the balance" is not a viable alternative for restoration of these forests (Steele 1994). The remaining old-growth ponderosa pine would be lost from the landscape and cannot be replaced for more than 200 years. With each stand-replacing fire in these low elevation forests, restoration options are lost. To complicate things further, the intensity of stand-replacing fires on these sites often damages the soil or allows understory species better adapted to intense fire regimes to take hold. The result is generally delayed recolonization by all species where the soil is damaged, or recolonization by shrubs that outcompete seral tree species and prevent or delay their establishment for many years to come. The impact is the same, however, with the extended loss of the old growth ponderosa pine ecosystem from the landscape.

Additional threats to the long-term viability of old growth ponderosa pine forests includes the subtle but significant risks due to within stand dynamics. The increased density of trees, generally 10 to 100 times their historical density (Sloan 1998a) results in increased competition on these sites. Overstory trees can become water- and nutrient-stressed, making them more susceptible to disease and insect outbreaks (Steele 1994). Sloan (1998a) found tree mortalities in a central Idaho Douglas-fir habitat type have gone from 0.9 trees per acre (0.4 ha) per year in the 1960s to 16 trees per acre (0.4 ha) per year in the 1990s. Numerous studies have shown that ponderosa pine mortality due to disease and insects increases with both diameter and stand density (McTague 1990). Increased tree mortality will in turn put the stand at greater risk to stand-replacing fire. Moreover, old age, coupled with density-related stress, diseases, and insects, can also affect a tree's ability to produce seed, bringing into question the amount of viable seed that will be available to recolonize sites for restoration purposes (R. Steele pers. comm.). Further, the overall density of trees also affects the ability of ponderosa pine to regenerate and thrive in the understory. A recent study (Sloan 1998a) in the Boise Basin of central Idaho found virtually no ponderosa pine regeneration for the last 50 years on sites that were almost exclusively dominated by ponderosa pine prior to the 1900s. This represents a substantial gap in the age structure of ponderosa pine present on the landscape today and presents a considerable challenge to maintaining an appropriate amount of old-growth ponderosa pine forests in future years.

Restoration efforts in this forest group must target saving any existing old-growth or large ponderosa pines where they occur and improving survival and growth rates of ponderosa pine where they can reestablish. Whereas restoration efforts are complicated and will not be addressed in detail here, restoration should primarily consist of reducing the density of trees in many stands by removing small trees, and reintroducing fire where possible. For this habitat, gentle slopes with remnant large ponderosa pine are almost nonexistent, but such sites serve as potential locations for primary restoration efforts. We caution that most areas with large ponderosa pine are currently on very steep slopes and/or are in inaccessible areas and are therefore not suitable for primary restoration efforts.

Bird Conservation Plan for Dry Ponderosa Pine/Douglas-Fir/Grand Fir Forests

In this section we present goals, population and habitat objectives, strategies, and tasks for identifying habitat conditions needed to restore and maintain these declining species, carry out the needed work, and monitor the effectiveness of restoration actions.

Overall goals

1. Identify locations and prevent additional loss of old-growth ponderosa pine forests.
2. Maintain and restore a minimum of 10% of the original distribution of dry ponderosa pine/Douglas-fir/grand fir forest in Idaho.
3. Achieve natural disturbance (or suitable alternative) regimes in original and restored ponderosa pine forests.
4. Provide suitable habitat for target species and document their use and abundance.
5. Monitor original forests and restoration areas for achievement of goals outlined in this document.

Habitat Objectives:

We chose a habitat-based approach to setting objectives for ponderosa pine habitat. In addition, we selected several focal species that would provide a mechanism for assessing our success in achieving our overall goals. For specific information about the habitat requirements of the focal species, see Appendix 5.

Our habitat objective is to restore by 2025 as much ponderosa pine forest as possible but at least 10% of the historical range of forests meeting the structural conditions below. This comes to approximately 100,000 ac (40,500 ha), based on information from the Southern Idaho Batholith. This figure may increase as new information from additional landscapes allows additional areas and amounts of desired restoration to be identified. ***Note*** *that complete restoration to old-growth conditions may take anywhere from 150 to 200 years, but that we aim to have, by 2025, stands that will be moving toward the desired old-growth conditions.* Structural conditions include:

- 10 (at lower elevations) to 30 (at higher elevations) trees per acre (0.4 ha) of ponderosa pine (trees should be as large a DBH as possible, preferably > 21 in (53 cm), and yet maintain a range of diameters to allow for replacement--see species accounts in Appendix 5 for tree sizes required by focal species);
- Adequate snag densities and sizes to meet the needs of the focal species (see Appendix 5); and
- Management sites should be in large blocks (at least some blocks should be at least 2,000 ac/ 810 ha of mixed ponderosa pine and thinned or open forest; if blocks are widely scattered, we recommend restoration of as large of a stand as possible within any given area)

Primary (**) and secondary (*) focal species:
** White-headed Woodpecker (a bird on the fringe of its range in Idaho);

** Pygmy Nuthatch;
* Lewis' Woodpecker
* Flammulated Owl

Other associated species that can be monitored include the White-breasted Nuthatch, Hairy Woodpecker, Orange-crowned Warbler, Nashville Warbler, and Mountain Quail (another species thought to be on the fringe of its range in Idaho). These are fairly easy-to-survey indicators of good quality ponderosa pine habitat.

Assumptions for Goals and Objectives

Although 10% sounds like a low goal, it is significant considering that Idaho currently only has less than 1% of this habitat type remaining (Noss et al. 1995). It is also a reasonable goal to attain over the next decade and a half (see Habitat Objectives above).

If we succeed in returning forest conditions to historical conditions, we are likely to lose or reduce populations of some currently abundant species. For example, The Townsend's Warbler is a species that prefers closed-canopy forest. Returning some forested areas to a more historical condition (open canopy with fewer, but larger trees) would mean losing some habitat for this species. Some examples of other species that might be adversely affected are the Red-breasted Nuthatch, Pileated Woodpecker, and MacGillivray's Warbler.

Our ultimate goal is to have forest conditions favorable to White-headed Woodpecker. Areas currently supporting large ponderosa pine should be identified and targeted for immediate restoration efforts. In doing so, White-headed Woodpeckers stand to benefit immediately. For other areas currently without large ponderosa pine, we assume that species such as the Pygmy Nuthatch will benefit from forest management much sooner than White-headed Woodpeckers.

The implementation of the goals outlined in this document will take a coordinated effort among land owners and agencies and a coordinated effort across state lines.The make-up of the 10% included in this plan will vary by ownership. For example, the U.S. Forest Service may be responsible for more than 10% of this type on lands managed by them.

While an understory fire was the most common fire regime in this type, we recognize that local stand-replacing and mixed severity fires did occur in this type and that such fires are important to nesting birds (Hutto 1995, Saab and Dudley 1998, Kotliar et al. *In press*), such as the Lewis' Woodpecker, Black-backed Woodpecker, and Lazuli Bunting. Temporal and spatial variation in the natural disturbance regime may create a changing mosaic of patch types which influences the distribution of species (Sprugel 1991). However, it is important to protect the targeted 10% that we are trying to restore from stand-replacing fires, as these represent the last of the stands with large ponderosa pines.

An analysis conducted by Boise Cascade Corporation and others of the 5.8 million ac (2.35 million ha) Southern Idaho Batholith Landscape estimated approximately 93,000 ac (38,000 ha) as a 10% level of maximum habitat range of variability for low elevation ponderosa pine. The Southern Idaho Batholith hitorically supported the largest and most significant amounts of this type. The 100,000 ac (40,500 ha) objective was extrapolated statewide from Boise Cascade Corporation's estimate but

Strategies and Tasks for Meeting Objectives

(For simplicity, "Pine" below will stand for "Dry Ponderosa Pine/Douglas-fir/Grand Fir")

Pine Issue A: We have a poor understanding of the distribution and condition of old-growth ponderosa pine forests in Idaho.

Pine Strategy A.1. Identify and map stands that are currently in historical condition, or could be in historical condition with minor restoration efforts such as initiation of understory burns. Also identify and map stands of of at least 10 ac (4 ha), that currently still support the large tree component (10-30 large trees per acre; ponderosa pine and to a lesser extent Douglas fir) to provide the historical stand tree size, density and structure with restoration efforts, but that are not currently within historical condition because of conditions created by fire exclusion.

Pine Task A.1.a. Define "historical condition," then query public land managers, timber industry biologists, Idaho Fish and Game biologists, private landowners, and Audubon members to identify known stands meeting these conditions.

Pine Task A.1.b. All sites, with the approval of the landowner/agency, should be identified in a GIS database housed at Idaho's Gap Analysis Laboratory or the Conservation Data Center and become available for use by all interested organizations. Layers for the GIS should include, but not be limited to: landownership, current management, location of nearest Breeding Bird Survey routes and other research/inventory sites within this habitat type, location of avian inventory and monitoring stations, current land use, current vegetation, Important Bird Area boundaries, and ecoregion and subsection boudaries.

Pine Task A.1.c. Communicate the immediate need to maintain sites currently under historical conditions and to restore appropriate amounts and distribution of the other sites to historical condition, and to protect them from the significant threat of loss by stand-replacing fire.

Pine Strategy A.2. Identify and map additional sites, as needed based on the analyses conducted for Strategy A.1, that may currently lack the desired large tree component, but that can be managed to provide for the desired amounts and distributions of this ecosystem in the future.

Pine Task A.2.a. Query public land managers, timber industry biologists, Idaho Fish and Game biologists, private landowners, and Audubon members to identify and map known stands that still contain ponderosa pine, that are at least 10 ac (4 ha) in size, and that could provide historical conditions in relatively short time spans with restoration efforts (thinning, prescribed burning).

Pine Task A.2.b. All sites, with the approval of the landowner/agency, should be identified in a GIS database housed at Idaho's Gap Analysis Laboratory or the Conservation Data Center and become available for use by all interested organizations. Layers for the GIS should include, but not be limited to: landownership, current management, location of nearest Breeding Bird Survey routes within this habitat type, location of avian inventory and monitoring stations, current land use, current vegetation, and ecoregion and subsection boudaries.

Pine Issue B: Although land management agencies (primarily USFS, BLM, Idaho State Lands) and private industry may recognize the decline in the historical conditions and distribution of these forests, they may not realize the importance of these forests for birds.

Pine Strategy B.1. We need to work with those responsible for these forests to guide restoration efforts that will benefit birds.

Pine Task B.1.a. Establish or encourage the development of a multi-interest Pine Task Force let by Idaho PIF Pine Committee to review, prioritize, and implement restoration efforts. There should be a small oversight group that sets direction and policy, and allocates resources, and a larger technical group. Include representatives from federal and state agencies, private industry, and other landowners (including representatives of housing developments within these forests).

Pine Task B.1.b. Prioritize and map all of the potential restoration sites based on the following criteria:

- feasibility of successful restoration
- landownership (private, federal, state) and willingness of landowners/managers to participate in restoration
- surrounding land management that enhances or makes difficult restoration (e.g., urban fire restrictions)
- existing conditions (i.e., how far we have to go to achieve restoration)
- size and juxtaposition of existing and potential sites (generally, priority given to larger stands).

Pine Task B.1.c. Publish a document for dry ponderosa pine/Douglas-fir/grand fir similar to those already published for managing riparian and sagebrush shrublands for birds (*Riparian Riches*, and *Birds in a Sagebrush Sea*, respectively), but targeting the general public more, including landowners in the urban interface.

Pine Task B.1.d. Write and publish a detailed and technical pine restoration document for forest managers giving a variety of management techniques appropriate to particular areas and context of the environment. Include discussion of the urban interface issues such as fire control.

Pine Strategy B.2. Raise funds for restoration efforts that will not require harvesting of big trees to pay for it.

Pine Task B.2.a. Communicate with other states to find innovative methods of funding large-scale and expensive restoration projects.

Pine Task B.2.b. Submit grants to the National Fish and Wildlife Foundation and other foundations to provide matching Challenge Cost-Share money for restoration projects.

Pine Issue C: Some of these stands may be on private lands, and there is a lack of incentive (or a negative incentive due to loss of revenues) for private landowners to participate in restoration efforts. In addition, management for historical conditions by use of fire may cause a threat to nearby housing developments.

Pine Strategy C.1. Stands currently within the historical range of conditions, or with the potential to be managed toward these conditions, that occur on private lands should be prioritized for development of conservation agreements, land or resource trades, or other incentives.

> Pine Task C.1.a. Work with local and statewide land trusts to include Idaho in the Forest Legacy Program, which provides federal funds to pay for conservation easements on forested land to prevent development.

Pine Issue D: There is a widespread loss of large-diameter (>21 in; >53 cm) snags in this habitat type.

Pine Strategy D.1. Develop a snag management strategy to optimize large ponderosa pine snags distributed across the landscape. Consider other snag management strategies currently being developed.

Pine Issue E: The Pine Forest Task Force needs to know if planned actions and established priorities are being implemented and if desired results are being achieved.

Pine Strategy E.1. The Idaho Pine Forest Task Force and an Idaho PIF Pine Committee will conduct an annual review of planned tasks and implementation of recommendations by land management agencies and other parties involved in planned actions.

> Pine Task E.1.a. Establish a communication process for Task Force and Committee members to follow-up on assigned tasks and gain input from agency offices to track planned actions and success.
>
> Pine Task E.1.b. Revise tasks and planned actions as needed to achieve desired intent of outlined actions.

Research and Monitoring Needs

We have a poor understanding of the distribution, population trends, and habitat requirements of birds associated with dry ponderosa pine forests. Idaho PIF should establish an inventory and long-term monitoring program for protected and restoration sites. Long-term monitoring of restoration sites is critical to determining if our goals are being met.

Conduct studies to understand the trade-offs for different fire-management activities (prescribed fire, fire suppression, stand-replacement fire) in ponderosa pine for focal and priority species. Such studies will provide information on possible conflicts in management for these species.

Conservation Plan for Priority Birds and Habitats

Other Habitats

OTHER HABITATS

Each bird species is unique in its habitat preferences and requirements. Thus, the loss of any native habitat, in either quality or quantity, is detrimental to some species or another. Although we focused on four habitats in this Bird Conservation Plan, we also recognize the importance of the other habitats for bird species. These other Idaho PIF habitats are briefly described below. Refer to Table 2, and Appendices 1 and 4 for information about bird species using these habitats. We will address these habitats in future versions of the Idaho Bird Conservation Plan.

Alpine

Habitat Description
Alpine areas include rocks, ice, snow, and alpine vegetation. Alpine vegetation consists of a combination of forbs, grasses, and sedges. Occasional trees may occur, especially Engelmann spruce, whitebark pine, and limber pine. This type is found at high elevations throughout Idaho, but especially in the mountains of central Idaho.

Importance to Birds
The Black Rosy-Finch is a high priority species that uses alpine habitat as its primary breeding habitat.

High-elevation Mixed Conifer Forest

Habitat Description
This Idaho PIF habitat includes whitebark pine forests, mountain hemlock forests, high elevation grand fir, and subalpine fir/Engelmann spruce forests. It would include the cool, moist grand fir habitat type and the warm/dry, warm/moist, and high elevation subalpine fir habitat types. These occur in montane areas, mostly in central and northern Idaho, but also in the mountains in the southeastern corner of the state.

Importance to Birds
High priority species that use this as their primary breeding habitat are the Hammond's and Olive-sided Flycatchers. We listed forty-six other species as using this habitat for breeding. Many of the species with the highest Percent Population scores (Appendices 2 and 3) breed in this habitat. Included among these is the Clark's Nutcracker, which is highly dependent on whitebark pine as a food source and the pine, in turn, is highly dependent upon this species for seed dissemination.

Lodgepole Pine Forest

Habitat Description
This Idaho PIF habitat includes montane and subalpine lodgepole pine forests. It would include the persistent lodgepole pine habitat type. It mostly occurs in central Idaho and along the eastern edge of the state.

Importance to Birds
No high priority species use the lodgepole pine forest habitat as their primary breeding habitat, although 31 species breed in this habitat and 5 use it as their primary breeding habitat. Many of the

species with the highest Percent Population scores (Appendices 2 and 3) breed in this habitat.

Cedar and Hemlock Forest

Habitat Description

This Idaho PIF habitat is restricted to the northern forests of Idaho. It includes western redcedar and western hemlock forests. The maritime-like forests in the Clearwater Basin of Idaho were listed by Noss et al. (1995) as a threatened ecosystem, due to a 70-84% decline.

Importance to Birds

One high priority species, the Vaux's Swift, uses this habitat as its primary breeding habitat. A moderate priority species, the Brown Creeper, is highly dependent in northern Idaho on old-growth cedar/hemlock forests and is experiencing a significant population decline.

Low-elevation Mixed Conifer Forest

Habitat Description

This Idaho PIF habitat needs to be better defined in terms of habitat types. Gap Analysis habitats include western larch and Douglas-fir forests, but presumably also include a number of other conifer species. It occurs in southeastern, central, and northern Idaho. There are over 6 million acres (2.5 million hectares) of this Idaho PIF habitat in Idaho, with almost 25 percent in a management status that provides moderate to good protection from degradation (Caicco et al. 1995).

Importance to Birds

Idaho PIF listed 83 bird species that use this habitat as breeding habitat, of which 35 use it as a primary breeding habitat. Nine high priority species use this habitat as their primary breeding habitat: Lewis' Woodpecker, Williamson's Sapsucker, Dusky Flycatcher, Varied Thrush, Townsend's Warbler, Northern Goshawk, Western Tanager, Sharp-shinned Hawk, and Brown Creeper. In addition, many of the species with the highest Percent Population scores (Appendices 2 and 3) breed in this habitat.

Juniper/Pinyon Pine/Mountain Mahogany

Habitat Description

Juniper and Pinyon Pine Woodlands include western, Utah, and Rocky Mountain juniper, and singleleaf pinyon pine woodlands, with some of these species being co-dominant with others. The singleleaf pinyon pine is co-dominant with curl-leaf mountain-mahogany or Utah juniper (Rust in press).

Pinyon-juniper and juniper woodland vegetation occurs at the northern extent of its range in Idaho (Cronquist et al. 1972). Western juniper in Idaho occurs in the Owyhee Plateau of the southwest corner. About six percent of the total area in the West covered by western juniper occurs in Idaho. Utah juniper-dominated woodlands in Idaho occur in the South Hills, east to the Malad and Bannock ranges and north across the Snake River Plain to the southern end of the Lost River and Lemhi ranges (Rust in press). Upland Rocky Mountain juniper-dominated woodlands occur on the Wapi Flow within the Snake River Plain, south on lower-slope positions in the Goose Creek drainage, and east on the lower-and upper-slope positions in the Bannock, Portneuf, and Bear River Ranges and on

basalt flows of the Portneuf River valley of southeastern Idaho (Rust in press). Singleleaf pinyon occurs in the Albion, Jim Sage, and Black Pine Mountains of the center part of southern Idaho. The most land-locked singleleaf pinyon are in southern Idaho, where they form woodlands with Utah juniper at several locations, including City of Rocks (Lanner 1975).

In general, pinyon and juniper woodlands range from open savannah to closed canopy. Height rarely exceeds 12 m. The older stands and old trees within the younger stands are particularly important for most of the priority species of birds.

During the past 150 years, western juniper has expanded its range into adjacent grasslands and shrublands (Burkhardt and Tisdale 1976), and aspen and riparian areas (Hann et al. 1997). All of these other types are priority habitats for birds; they have all decreased in quantity and quality from historic times (Hann et al. 1997*)*, and expansion of junipers into these types is an important issue. Much of the Utah juniper in southern Idaho is relatively young (<120 years), having become established after about 1880, based on recent studies (P. Makela pers. Comm.). The post-settlement increase of juniper came about at least partly due to a reduction in fine fuels as a result of heavy livestock grazing near the turn of the century. Lack of find fuels hinders the spread of wildfires (US Bureau of Land Management 1991). Current conditions of juniper dominance have been maintained in many areas due to aggressive wildfire suppression (P. Makela pers. Comm.). Lack of wildfire also has allowed young junipers to fill in the interspaces within old-growth stands, resulting in a closer canopy than probably occurred pre-European settlement. This likely has reduced the quality of old-growth habitat for old-growth dependent species. West et al. (1998) state, "We are currently dealing with a vastly greater amount of juniper and pinyon-dominated lands than any humans have encountered over the last 5,000 years."

Importance to Birds and Other Wildlife Species

The following high priority species use juniper and pinyon/juniper woodlands as their primary breeding habitat: Gray Flycatcher, Virginia's Warbler, Ferruginous Hawk, Pinyon Jay, Plumbeous Vireo, and Black-throated Gray Warbler. Most of these rely on older age classes. Although juniper and pinyon pine distribution has expanded in the West, the declining quality of older stands as habitat for the priority bird species is our primary concern.

Juniper and juniper/pinyon woodlands, and the wildlife associated with them, are peripheral to the state, but contribute significantly to Idaho's faunal and floral diversity. The western region of the USA has global responsibility for maintaining juniper and pinyon habitats.

Both pinyon nuts and juniper berries are important foods for birds and mammals. Juniper berries remain on the trees a large part of the year (Evans 1988). Four species of birds are known to eat and cache pinyon seeds: Clark's Nutcracker, Pinyon Jay, Western Scrub-Jay, and Steller's Jay (Evans 1988). Pinyon and juniper habitat is an important wintering habitat for several bird species (e.g., waxwings, Townsend's Solitaire, Pinyon Jays, Clark's Nutcrackers, Western Scrub-Jays, Steller's Jays, American Robins) and other wildlife (e.g., mule deer).

Several studies have shown the importance of pinyon or pinyon-juniper stands to birds (Maser and Gashwiler 1978; Balda and Masters 1980; Sedgwick 1987; Sieg 1991; Eddleman et al. 1994). Saab and Rich (1997) listed 43 Neotropical migrant species as breeding in juniper woodlands in the Interior Columbia River Basin. Some of the mammals that use pinyon and juniper woodlands are mule deer, bighorn sheep, elk, pronghorn, mountain lions, coyotes, porcupines, rabbits, mice, voles, woodrats, and squirrels (Evans 1988).

Aspen

Habitat Description

Aspen mostly occurs in southern and central Idaho (Mueggler 1988; Steele undated). However, it also occurs in northern Idaho, occurring over broad elevations and in many habitat types, most frequently occurring in stands of mixed hardwoods (including birch and cottonwood) and mixed conifers (S. Jacobson pers. comm.). Aspen is a seral species in habitat types where conifer trees are climax, but also occurs as a stable type (*de facto* climax), and as a grazing disclimax (Mueggler 1988).

In the Northern Rocky Mountains, which include central and northern Idaho, aspen communities are relatively infrequent and small, the size of individual stands seldom exceeding 5 ac (2 ha; Mueggler 1985). In eastern Idaho, northern Utah, and western Wyoming, aspen communities can be either small patches or large stands.

Importance to Birds

The Ruffed Grouse is a high priority species that uses aspen habitat as its primary breeding habitat. Over 30 bird species breed in aspen forests in Idaho. There are no bird species that occur only in aspen stands. However, some species, for example the Red-naped Sapsucker, Warbling Vireo, Orange-crowned Warbler, Northern Waterthrush, Cordilleran Flycatcher, Blue Grouse, and Ruffed Grouse are particularly attracted to aspen stands for at least part of the year. In the Great Basin and southern Idaho, the Northern Goshawk commonly nests in aspen stands, and in the Subletter Mountains of southern Idaho, the Flammulated Owl typically nests in cavities in aspens (T. Bandolin, pers. commun.).

Aspen provides a deciduous component within coniferous or shrubsteppe habitats, increasing plant and animal species diversity. Aspen trees are especially important for cavity nesters because of their susceptibility to heart rot. Thirteen of the species we list as associated with aspen stands are cavity nesters. Aspen suckers and bark provide winter forage for wildlife, especially elk. Ruffed Grouse eat the buds of aspen. The diverse, and often moist understory attracts insects that are important to the insectivores.

Mountain Brush

Habitat Description

The mountain brush habitat includes mesic upland deciduous shrub communities and warm mesic shrubs which are upland shrublands that occur naturally or are initiated by fire or clearcutting. The mesic upland deciduous shrub communities include alder, maple, bearberry, hawthorn, ceanothus, buffaloberry, chokecherry, Prince's pine, huckleberry, whortleberry, ocean spray, raspberry, rose, and spirea. It occurs in northern Idaho. The warm mesic shrublands include alder, serviceberry, Oregon grape, snowberry, ceanothus, ninebark, chokecherry, rose, currant, willow, elderberry, and spirea. There may also be mountain big sagebrush. This type occurs throughout Idaho.

Importance to Birds

No high priority species use the mountain brush habitat as their primary breeding habitat. However, the Sharp-tailed Grouse is dependent upon this type for wintering habitat.

Salt Desert Shrub

Habitat Description

Vegetation of salt desert shrub in the Intermountain region is characteristically sparse (Blaisdell and Holmgren 1984). The plant community is relatively simple in terms of structure and species diversity. The main factors that influence this type are soil salinity, soil alkalinity, and/or low annual precipitation (under 6 in or 15 cm; Blaisdell and Holmgren 1984). The mosaic of shrub communities is largely dominated by shrubs and half-shrubs of the family Chenopodiaceae. Forbs are not prominent in this habitat, but do occur, especially in wet years.

Salt desert shrub habitat has been damaged by livestock grazing, construction of energy or transportation corridors, military operations, off-road vehicle recreation, and surface mining (Blaisdell and Holmgren 1984). Most of these activities can weaken the microbiotic crust, increasing the soil's susceptibility to erosion. The naturally sparse plant cover along with fine-grained saline soils make salt desert shrub ranges vulnerable to water and wind erosion. Introduced annual weeds such as Russian thistle, halogeton, and cheatgrass can outcompete native species. Heavy livestock grazing affects this type by trampling of soils and weakening or killing of vegetation (Blaisdell and Holmgren 1984).

Depleted salt desert shrub ranges are slow to improve under either good management or complete protection, so direct revegetation is often necessary. However, the harsh environment makes this difficult (Blaisdell and Holmgren 1984).

Importance to Birds and Other Wildlife

There are no bird species that are obligates in the salt desert shrub type. This type, because of the lack of grasses and forbs, provides little food and only greasewood has the structure needed by shrub-nesting species. Still, many of the species that use sagebrush shrublands also use salt desert shrub, including: pronghorn; jackrabbits; mule deer; Swainson's, Ferruginous, and Red-tailed Hawks; Prairie Falcons; Golden Eagles; and, on the periphery, Sage Grouse (Blaisdell and Holmgren 1984).

Grassland

Habitat Description

Native grasslands occur in a wide variety of situations in Idaho (Idaho Cooperative Fish and Wildlife Research Unit 1998):

- Foothills grasslands are grass and forb co-dominated dry meadows and ridges associated with species such as sagebrush, cinquefoil, snowberry, and willow. The principal grass species are wheatgrasses, needle and thread, bluegrasses, and Idaho fescue. They occur throughout Idaho. This type includes the Palouse prairie of northern Idaho, which has been mostly converted to farmland.

- Montane parklands and subalpine meadows occur on grassland ridges, forest openings, and meadows dominated or co-dominated by perennial montane or subalpine grass species including bluebunch wheatgrass, Idaho fescue, bluegrasses, sedges, and timothy. They may include yarrow, arnica, arrowleaf balsamroot, and fireweed. They occur in montane areas throughout Idaho.

- Perennial grass-slope grasslands are dominated or co-dominated by native perennial grass species such as bluebunch wheatgrass, Idaho fescue, junegrass, and mutton bluegrass on foothill and

canyon slopes above 15 degrees. This type is associated with curlleaf mountain mahogany, juniper, and ponderosa pine. They occur in southern Idaho.

- Herbaceous burn grasslands occur in recent burns in southern Idaho.

In addition to native grasslands, there are non-native seeded perennial grasslands consisting of crested wheatgrass and other species, and shrubsteppe annual grass-forb grasslands which are dominated or co-dominated by cheatgrass, medusahead, and other introduced and native species. Both of these occur in southern Idaho. The former now would also include some grasslands planted under the USDA Natural Resources Conservation Service's Conservation Reserve Program. Grasslands planted under this program have a number of native species in the seed mix and appear to be beneficial to some grassland birds; the seeded perennial and shrubsteppe annual grass-forb types have little value to birds.

Importance to Birds
The following high priority species use native grasslands as their primary breeding habitat: Long-billed Curlew, Sharp-tailed Grouse (Columbian subspecies), Grasshopper Sparrow, and Western Meadowlark.

Bird Conservation Plan for Other Habitats

Strategies and Tasks

Issue: Other habitats in Idaho besides those covered in this version of the Idaho Bird Conservation Plan have priority species and may need management action for birds.

Strategy 1. Prepare bird conservation plan sections for the next highest priority habitats and include them in Version 2.0 of the Idaho Bird Conservation Plan.

Task 1A. Select the next two or three priority habitats.

Task 2B. Set up committees to write the habitat descriptions and species accounts, set goals and population and/or habitat objectives, and list the issues, strategies, and tasks.

Subtask 2B1. Use the Bird Conservation Plans for Montana, Oregon, Washington, Nevada, Utah, and Wyoming to prepare the bird conservation plans for these habitats.

Research and Monitoring Needs

Specific bird management prescriptions are generally lacking for these Other Habitats. Available information often lacks the specific habitat needs of priority species, requiring the land managers to use generic habitat information to formulate detailed management plans. As in other habitat types, research is needed to identify the specific habitat needs of the priority species, including detail on ideal canopy coverage, age structure, fragmentation impacts and habitat juxtaposition requirements, understory relationships and requirements, thresholds at which species occurrence changes, and management prescriptions for creating optimal habitat conditions.

Detailed habitat mapping of these Other Habitats is also required, along with data on pre-settlement distribution and ecology.

Bird Conservation Plan for Idaho

Non-habitat and Cross-habitat Threats; Important Bird Area Program

Idaho PIF Coordination

How to Evaluate Progress

NON-HABITAT AND CROSS-HABITAT THREATS; IMPORTANT BIRD AREAS PROGRAM

The bulk of the Idaho Bird Conservation Plan has taken a habitat-based approach to conservation of bird populations. This section discusses threats that are not directly related to habitat, or that occur across habitats. Many of these threats affect birds that we have indicated are priority species.

In addition, this section deals with the Important Bird Areas program, which currently has sites covering all of the priority habitats and many of the other habitats mentioned in this plan.

Goals and Objectives

Our goals are to:

1) Increase awareness of the threats that occur across habitats;
2) Decrease their occurrence and intensity to result in decreased bird mortality or loss of habitat caused by these threats.

Our objectives are:

1) Establish an interdisciplinary task force to work on these issues.

2) Produce news releases, Windows to Wildlife articles, and specialpublications dealing with these threats.

3) Designate proponents for all of the Important Bird Areas.

Strategies and Tasks to Meet Goals and Objectives

Non-Habitat/Cross-Habitat Issue A: Many of the issues discussed below are complex, politically sensitive, and require creative solutions.

Non-Habitat/Cross-Habitat Strategy A.1. Idaho PIF should form a collaborative group to discuss these issues, define and prioritize strategies and tasks, and provide information and recommendations. The group should include representatives of business and industry, city and county governments, federal agencies, environmental organizations, and others as appropriate. If necessary, have regional groups to decrease travel costs and increase participation.

Non-Habitat/Cross-Habitat Task A.1.a. Contact representatives to serve on the collaborative group.

Non-Habitat/Cross-Habitat Task A.1.b. Prepare a list of strategies and tasks for dealing with the issues below.

Non-Habitat and Cross-Habitat Issue B: Urbanization has multiple effects on bird populations besides direct loss of habitat, including but not limited to:

- increased predation by cats, dogs, corvids, skunks, and raccoons;

- mortality due to collisions with windows on office buildings;
- disturbance of nesting activities by recreationists;
- toxic effects of industrial pollution, hazardous wastes, yard pesticide and herbicide use, and hazardous garbage (e.g., 6-pack rings);
- flood control and fire suppression that negatively impact surrounding natural habitats;
- introduction of non-native, invasive plant species;
- encouragement of non-native bird species that compete for resources or spread disease;
- intentional killing of birds or disruption of nesting activities; and
- cowbird nest parasitism.

Non-Habitat/Cross-Habitat Strategy B.1. Encourage communities to pass and enforce cat and dog leash laws, using the American Bird Conservancy's "Cats Indoors!" campaign as a starting point.

Non-Habitat/Cross-Habitat Strategy B.2. Provide to the public information concerning the impact of pets on birds, and the hazards to birds of directly or indirectly encouraging the presence of other predators.

Non-Habitat/Cross-Habitat Strategy B.3. Identify office buildings that are killing or have the potential to kill significant numbers of songbirds and provide the owners with recommendations and incentives for reducing bird mortalities. For planned buildings, provide information to developers and architects that will describe how to design buildings to avoid collisions.

Non-Habitat/Cross-Habitat Strategy B.4. To reduce disturbance of nesting activities by recreationists, move recreational paths away from nesting habitat.

Non-Habitat/Cross-Habitat Strategy B.5. To decrease impacts of toxic materials and other waste on birds, recommend measures communities and counties can take.

Non-Habitat/Cross-Habitat Strategy B.6. To reduce the need for flood control, work with Planning and Zoning Commissions to discourage building in the flood plain.

Non-Habitat/Cross-Habitat Strategy B.7. To reduce the chance of invasive non-native plant species invading native habitats, encourage nurseries to no longer stock those species, to label native species that are valuable to birds, and encourage landowners to plant native species instead of non-natives.

Non-Habitat/Cross-Habitat Strategy B.8. Inform the public of the deleterious effects of non-native bird species and some native bird species with unnaturally high local populations.

Non-Habitat/Cross-Habitat Strategy B.9. Decrease intentional killing of birds or disruption of nesting activities by increasing educational efforts in the schools and by encouraging law enforcement workers to enforce wildlife protection laws.

Non-Habitat/Cross-Habitat Issue C: Urbanization causes direct loss and fragmentation of habitats. Planning and Zoning Departments are reluctant to regulate deleterious activities with regard to urban planning issues.

Non-Habitat/Cross-Habitat Strategy C.1. Encourage planning and zoning departments and developers to leave blocks of undisturbed habitat within developments, or to cluster housing in one area and retain open space in the remaining areas. Provide guidelines and best management practices for development and/or management of wildlife habitats.

Non-Habitat/Cross-Habitat Strategy C.2. Establish criteria for certifying developments as "Bird and Wildlife Friendly" to encourage use of best management practices for development and/or management of wildlife habitats.

Non-Habitat/Cross-Habitat Strategy C.3. Encourage planning and zoning departments to keep commercial developments centralized. Provide public relations incentives or financial incentives for responsible planning.

Non-Habitat/Cross-Habitat Strategy C.4. Encourage use of conservation easements, mitigation options, and land swaps to retain open space.

Non-Habitat/Cross-Habitat Issue D: Mine tailings, leaching ponds, gas flares, and oil field ponds cause direct and indirect bird mortality.

Non-Habitat/Cross-Habitat Strategy D.1. Provide companies with information about impacts of these features on birds and other wildlife, applicable federal and state laws, and recommendations to decrease the problems.

Non-Habitat/Cross-Habitat Issue E: Radio towers, other communication towers, wind generators, and powerlines kill birds, especially during migration.

Non-Habitat/Cross-Habitat Strategy E.1. Identify which towers and powerlines are currently causing problems and provide owners with recommendations for decreasing mortality.

Non-Habitat/Cross-Habitat Strategy E.2. For planned structures, work with owners to design them to prevent mortalities or to relocate them to less hazardous locations.

Non-Habitat/Cross-Habitat Issue F: Human travel corridors (planes, trains, and automobiles) and utility corridors cause direct loss and fragmentation of habitats, spread non-native invasive plants, can create noise pollution that can disrupt breeding activities, and can cause bird mortality by collisions.

Non-Habitat/Cross-Habitat Strategy F.1. Identify the direct and indirect threats of these corridors to priority species.

Non-Habitat/Cross-Habitat Issue G: Recreation sites (e.g., golf courses, All-Terrain Vehicle areas, ski areas, boat ramps and boating areas) cause direct loss and fragmentation of habitats, disruption of nesting and feeding activities, and chemical pollution.

Non-Habitat/Cross-Habitat Strategy G.1. Identify threats to priority species, Prioritize areas where conflicts occur and seasonally restrict access to some areas as needed to protect nesting birds. Accompany this with public information signs and brochures.

Non-Habitat/Cross-Habitat Strategy G.2. Obtain copies of Colorado Bird Observatory's hands-on manual for golf course architects and superintendents explaining how to design and manage golf courses to benefit birds. Provide these to each golf course in Idaho.

Non-Habitat/Cross-Habitat Issue H: The introduction and spread of noxious weeds is threatening all habitats.

Non-Habitat/Cross-Habitat Strategy H.1. Idaho PIF should provide information about the loss of bird habitat due to noxious weeds to the public, state weed control boards, the Natural Resources Conservation Service Technical Committee, local Conservation Districts, and private landowners (both large and small).

Suggested Tasks:
Idaho PIF should identify the noxious weed species most threatening to priority birds and their habitats.

Idaho PIF should identify weed-free locations (or nearly so) that are important bird habitats.

Idaho PIF should prioritize weed prevention efforts and seek funding to help those efforts and to provide information to the public about weed control strategies.

Non-Habitat/Cross-Habitat Issue I: Idaho PIF is not taking advantage of the opportunity for information dissemination through the Internet.

Non-Habitat/Cross-Habitat Strategy I.1. Establish an Idaho PIF Web Site.

Non-Habitat/Cross-Habitat Task I.1.a. Locate funding to have an Idaho PIF web site written, maintained, and placed on a server. The web site should contain a description of Idaho PIF, priority species lists, management guidelines and other pertinent publications, informational databases, and links to associated web sites.

Non-Habitat/Cross-Habitat Task I.1.a. Subtask 1. Find a volunteer to keep the web site updated using information provided by committees and the Coordinator.

Non-Habitat/Cross-Habitat Issue J: The Important Bird Areas Program has 50 accepted sites, but has not moved much beyond the nomination and voting stage.

Non-Habitat/Cross-Habitat Strategy J.1. Find proponents for all 50 Important Bird Areas.

Non-Habitat/Cross-Habitat Task J.1.a. Find someone to lead the Important Bird Areas Program

Non-Habitat/Cross-Habitat Task J.1.b. Contact all potential proponents listed on the nomination forms and in the October 1997 Progress Report, let them know what being a proponent may include, and get commitments from them.

Non-Habitat/Cross-Habitat Task J.1.c. Have a statewide news release and sample local news releases written announcing the Important Bird Areas Program.

Non-Habitat/Cross-Habitat Task J.1.d. Have Important Bird Area signs or certificates prepared to be given to owners/managers of the sites.

Non-Habitat/Cross-Habitat Task J.1.e. Encourage inclusion of designation ceremonies as part of International Bird Day Events throughout Idaho.

IDAHO PIF COORDINATION

CURRENT ORGANIZATION

Idaho PIF is led by a Coordinator, who is paid through grants, Challenge Cost-Shares, and other agency and private funds. Helping the Coordinator with decisions is a Steering Committee, with representatives from the major particants in Idaho PIF: U. S. Bureau of Land Management, U. S. Forest Service, Idaho Department of Fish and Game, Audubon, Boise Cascade Corporation, and U. S. Fish and Wildlife Service. Members come from agencies and organizations throughout the state and participate in meetings, receive information from the coordinator, and have an opportunity to review and have influence on all products produced by Idaho PIF.

FUTURE ORGANIZATION

The presence of a Coordinator position has been crucial to Idaho PIF's success in producing informational mailings, newsletter and magazine articles, several publications (*Idaho's Nongame Landbirds: Making Room; Riparian Riches: Habitat Management for Birds in Idaho;* and *Birds in a Sagebrush Sea: Managing Sagebrush Habitat for Bird Communities*), and this plan. In addition, the Coordinator sets up meetings, provides information when requested, coordinates with the Western Working Group of PIF, heads up the Important Bird Areas Program, gives talks, and has held training sessions.

The continuation of the Coordinator position is also crucial to the implementation of this Idaho Bird Conservation Plan. Without one person who is dedicated at least half-time to either completing these tasks, or working with Idaho PIF members and others to complete them, this plan will simply collect dust. Also important are the Coordinator's role in working with other states and physiographic areas as we implement our plans across state boundaries, and completion of the next version of the plan that will address the other habitats.

Idaho PIF Members are also crucial to the success of Idaho PIF and this Bird Conservation Plan. Attendance at meetings has fallen off due to budget cuts, personnel cuts that have left remaining members with more responsibilities in their jobs, and perhaps due to weariness over this planning phase. We need to increase our reach to new members of this coalition, and we need positive on-the-ground results to reward us for our efforts, and to make a difference. That is, after all, why we formed in the first place.

Strategies and Tasks

Coordination Issue A: Funding for the Idaho PIF Coordinator position has been insecure and often depended on just a couple of agencies.

Coordination Strategy A.1. Obtain permanent funding for the Idaho PIF Coordinator position.

Task A. Idaho PIF members will annually request that their organizations and agencies contribute to the Idaho PIF Coordinator position for salary and expenses.

Task B. Develop a Memorandum of Understanding among the various agencies and organizations involved in Idaho PIF to provide a mechanism for obtaining funding and to justify the participation of representatives of the groups.

Coordination Issue B: The Idaho PIF membership list has changed little over the past two years and needs to be increased to ensure successful implementation of this plan.

Coordination Strategy B.1. Expand the mailing list to other biologists and other resource managers in the existing agencies and reach out to new coalition members.

Coordination Strategy B.2. Publish a newsletter at least two times a year to keep membership up-to-date on Idaho PIF accomplishments and plans.

HOW TO EVALUATE PROGRESS TOWARD REACHING THE OBJECTIVES IN THIS PLAN

Most strategies and tasks given in this Idaho Bird Conservation Plan have specific target dates for completion. It will be the Coordinator's and Steering Committee's responsibility to set in motion these tasks and to document their completion. Progress toward completing these tasks will be assessed during biannual Steering Committee and/or membership meetings.

Evaluation Issue A: The Idaho PIF Steering Committee needs to know if the Idaho Bird Conservation Plan tasks and priorities are being implemented and if the desired progress toward goals and objectives is being achieved.

Evaluation Strategy A.1. The Idaho PIF Steering Committee will conduct a semi-annual review of planned tasks and implementation of recommendations by land management agencies and other parties involved in planned actions.

Evaluation Task A.1.a. Establish a communication process for Committee or Task Force members to follow-up on assigned tasks and gain input from agency offices to track planned actions and success.

Evaluation Task A.1.b. Revise tasks and planned actions as needed to improve progress toward goals and objectives.

Evaluation Task A.1.c. On an annual or biennial basis, update the Idaho Bird Conservation Plan based on the evaluation of progress and new information.

Evaluation Task A.1.d Steering Committee members should prepare notebooks for tracking progress on the plan.

LITERATURE CITED

Abernethy, Y., and R. E. Turner. 1987. U.S. forested wetlands: 1940-1980. BioScience 37:721-727.

Agee, J. K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Covelo, CA. 493pp.

Agee, J. K. 1996. Fires in the Blue Mountains: a history, ecology, and research agenda. Pages 119-146 *in* R.G. Jaindl and T.M. Quigley, editors. Search for a solution: sustaining the land, people and economy of the Blue Mountains. 316pp.

American Bird Conservancy. 1998. Bird conservation magazine. Summer 1998 issue. Washington, D.C. 16pp.

American Ornithologists' Union. 1998. Check-list of North American birds, 7th ed. American Ornithologists' Union, Washington, D.C.

Ames, C. P. 1977. Wildlife conflicts in riparian management: grazing. *In* Importance, preservation and management of riparian habitat. USDA Forest Service Rocky Mountain Forest and Range Experiment Station General Technical Report GTR-RM-43.

Ammon, E. M. 1995a. Lincoln's Sparrow *Melospiza lincolnii*. No. 191 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Ammon, E. M. 1995b. Reproductive strategies and factors determining nest success in subalpine ground-nesting passerines. PhD dissertation. Univ. Colorado, Boulder.

Anderson, J. 1998. Personal communication (E-mail to T. Reynolds, 4 September). Dept. of Biology, Idaho State University, Pocatello, ID.

Anderson, J. E., and K. E. Holte. 1981. Vegetation development over 25 years without grazing on sagebrush-dominated rangeland in south-eastern Idaho. Journal of Range Management 34:25-29.

Anderson, D. C., K. T. Harper, and R. C. Holmgren. 1982. Factors influencing the development of cryptogamic soil crusts in Utah deserts. Journal of Range Management 35:180-185.

Apa, A. D. 1998. Habitat use and movements of sympatric Sage and Columbian Sharp-tailed Grouse in southeastern Idaho. PhD Dissertation. Univ. of Idaho, Moscow. 199Pp.

Baicich, P. J., and C. J. O. Harrison. 1997. A guide to the nests, eggs, and nestlings of North American Birds. 2nd edition. Academic Press, San Diego, CA. 347 pp.

Balda, R. P. 1975. The relationship of secondary cavity nesters to snag densities in western coniferous forests. USDA Forest Service, Southwest Region, Wildlife Habitat Technical Bulletin No. 1, Albuquerque, N.M. 37 pp.

Balda, R. P., and N. Masters. 1980. Avian communities in pinyon-juniper woodlands: a descriptive analysis. Pages 146-169 *In* P.M. DeGraff (tech. coord.) Workshop proceedings: managing western forests and grasslands for nongame birds. USDA Forest Service General Technical Report INT-86.

Bammann, A. Personal communication (letter, April). Bureau of Land Management, Vale District. Vale, OR.

Bechard, M. J. 1982. Effect of vegetative cover on foraging site selection by Swainson's Hawk. Condor 84:153-159.

Bechard, M. J. and J. K. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*). No. 172 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Belnap, J. 1993. Recovery rates of cryptobiotic crusts: inoculant use and assessment methods. Great Basin Naturalist

53:89-95.

Belnap, J. 1994. Potential role of cryptobiotic soil crusts in semiarid rangelands. Pages 179-185 *in* S.B. Monson and S.G. Kitchen, editors. Proceedings-Ecology and management of annual rangelands. USDA Forest Service Intermountain Research Station General Technical Report. INT-GTR-313. Ogden, UT.

Bene, F. 1945. The role of learning in the feeding behavior of Black-chinned Hummingbirds. Condor 47:3-21.

Bent, A. C. 1939. Life histories of North American woodpeckers. US National Museum Bulletin No. 174.

Best, L. B. 1972. First-year effects of sagebrush control on two sparrows. J. Wildlife Management 36:534-544.

Bicak, T. K., R. L. Redmond, and D. A. Jenni. 1982. Effects of grazing on Long-billed Curlew (*Numenius americanus*) breeding behavior and ecology in southwestern Idaho. Pages 74-85 *in* J.M. Peek and P.D. Dalke, editors. Proceedings of the wildlife-livestock relationships symposium. Univ. of Idaho Forest, Wildlife and Range Experiment Station, Moscow.

Blaisdell, J. P., and R. C. Holmgren. 1984. Managing Intermountain rangelands--salt-desert shrub ranges. USDA Forest Service Intermountain Forest and Range Experiment Station, General Technical Repport INT-163. 52pp.

Blus, L. J., C. S. Staley, C. J. Henny, G. W. Pendleton, T. H. Craig, E. H. Craig, and D. K. Halford. 1989. Effects of organophosphorus insecticides on Sage Grouse in southeastern Idaho. Journal Wildlife Management 53:1139-1146.

Bock, C. E. 1969. Intra- vs. interspecific aggression in Pygmy Nuthatch flocks. Ecology 50(5):903-905.

Bock, C. E., and J. E. Bock. 1987. Avian habitat occupancy following fire in a Montana shrubsteppe. Prairie Naturalist 19:153-158.

Bock, C. E., and J. F. Lynch. 1970. Breeding bird populations of burned and unburned conifer forests in the Sierra Nevada. Condor 72:182-189.

Boise National Forest. 1993. Snapshot in time: repeat photography on the Boise National Forest 1870-1992. USDA Forest Service, Intermountain Region, Odgen, UT. 239 pp.

Bouffard, S. 1998. Personal communication (E-mail, 1 September). US Fish and Wildlife Service, Pocatello, ID.

Brawn, J. D., and R. P. Balda. 1988. Population biology of cavity nesters in northern Arizona: Do nest sites limit breeding densities? Condor 90(1):61-71.

Braun, C. E., T. Britt, and R. O. Wallestad. 1977. Guidelines for maintenance of Sage Grouse habitats. Wildlife Society Bulletin 5:99-106.

Braun, C. E., M. F. Baker, R. L. Eng, J. S. Gashwiler, and M. H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin 88:165-171.

Brewer, R. 1955. Size of home ranges in eight bird species in a southern Illinois swamp-thicket. Wilson Bulletin 67:140-141.

Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, US Army Engineering Waterways Experiment Station, Vicksburg, MS.

Brinson, M. M., B. L. Swift, R. C. Plantico, and J. S. Barclay. 1981. Riparian ecosystems: Their ecology and status. FWS/OBS-83/17. US Fish and Wildlife Service, Biological Resources Program, Washington, D.C.

Britton, C. M., and R. G. Clark. 1984. Effects of fire on sagebrush and bitterbrush. Pages 22-26 *in* K. Sanders and J. Durham, editors. Rangeland fire effects: A symposium. USDI Bureau of Land Management, Boise, ID.

Bryant, F. T., R. E. Blaser, and J. R. Peterson. 1972. Effects of trampling by cattle on bluegrass yield and soil compaction of a Meadowville Loam. Agronomy Journal 64:331-334.

Bull, E. L., A. L. Wright, and M. G. Henjum. 1990. Nesting habitat of Flammulated Owls in Oregon. Journal of Raptor Research 24(3):52-55.

Bunting, S. C. 1984. Fires in sagebrush-grass ecosystems: Successional changes. Pages 7-11 *in* K. Sanders and J. Durham, editors. Rangeland fire effects: A symposium. USDI Bureau of Land Management, Boise, ID.

Burkhardt, J. W., and E. W. Tisdale. 1976. Causes of juniper invasion in southwestern Idaho. Ecology 57:472-484.

Burleigh, T. D. 1972. Birds of Idaho. Caxton Printers, Ltd., Caldwell, ID.

Caicco, S. L., J. M. Scott, B. Butterfield, and B. Csuti. 1995. A gap analysis of the management status of the vegetation of Idaho (U.S.A). Conservation Biology 9(3):498-511.

Calder, W. A., and L. L. Calder. 1994. The Calliope Hummingbird. No. 135 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Call, M. W., and C. Maser. 1985. Wildlife habitats in managed rangelands - The Great Basin of southeastern Oregon: Sage Grouse. USDA Forest Service and USDI Bureau of Land Management, General Technical Report PNW-187.

Carter, M. F., W. C. Hunter, and D. N. Pashleyr. *in press*. *In* R. E. Bonney, Jr., D. N. Pashley, and R. Cooper, editors. Strategies for Bird Conservation: Creating the Partners in Flight Planning Process. Cornell Lab of Ornithology, Ithaca, NY.

Castrale, J. S. 1982. Effects of two sagebrush control methods on nongame birds. Journal of Wildlife Management 46:945-952.

Chadde, S. W., J. S. Shelly, R. J. Bursik, R. K. Moseley, A. G. Evenden, M. Mantas, F. Rabe, and B. Heidel. 1998. Peatlands on national forests of the northern Rocky Mountains: Ecology and conservation. USDA Forest Service General Technical Report RMRS-GTR-11. Rocky Mountain Research Station. Ogden, UT. 75 pp.

Chaney, E., W. Elmore, and W. S. Platts. 1990. Livestock grazing on western riparian areas. US Environmental Protection Agency and Northwest Resource Information Center, Inc. Eagle, Idaho. 45 pp.

Cogswell, H. L. 1949. Alternate care of two nests of the Black-chinned Hummingbird. Condor 51:176-178.

Connelly, J. W. 1998. Personal communication (e-mail, 27 April). Idaho Department of Fish and Game, ID.

Connelly, J. W., and O. D. Markham. 1983. Movements and radionuclide concentrations of Sage Grouse in southeastern Idaho. Journal of Wildlife Management 47:169-177.

Connelly, J. W., H. W. Browers, and R. J. Gates. 1988. Seasonal movements of Sage Grouse in southeastern Idaho. Journal of Wildlife Management 52:116-122.

Connelly, J. W., W. L. Wakkinen, A. D. Apa, and K. P. Reese. 1991. Sage Grouse use of nest sites in southeastern Idaho. Journal of Wildlife Management 55:521-524.

Cooper, J. K. 1969. First breeding record of the White-headed Woodpecker for Canada. Canadian Field-Naturalist 83:276-277.

Cooper, S. V., K. E. Neiman, and D. W. Roberts. 1991. Forest habitat types of northern Idaho: A second approximation. General Technical Report INT-236; USDA Forest Service, Intermountain Research Station, Ogden, UT. 143 pp.

Covington, W. W., and M. M. Moore. 1994. Postsettlement changes in natural fires regimes and forest structure: Ecological restoration of old growth ponderosa pine forests. Pages 153-181 *in* R.N. Sampson and D.L. Adams, editors. Assessing forest ecosystem health in the Inland West. The Haworth Press. 461 pp.

Crane, M. F., and W. C. Fischer. 1986. Fire ecology of the forest habitat types in Central Idaho. General Technical Report INT-218; USDA Forest Service, Intermountain Resource Station, Ogden, UT. 86 pp.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, and J. L. Reveal. 1972. Intermountain flora: vascular plants of the Intermountain West, U.S.A. Vol. 1. Hafner Publishing Company, Inc. New York, NY. 270pp.

Csuti et al. 1997 (Calliope Hummingbird paper) **<need to find citation>**

Dahl, T. E. 1990. Wetlands losses in the United States 1780s to 1980s. USDI Fish and Wildlife Service, Washington, D.C. 21 pp.

Dalke, P. D., D. B. Pyrah, D. C. Stanton, J. E. Crawford, and E. F. Schlatterer. 1963. Ecology, productivity and management of Sage Grouse in Idaho. Journal of Wildlife Management 27:811-841.

Dealy, J. E., D. A. Leckenby and D. M. Concannon. 1981. Wildlife habitats in managed rangelands--the Great Basin of southeastern Oregon: plant communities and their importance to wildlife. USDA Forest Service, General Technical Report PNW-120.

Dennis, J. V. 1958. Some aspects of the breeding ecology of the Yellow-breasted Chat (*Icteria virens)*. Bird-Banding 29:169-183.

DeSante, D. F., and T. L. George. 1994. Population trends in the landbirds of western North America. Studies in Avian Biology 15:173-190.

DeWolfe, B. B. 1968. *Zonotrichia leucophrys nuttalli* Ridgway, Nuttall's White-crowned Sparrow. Pages 1292-1324. *Z. l. Gambelii* (Nuttall), Gambel's White-crowned Sparrow. Pages 1324-1338. *Z. l. Pugetensis* (Grinnell), Puget Sound White-crowned Sparrow. Pages 1344-1352 *in* O. L. Austin, editor. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. US National Museum Bulletin 237, Part 3.

DeWolfe, B. B., and R. H. DeWolfe. 1962. Mountain White-crowned Sparrow in California. Condor 64:378-389.

Dixon, R. D. 1995a. Density, nest-site and roost-site characteristics, home-range, habitat-use, and behavior of White-headed Woodpeckers: Deschutes and Winema National Forests, Oregon. Oregon Department of Fish and Wildlife Nongame Report No. 93-3-01.

Dixon, R. D. 1995b. Ecology of White-headed Woodpeckers in the central Oregon Cascades. M.S. thesis, Univ. Idaho, Moscow.

Dobkin, D. S. 1994. Conservation and management of neotropical migrant birds in the Northern Rockies and Great Plains. University of Idaho Press. Moscow. 220 pp.

Dobkin, D. S. 1995. Management and conservation of Sage Grouse, denominative species for the ecological health of shrubsteppe ecosystems. USDI Bureau of Land Management, Portland, OR.

Douglas, D. C., J. T. Ratti, R. A. Black, and J. R. Alldredge. 1992. Avian habitat associations in riparian zones of Idaho's Centennial Mountains. Wilson Bulletin 104:485-500.

Drut, M. S. 1994. Status of Sage Grouse with emphasis on populations in Oregon and Washington. Audubon Society of Portland, Portland, OR.

ECOMAP. 1993. National hierarchical framework of ecological land units. USDA Forest Service, Washington, D.C. 18 pp.

Eddleman, L. E., R. F. Miller, P. M. Miller, and P. L. Dysart. 1994. Western juniper woodlands (of the Pacific Northwest): science assessment. Unpublished science contract report for the Interior Columbia River Basin Ecosystem Management Project. 131pp.

Ehrlich, P. R., D. S. Dobkin and D. Wheye. 1988. The birder's handbook: A field guide to the natural history of North American birds. Simon & Schuster, Inc. New York, NY.

Evans, R.A. 1988. Management of pinyon-juniper woodlands. USDA Forest Service. Intermountain Research Station General Technical Report INT-249. 34pp.

Franklin, J. F. 1992. Scientific basis for new perspectives in forests and streams. Pages 25-72 *in* R.J. Naiman, editor. Watershed management: Balancing sustainability and environmental change. Springer-Verlag, New York.

Frederick, G. P., and T. L. Moore. 1991. Distribution and habitat of White-headed Woodpeckers (*Picoides albolarvatus*) in west-central Idaho. Conservation Data Center, Idaho Dept. of Fish and Game, Boise, ID.

Gaines 1974 (Yellow-breasted Chat paper) **<need to find citation>**

Garrett, K. L., M. G. Raphael, and R. D. Dixon. 1996. White-headed Woodpecker (*Picoides albolarvatus*). No. 252 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Gates, R. J. 1983. Sage grouse, lagomorph, and pronghorn use of a sagebrush grassland burn site on the Idaho National Engineering Laboratory. M.S. Thesis. Montana State University, Bozeman.

Gilmer, D. S., and R. E. Stewart. 1983. Ferruginous Hawk populations and habitat use in North Dakota. Journal of Wildlife Management 46:146-157.

Goebel, C. J., and G. Berry. 1976. Selectivity of range grass seeds by local birds. Journal of Range Management 29:393-395.

Goossen, J. P., and S. G. Sealy. 1982. Production of young in a dense nesting population of Yellow Warblers, *Dendroica petechia*, in Manitoba. Canadian Field-Naturalist 96:189-199.

Gregg, M. A., J. A. Crawford, M. S. Drut, and A. K. DeLong. 1994. Vegetational cover and predation of Sage Grouse nests in Oregon. Journal of Wildlife Management 58:162-166.

Groves, C. R., B. Butterfield, G. Lippincott, B. Csuti, and J. M. Scott. 1997. Atlas of Idaho's wildlife. Idaho Department of Fish and Game, Boise. 372 pp.

Gruell, G. E. 1985. Indian fires in the Interior West: a widespread influence. Pages 68-74 *in* Proceedings: Syposium and workshop on wilderness fire. USDA Forest Service General Technical Report INT-182, Intermountain Research Station, Ogden, UT.

Hamilton, R. C. 1993. Characteristics of old growth forest in the Intermountain Region. USDA Forest Service, Intermountain Research Station, Ogden, UT. 86 pp.

Hann, W. J., J. L. Lyons, M. G. Karl, P. F. Hessburg, R. E. Keane, D. G. Long, J. P. Menakis, C. H. McNicoll, S. G. Leonard, R. A. Gravenmier, and B. G. Smith. 1997. Landscape dynamics of the basin. Chapter 3, pages 339-1055 *In* T. M. Quigley and S. J. Arbelbide, Technical editors). An assessment of ecosystem components in the Interior Columbia River Basin and portions of the Klamath and Great Basins: Volume II. USDA Forest Service Pacific Northwest Research Station PNW-GTR-405. 2066pp.

Hansen, P. L., R. D. Pfister, K. Boggs, B. J. Cook, J. Joy, and D. K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station, School of Forestry,

University of Montana, Missoula. Miscellaneous publication No. 5. 646pp.

Harlow, D. L., and P. H. Bloom. 1989. Buteos and the Golden Eagle. Pages 102-110 *in* B.G. Pendleton, editor. Proceedings of the western raptor management symposium and workshop. National Wildlife Federation, Scientific Technical Series No. 12.

Harris, J. H., S. D. Sanders, and M. A. Flett. 1988. The status and distribution of the Willow Flycatcher in the Sierra Nevada: Results of the 1986 survey. California Department of Fish and Game, Wildlife Management Division, Adminstrative Report 88-1. 32 pp.

Harrison, H. H. 1975. A field guide to the nests, eggs, and nestlings of North American birds. Houghton Mifflin Co., Boston. 257 pp.

Harrod, R. J., W. L. Gaines, W. E. Hartl, and A. Camp. 1998. Estimating historical snag density in dry forests east of the Cascade range. USDA Forest Service, PNW-GTR-428.

Haug, E. A., B. A. Millsap and M. S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). No. 61 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Herman, S. G., and J. B. Bulger. 1979. Effects of a forest application of DDT on nontarget organisms. Wildlife Monographs 69:1-62.

Hillman, G. R. 1998. Flood wave attenuation by a wetland following a beaver dam failure on a second order boreal stream. Wetlands 18(1):21-34.

Hironaka, M., M. A. Fosberg, and A. H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. University of Idaho Forest, Wildlife, and Range Experiment Station. Bulletin No. 35. 43 pp.

Houston, C. S. 1993. The Swainson's Hawk productivity crash. Abstract only. Proceedings—Raptor Research Foundation meeting, 4-6 November 1993, Charlotte, NC.

Houston, C. S., and M. J. Bechard. 1983. Trees and the Red-tailed Hawk in southern Saskatchewan. Blue Jay 41:99-109.

Howell, T. R. 1952. Natural history and differentiation in the Yellow-bellied Sapsucker. Condor 54:237-282.

Howie, R. R., and Ritcey. 1987. Distribution, habitat selection, and densities of Flammulated Owls in British Columbia. Pages 249-254 *In* R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, editors. Biology and conservation of northern forest owls. USDA Forest Service General Technical Report RM-142.

Hutto, R. L. 1989. Pygmy Nuthatch *Sitta pygmaea*. Pages 92-93 *in* T. W. Clark, A. H. Harvey, R. D. Dorn, D. L. Genter, and C. Groves, editors. Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem.

Hutto, R. L. 1993. Effects of clearcutting and fragmentation on the birds of a western coniferous forest. Final report to the Clearwater National Forest, University of Montana, Missoula. 13 pp.

Hutto, R. 1994. Personal communication (Phone call). University of Montana, Missoula.

Hutto, R. L. 1995. Composition of bird communities following stand-replacement fires in Northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9:1041-1058.

Hutto, R. L. 1995. USFS Northern Region songbird monitoring program--Distribution and habitat relationships. USFS contract #R1-95-05, Second Report. University of Montana, Missoula. 119 pp.

Idaho Conservation Data Center. 1998. Database on land trusts in Idaho. Idaho Department of Fish and Game, Boise.

Idaho Cooperative Fish and Wildlife Research Unit. 1998. Draft Idaho GAP analysis wildlife habitat relationship model review information. USGS Biological Resources Division, Moscow, ID.

Idaho Partners in Flight. 1998. Riparian riches: Habitat management for birds in Idaho. Idaho Dept. Of Fish and Game, Boise. 18 pp.

Idaho Sage Grouse Task Force. 1997. Idaho Sage Grouse management plan--1997. Idaho Department of Fish and Game, Boise. 34 pp.

Jankovsky-Jones, M. 1997. Conservation strategy for Northern Idaho wetlands. Conservation Data Center, Idaho Department of Fish and Game. 35 pp. plus appendices.

Jankovsky-Jones, M. *In preparation*. Conservation strategy for east-central Idaho wetlands. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.

Jewett, S. G., W. P. Taylor, W. T. Shaw, and J. W. Aldrich. 1953. Birds of Washington State. University of Washington Press, Seattle.

Johnsgard, P.A. 1983. The hummingbirds of North America. Smithsonian Inst. Press, Washington, D.C. 303pp.

Johnston, C. A., and R. J. Naiman. 1987. Boundary dynamics at the aquatic –terrestrial interface: The influence of beaver and geomorphology. Landscape Ecology 1:47-57.

Kaltenecker, J. H. 1997. The recovery of microbiotic crusts following post-fire rehabilitation on rangelands of the western Snake River Plain. M.S. Thesis. Boise State Univ., Boise, ID. 99 pp.

Kaltenecker, J. H. 1998. Personal communication (telephone conversation, January). Bureau of Land Management, Boise, ID.

Kantrud, H. A., and R. L. Kologiski. 1982. Effects of soil and grazing on breeding birds of uncultivated upland grasslands of the northern Great Plains. USDI Fish and Wildlife Service, Wildlife Research Report No. 15, Washington, D.C.

Kauffman, J. B., and W. C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications: a review. Journal of Range Management 37(5):430-438.

Kelrich, M. I., J. A. MacMahon, R. R. Parmenter, and D. V. Sisson. 1986. Native seed preference of shrubsteppe rodents, birds and ants: The relationships of seed attributes and seed use. Oecologia. 68:327-337.

Kerley, L. L., and S. H. Anderson. 1995. Songbird responses to sagebrush removal in a high elevation sagebrush steppe ecosystem. Prairie Naturalist 27:129-146.

King, J. R., and L. R. Mewaldt. 1987. The summer biology of an unstable insular population of White-crowned Sparrows in Oregon. Condor 89:549-565.

Kings River Conservation District. 1985. Studies on the Willow Flycatcher in the central Sierra Nevada conducted during 1983 and 1984. Research Report 85-017. 66 pp.

Klebenow, D. A. 1982. Livestock grazing interactions with Sage Grouse. Pages 113-123 *in* J. M. Peek and P. D. Dalke, editors. Proceedings of the wildlife-livestock relationships symposium. University of Idaho Forest, Wildlife, and Range Experiment Station, Moscow.

Knick, S. T., and J. T. Rotenberry. 1995. Landscape characteristics of fragmented shrubsteppe habitats and breeding passerine birds. Conservation Biology 9:1059-1071.

Knick, S. T., and J. T. Rotenberry. 1997. Landscape characteristics of disturbed shrubsteppe habitats in southwestern

Idaho (U.S.A). Landscape Ecology 12:287-297.

Knopf, F. L., and R. W. Cannon. 1982. Structural resilience of a willow riparian community to changes in grazing practices. Pages 198-209 *In* Wildlife-livestock relationships symposium: Proceedings 10. University of Idaho Fish, Wildlife and Range Experiment Station, Moscow.

Knopf, F. L., and M.L. Scott. 1990. Altered flows and created landscapes in the Platte River headwaters, 1840-1990. Pages 47-70 *in* J. M. Sweeney, editor. Management of dynamic ecosystems. North Central Section, The Wildlife Society, West Lafayette, IN.

Knopf, F. L., J. A. Sedgwick, and R. W. Cannon. 1988. Guild structure of a riparian avifauna relative to seasonal cattle grazing. Journal of Wildlife Management 52:280-290.

Knopf, F. L., R. R. Johnson, T. Rich, F. B. Samson, and R. C. Szaro. 1988. Conservation of riparian ecosystems in the United States. Wilson Bulletin 100:272-284.

Knorr, O. A. 1957. Communal roosting of the Pygmy Nuthatch. Condor 59(6):398.

LaFramboise, B., and N. LaFramboise. 1997. Personal communication (e-mail, October 26). Richland, Washington.

Lambeth, R. 1998. Personal communication (letter, January 14). Bureau of Land Management, Grand Junction, CO.

Lanner, R. M. 1975. Piñon pines and junipers of the southwestern woodlands. Pages 1-17 *In* G. F. Gifford and F. E. Busby, editors. The pinyon-juniper ecosystem: a symposium, May 1975. Utah State University, Logan. 194pp.

Larson, D. L., and C. E. Bock. 1984. Determining avian habitat preference by bird-centered vegetation sampling. Pages 37-43 *In* J. Verner, M. L. Morrison, and C. J. Ralph, editors. Wildlife 2000: Modeling habitat relationships of terrestrial vertebrates. University of Wisconsin Press, Madison.

Leedy, R. R. 1972. The status of Prairie Falcons in western Montana: Special emphasis on possible effects of chlorinated hydrocarbon insecticides. M.S. Thesis, University of Montana, Missoula.

Lehmkuhl, J. F., M. G. Raphael, R. S. Holthausen, J. R. Hickenbottom, R. H. Naney, and J. S. Shelly. 1997. Chapter 4. Effects of planning alternatives on terrestrial species in the Interior Columbia River Basin. Pages 537-730 *in* T. M. Quigley, K. M. Lee, and S. J. Arbelbide, technical editors. Evaluation of EIS alternatives by the Science Integration Team, volume II. USDA Forest Service General Technical Report PNW-GTR-406. Pacific Northwest Research Station, Portland, Oregon.

Leu, M. 1995. The feeding ecology and the selection of nest shrubs and fledgling roost sites by Loggerhead Shrikes (*Lanius ludovicianus*) in the shrubsteppe habitat. M.S. thesis. University of Washington. Seattle.

Ligon, J. D. 1973. Foraging behavior of the White-headed Woodpecker in Idaho. Auk 90:862-869.

Linder, K. A. 1994. Habitat utilization and behavior of nesting Lewis' Woodpecker (*Melanerpes lewis*) in the Laramie Range, southeast Wyoming. M.S. thesis, University of Wyoming, Laramie.

Linkhart, B. D., R. T. Reynolds, and R. A. Ryder. 1998. Home range and habitat of breeding Flammulated Owls in Colorado. Wilson Bulletin 110(3):342-351

MacCracken, J. G., D. W. Uresk, and R. M. Hansen. 1985. Vegetation and soil of Burrowing Owl nest sites in Connata Basin, South Dakota. Condor 87:152-154.

McCallum, D. A. 1994. Flammulated Owl (*Otus flammeolus*). No. 93 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Makela, P. D. 1999. Personal communication (e-mail, January 5). Bureau of Land Management, Burley, ID.

Manolis, T. 1977. Foraging relationships of Mountain Chickadees and Pygmy Nuthatches. Western Birds 8:13-20.

Marcuson, P. E. 1977. The effects of cattle grzing on brown trout in Rock Creek, Montan. Montana Fish and Game Special Report. Project number F-20-R-21-11a. Helena, MT. 11pp.

Marshall, D. B. 1997. Status of the White-headed Woodpecker in Oregon and Washington. Audubon Society of Portland, Portland, OR.

Maser, C., and J. S. Gashwiler. 1978. Interrelationships of wildlife and western juniper. Pages 37-82 *In* R. E. Martin, J. E. Dealy, and D. L. Caraher, editors. Proceedings of the western juniper ecology and management workshop, January 1977, Bend, Oregon. USDA Forest Service Pacific Northwest Forest and Range Experiment Station General Technical Report PNW-74.

Maser, C., J. W. Thomas, and R. G. Anderson. 1984. Wildlife habitats in managed rangelands—The Great Basin of southeastern Oregon. The relationship of terrestrial vertebrates to plant communities. USDA Forest Service Pacific Northwest Research Station, USDI Bureau of Land Management General Technical Report PNW-172. LaGrande, OR.

McAdoo, Longland, and Evans. 1989. Nongame bird community responses to sagebrush invasion of crested wheatgrass seedings. J. Wildlife Management 53(2):494-502.

McClelland, B. R. 1977. Relationships between hole-nesting birds, forest snags, and decay in western larch-Douglas-fir forests of the Northern Rocky Mountains. PhD Dissertation. Univ. of Montana, Missoula. 495 pp.

McEllin, S. M. 1979. Nest sites and population demographies of White-breasted and Pygmy Nuthatches in Colorado. Condor 81(4):348-52.

McTague, J. P. 1990. Tree growth and yield in southwestern ponderosa pine forests. Pages 24-120 *in* A. Tecle and W. W. Covington, editors. Multiresource management of southwestern ponderosa pine forests: The status of knowledge. USDA Forest Service, Southwestern Region. 410 pp.

Medin, D. E. 1986. Grazing and passerine breeding birds in a Great Basin low-shrub desert. Great Basin Naturalist 46:567-572.

Medin, D. E. and W. P. Clary. 1990. Bird and small mammal populations in a grazed and ungrazed riparian habitat in Idaho. USDA Forest Service, General Technical Report INT-425. Ogden, UT.

Mehann, W. R., F. J. Swanson, and J. R. Sedell. 1977. Influences of riparian on aquatic ecosystems with particular reference to salmonid fishes and their food supply. Pages 137-143 *In* Importance, preservation and management of riparian habitat. USDA Forest Service Rocky Mountain Forest and Range Experiment Station General Technical Report GTR-RM-43.

Merigliano, M. F. 1996. Ecology and management of the South Fork Snake River cottonwood forest. USDI Bureau of Land Management Technical Bulletin 96-9. 79 pp. plus appendices.

Merrill et al. 1996 (Calliope Hummingbird paper) **<need to find citation>**

Milne, K. A., and S. J. Hejl. 1989. Nest-site characteristics of White-headed Woodpeckers. Journal of Wildlife Management 53:50-55.

Minshall, M. E. 1993. Stream-riparian ecosystems: Rationale and methods for basin-level assessments of management effects. Pages 154-177 *in* M. E. Jensen and P. S. Bourgeron, editors. 1993 Eastside forest ecosystem health assessment. Vol II: Ecosystem management: principles and applications. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Monsen, S. B., and S. G. Kitchen, Ed. 1994. Proceedings--ecology and management of annual rangeleands. USDA Tech. Report INT-GTR-313.

Morrison, M. L., and K. A. With. 1987. Interseasonal and intersexual resource partitioning in Hairy and White-headed Woodpeckers. Auk 104:225-233.

Morrison, M. L., K. A. With, I. C. Timossi, W. M. Block, and K. A. Milne. 1987. Foraging behavior of bark-foraging birds in the Sierra Nevada. Condor 89:201-204.

Morton, M. L., and C. Carey. 1971. Growth and the development of endothermy in the Mountain White-crowned Sparrow (*Zonotrichia leucophrys oriantha*). Physiol. Zool. 44:177-189.

Mosconi, S. L., and R. L. Hutto. 1982. The effects of grazing on land birds of a western Montana riparian habitat. Pages 221-233 *in* J. M. Peek and P. D. Dalke, editors. Wildlife-livestock relationships symposium. University of Idaho, Forest, Wildlife and Range Experiment Station, Moscow.

Mueggler, W. F. 1985. Vegetation associations. Pages 45-55 *In* N. V. DeByle and R. P. Winokur, editors. Aspen: ecology and management in the western United States. USDA Forest Service General Technical Report RM-119. 283pp.

Mueggler, W. F. 1988. Aspen community types of the Intermountain Region. USDA Forest Service General Technical Report INT-250.

Muehter, V. R. (editor). 1998. WatchList Website <http://www.audubon.org/bird/watch/>. Version 97.12. National Audubon Society, New York, NY.

Naiman, R. J., C. A. Johnston, and J. C. Kelley. 1988. Alteration of North American streams by beaver. BioScience 38(11):753-762.

Naiman, R. J., J. M. Melillo, and J. E. Hobbie. 1986. Ecosystem alteration of boreal forest streams by beaver (*Castor canadensis*). Ecology 67:1254-1269.

Noss, R. F., E. T. LaRoe III, and J. M. Scott. 1995. Endangered ecosystems of the United States: A preliminary assessment of loss and degradation. USDI National Biological Service. Biological Report 28. Washington, D.C. 58 pp.

Oliver, W. W. and. R. A. Ryker. 1990. *Pinus ponderosa* Dougl. ex Laws. Ponderosa pine, Pages 413-424 *in* R. M. Burns and B. H. Honkala [technical coordinators], Silvics of North America: Volume 1, Conifers. USDA Forest Service Handbook 654.

Paige, C. and S. A. Ritter. 1999. Birds in a sagebrush sea: Managing sagebrush habitats for bird communities. Western Working Group of Partners in Flight, Idaho Department of Fish and Game, Boise.

Page, J. L., N. Dodd, T. O. Osborne, and J. A. Carson. 1978. The influence of livestock grazing on non-game wildlife. California Nevada Wildlife 1978:159-173.

Partners in Flight. 1998. Flight plan: Strategy for successful bird conservation (brochure). Washington, D.C.

Partners In Flight Bird Prioritization Technical Committee. 1999. PIF Priority Scores Website. <http://www.cbobirds.org/pif/index.html>Version 99.4. Colorado Bird Observatory, Brighton, CO.

Patterson, T. L., and L. Petrinovich. 1978. Territory size in the White-crowned Sparrow (*Zonotrichia leucophrys*): Measurement and stability. Condor 80:97-98.

Paton, P., W. C., and J. Dalton. 1994. Breeding ecology of Long-billed Curlews at Great Salt Lake. Great Basin Naturalist 54:79-85.

Peters, E. F., and S.C. Bunting. 1994. Fire conditions pre- and post-occurrence of annual grasses on the Snake River Plain. Pages 31-36 *in* S. B. Monsen and S. G. Kitchen, editors. Proceedings--Ecology and management of annual rangelands. USDA Forest Service, Intermountain Research Station General Technical Report INT-GTR-313.

Peterson, J. G. 1995. Sagebrush: Ecological implications of sagebrush manipulation. Montana Department of Fish, Wildlife and Parks, Helena.

Peterson, K. L., and L. B. Best. 1985a. Nest-site selection by Sage Sparrows. Condor 87:217-221.

Peterson, K. L., and L. B. Best. 1985b. Brewer's Sparrow nest-site characteristics in a sagebrush community. Journal of Field Ornithology 56:23-27.

Peterson, K. L., and L. B. Best. 1991. Nest-site selection by Sage Thrashers in southeastern Idaho. Great Basin Naturalist 51:261-266.

Peterson, R. T. 1961. A field guide to western birds. Houghton Mifflin Co., Boston, MA 309 pp.

Pitelka, F. A. 1951. Breeding seasons of hummingbirds near Santa Barbara, California. Condor 53:198-201.

Platts, W. S. 1979. Livestock grazing and riparian/stream ecosystems. Pages 39-45 *In* Proceedings: Forum on grazing and riparian/stream ecosystems. Trout Unlimited, Inc. Vienna, VA.

Powers, L. R., A. Dale, P. A. Gaede, C. Rodes, L. Nelson, J. J. Dean, and J. D. May. 1996. Nesting and food habits of the Flammulated Owl (*Otus flammeolus*) in south-central Idaho. Journal of Raptor Research 30(1):15-20.

Rabe, F. W., C. Elzinga, and R. Breckenridge. 1994. Classification of meandering glide and spring stream natural areas in Idaho. Natural Areas Journal 14(3):188-202.

Raphael, M. G., and M. White. 1984. Use of snags by cavity-nesting birds in the Sierra Nevada. Wildlife Monographs 86:1-66.

Rappole, J. H., E. S. Morton, T. E. Lovejoy, and J. L. Ruos. 1983. Nearctic avian migrants in the neotropics. USDI Fish and Wildlife Service, Washington, D.C.

Reynolds, R. T., and B. D. Linkhart. 1987. The nesting biology of Flammulated Owls in Colorado. Pages 239-248 *in* Biology and conservation of northern forest owls. R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, editors. USDA Forest Service General Technical Report RM-142.

Reynolds, R. T., R. A. Ryder, and B. D. Linkhart. 1989. Small forest owls. Pages 134-143 *In* K. S. Steenhof, M. N. Kochert, and M. N. LeFrance, editors. Western raptor management symposium and workshop, National Wildlife Federation Science Technical Series No. 12, Washington, D.C.

Reynolds, T. D. 1981. Nesting of Sage Thrasher, Sage Sparrow, and Brewer's Sparrow in southeastern Idaho. Condor 83:61-64.

Reynolds, T. D., and T. D. Rich. 1978. Reproductive ecology of the Sage Thrasher (*Oreoscoptes montanus*) on the Snake River Plain in south-central Idaho. Auk 95:580-582.

Reynolds, T. D., and C. H. Trost. 1979. The effects of crested wheatgrass plantings on wildlife on the Idaho National Engineering Laboratory site. Pages 665-666 *In* The mitigation symposium: A national workshop on mitigating losses of fish and wildlife habitats. July 16-20, 1989, Fort Collins, CO. USDA Forest Service General Technical Report GTR-RM-65. 696pp.

Reynolds, T. D., and C. H. Trost. 1980. The response of native vertebrate populations to crested wheatgrass planting and grazing by sheep. Journal of Range Management 33:122-125.

Reynolds, T. D., and C. H. Trost. 1981. Grazing, crested wheatgrass and bird populations in southeastern Idaho. Northwest Science 55:225-234.

Rich, T. D. 1978. Cowbird parasitism of Sage and Brewer's Sparrows. Condor 80:348.

Rich, T. D. 1980. Nest placement in Sage Thrashers, Sage Sparrows and Brewer's Sparrows. Wilson Bulletin 92:362-368.

Rich, T. D., and S. I. Rothstein. 1985. Sage Thrashers reject cowbird eggs. Condor 87:561-562.

Rising, J. D. 1996. A guide to the identification and natural history of the sparrows of the United States and Canada. Academic Press, New York, NY.

Roberson, J. A. 1986. Sage Grouse-sagebrush relationships: A review. Pages 157-167 *in* E. D. McArthur and B. L. Welch, editors. Proceedings: Symposium on the biology of *Artemisia* and *Chrysothamnus.* USDA Forest Service Intermountain Research Station, General Technical Report INT-200.

Robertson, M. D. 1991. Winter ecology of migratory Sage Grouse and associated effects of prescribed fire in southwestern Idaho. M.S. thesis, Univ. of Idaho, Moscow.

Rosenberg, K. V., and J. V. Wells. (in press). Global perspectives on Neotropical migrant conservation in the Northeast: Long-term responsibility vs. immediate concern. *In* R. E. Bonney, D. Pashley, R. J. Cooper, and L. Niles (editors.). Strategies for bird conservation: The Partners in Flight planning process. Cornell Lab of Ornithology, Ithaca, NY.

Rotenberry, J. T., and J. A. Wiens. 1980. Habitat structure, patchiness, and avian communities in North American steppe vegetation: A multivariate analysis. Ecology 61:1228-1250.

Rotenberry, J. T., and J. A. Wiens. 1989. Reproductive biology of shrubsteppe passerine birds: Geographical and temporal variation in clutch size, brood size, and fledging success. Condor 91:1-14.

Rotenberry, J. T., and J. A. Wiens. 1991. Weather and reproductive variation in shrubsteppe sparrows: A hierarchical analysis. Ecology 72:1325-1335.

Rust, S. K. *In press.* Pinyon-juniper woodland classification and description in Research Natural Areas of southeastern Idaho. *In*: S. B. Monson, R. Stevens R. J. Tausch, R. Miller, and S. Goodrich, editors. Proceedings: Ecology and management of pinyon-juniper communities within the interior west. 15-18 September 1997, Provo, UT. USDA Forest Service Rocky Mountain Research Station General Technical Report.

Rutten, M. G. 1967. Flat bottom glacial valleys, braided rivers, and beavers. Geol. Mijnbouw 46:356-360.

Ryder, R. A. 1980. Effects of grazing on bird habitats. Pages 51-66 *in* R. M. DeGraff and N. G. Tilghman, editors. Workshop proceedings: Management of western forests and grasslands for nongame birds. USDA Forest Service, General Technical Report INT-86.

Ryser, F. A. 1985. Birds of the Great Basin. University of Nevada Press, Reno.

Saab, V. A. 1996. Influence of spatial scale and land management on habitat use by breeding birds in cottonwood forests of southeastern Idaho. PhD Dissertation. University of Colorado, Boulder. 140 pp.

Saab, V. A. 1998. Effects of recreational activity and livestock grazing on habitat use by breeding birds in cottonwood forests along the South Fork Snake River. USDI Bureau of Land Management Tech. Bull. 98-17. Boise, ID 48pp.

Saab, V. A. 1999. Importance of spatial scale to habitat use by breeding birds in riparian forests: A hierarchical analysis. Ecological Applications 9:135-151.

Saab, V. A., and J. Dudley. 1996. Why do burned forests provide conditions for nest site convergence among cavity-

nesting birds? Abstract No. 119. 114th Stated Meeting of the American Ornithologist's Union, 13-17 Aug. 1996, Boise, ID.

Saab, V. A., and J. Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. Res. Pap. RMRS-RP-11. Ogden, UT. USDA Forest Service, Rocky Mountain Research Station.

Saab, V. A., and C. R. Groves. 1992. Idaho's migratory landbirds: Description, habitats, and conservation. Nongame Wildlife Leaflet #10, Idaho Department of Fish and Game, Boise. 16 pp.

Saab, V. A., and J. S. Marks. 1992. Summer habitat use by Columbian Sharp-tailed Grouse in western Idaho. Great Basin Nat. 52:166-173.

Saab, V. A., and T. D. Rich. 1997. Large-scale conservation assessment for neotropical migratory land birds in the Interior Columbia River Basin. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-399. Portland, OR.

Saab, V. A., C. E. Bock, T. D. Rich, and D. S. Dobkin. 1995. Livestock grazing effects in western North America. Pages 311-353 *in* T. E. Martin and D. M. Finch, editors. Ecology and management of neotropical migratory birds. Oxford University Press. New York, NY.

Sakai, H. F., and B. R. Noon. 1991. Nest-site characteristics of Hammond's and Pacific-slope Flycatchers in northwestern California. Western Birds 19:49-60.

Sallabanks, R. 1996. Bird-habitat relationships in forests of the Idaho Southern Batholith landscape. Unpublished annual report, Sustainable Ecosystems Institute, Meridian, Idaho. 72 pp.

Sampson, R. N., D. L. Adams, S. S. Hamilton, S. P. Mealey, R. Steele, and D. Van De Graaff. 1994. Assessing forest ecosystem health in the Inland West. Pages 3-10 *In* R. N. Sampson and D. L. Adams, editors. Assessing forest ecosystem health in the Inland West. The Haworth Press. 461 pp.

Sanders, S. D., and M.A. Flett. 1988. Ecology of a Sierra Nevada population of Willow Flycatchers (*Empidonax traillii*), 1986-1987. California Department of Fish and Game, Wildlife Management Division, Adminstrative Report 88-3. 34 pp.

Santillo, D. J., P. W. Brown, and D. M. Leslie, Jr. 1989. Response of songirds to glyphosphate-induced habitat changes on clearcuts. Journal of Wildlife Management 53:64-71.

Sauer, J. R., J. E. Hines, G. Gough, I. Thomas, and B. G. Peterjohn.1997. The North American Breeding Bird Survey results and analysis. Version 96.4. Patuxent Wildlife Research Center, Laurel, MD.

Schroeder, M. H. and D. L. Sturges. 1975. The effect on the Brewer's Sparrow of spraying big sagebrush. Journal of Range Management 28:294-297.

Schulz, T. T., and W. C. Leininger. 1991. Nongame wildlife communities in grazed and ungrazed montane riparian sites. Great Basin Naturalist 51:286-292.

Sedgwick, J. A. 1987. Avian habitat relationships in pinyon-juniper woodland. Wilson Bulletin 99:413-431.

Sedgwick, J. A. 1994. Hammond's Flycatcher (*Empindonax hammondii*). No. 109 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Serena, M. 1982. The status and distribution of the Willow Flycatcher (*Empidonax traillii*) in selected portions of the Sierra Nevada, 1982. California Department of Fish and Game, Wildlife Management Division, Administrative Report 82-5. 28 pp.

Shaw, S. P., and C. G. Fredine. 1956. Wetlands of the United States. USDI Fish Wildlife Service, Circular 39. 67 pp.

Sieg, C.H. 1991. Rocky Mountain juniper woodlands: year-round avian habitat. USDA Forest Service Research Paper RM-296. 7pp.

Sloan, J. P. 1998a. Historical density and stand structure of an old-growth forest in the Boise Basin of Central Idaho. *In* L. A. Brennan and T. L. Pruden, editors. Fire in ecosystem management: Shifting the paradigm from suppression to prescription. Proceedings of the Tall Timbers Fire Ecology Conference, No. 20. Tall Timbers Research Station, Tallahassee, FL.

Sloan, J. P. 1998b. Interruption of the natural fire cycle in a grand fir forest of central Idaho: changes in stand structure and composition. *In* L. A. Brennan and T. L. Pruden, editors. Fire in ecosystem management: Shifting the paradigm from suppression to prescription. Proceedings of the Tall Timbers Fire Ecology Conference, No. 20. Tall Timbers Research Station, Tallahassee, FL.

Smith, R. D., A. Ammann, C. Bartoldus, and M. M. Brinson. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices. US Army Corp of Engineers Waterways Experiment Station, Washington D.C. 72pp plus appendix.

Sprugel, D. G. 1991. Disturbance, equilibrium, and environmental variability: what is natural vegetation in a changing environment? Biological Conservation 58:1-18.

St. Clair, L. L., and J. R. Johansen. 1993. Introduction to the symposium on soil crust communities. Great Basin Naturalist 53:1-4.

St. Clair, L. L., J. R. Johansen, and S. R. Rushforth. 1993. Lichens of soil crust communities in the Intermountain areas of the western United States. Great Basin Naturalist 53:5-12.

Steele, R. 1994. The role of succession in forest health. Pages 183-190 *in* R. N. Sampson and D. L. Adams, editors. Assessing forest ecosystem health in the Inland West. The Haworth Press. 461 pp.

Steele, R. Undated. Habitat type class descriptions for the Ecosystem Diversity Matrix. Unpublished report for Boise Cascade Corporation.

Steele, R., S. F. Arno, and K. Geier-Hayes. 1986. Wildfire patterns change in central Idaho's ponderosa pine-Douglas-fir forest. Western Journal of Applied Forestry 1(1):16-18.

Steele, R., R. D. Pfister, R. A. Ryker, and J. A. Kittams. 1981. Forest habitat types of central Idaho. USDA Forest Service General Technical Report INT-114, Intermountain Research Station, Ogden, UT. 138 pp.

Stephens, D. A., and S. H. Sturts. 1998. Idaho bird distribution. Special Publication No. 11, Idaho Museum of Natural History, Pocatello.

Sydeman, W. J., M. Guntert, and R. P. Balda. 1988. Annual reproductive yield in the cooperative Pygmy Nuthatch (*Sitta pygmaea*). Auk 105(1):70-7.

Tamm, S., D. P. Armstrong, and Z. J. Tooze. Display behavior of male Calliope Hummingbirds during the breeding season. Condor 91:272-279.

Taylor, D. M., and C. D. Littlefield. 1986. Willow Flycatcher and Yellow Warbler response to cattle grazing. American Birds 40:1169-1173.

The Nature Conservancy, and Pheasants Forever. 1998. How to get financial assistance to improve your land for wildlife: programs for private landowners. Idaho Department of Fish and Game, USDA Natural Resource Conservation Service, and USDI Fish and Wildlife Service. Pamphlet, 6 pp.

Thomas, J. W., R. G. Anderson, C. Maser, and E. L. Bull. 1979. Snags. Pages 60-77 and 387-389 *In* J.W. Thomas, editor. Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington. USDA Forest Service, Agricultural Handbook 553. 512 pp.

Thompson, C. F., and V. Nolan, Jr. 1973. Population biology of the Yellow-breasted Chat (*Icteria virens)*. Ecological Monographs 43:145-171.

Timossi, I. 1990. California's statewide wildlife habitat relationship's system. California Department of Fish and Game. Computer database for the IBM personal computer. June 1992 Version.

Tisdale, E. W., and M. Hironaka. 1981. The sagebrush-grass ecoregion: A review of the ecological literature. University of Idaho Forest, Wildlife and Range Experiment Station. University of Idaho Contribution No. 209. Moscow.

Tobalske, B. W. 1992. Evaluating habitat suitability using relative abundance and fledging success of Red-naped Sapsuckers. Condor 94:550-553.

Townsend, J. E. 1953. Beaver ecology in western Montana with special reference to movements. Journal of Mammalogy 34:459-479.

Trimble, S. 1989. The sagebrush ocean. University of Nevada Press. Reno.

Trost, C. Personal communication. Idaho State University, Pocatello, ID.

Ulliman, M. J., A. Sands, and T. Hemker. 1998. Draft conservation plan for Columbian Sharp-tailed Grouse and its habitats in Idaho. Idaho Department of Fish and Game, Boise. 36 pp

United States Army Corps of Engineers (USACOE). 1995. Water resources development in Idaho-1995. United States Army Corps of Engineers, Walla Walla District. Walla Walla, Washington. 88 pp.

US Bureau of Land Management. 1991. Final environmental impact statement. Vegetation treatment on BLM lands in thirteen western states.

US Forest Service (USFS). 1994. Neotropical migratory bird reference book, Vol. 1. USDA Forest Service Pacific Southwest Region. 832 pp.

US Forest Service Northern Region. Unpublished species accounts and models for vertebrate species. Missoula, MT.

US Forest Service and US Bureau of Land Management. 1997. Upper Columbia River Basin Draft Environmental Impact Statement. Boise, ID.

Vander Haegan, M. Personal communication.

Vera, C. J., and F. A. Servello. 1994. Effects of paper mill sludge in spruce-fir forests on wildlife in Maine. Journal of Wildlife Management 58:719-727.

Verner, J. 1974. Notes on the current status of some birds of central Washington. Murrelet 55:19-22.

Verner, J., and A. S. Boss, editors. 1980. California wildlife and their habitats: western Sierra Nevada. USDA Forest Service General Technical Report PSW-37. Pacific Southwest Forest and Range Experiment Station. 439 pp.

Wakkinen, W. L. 1990. Nest site characteristics and spring-summer movements of migratory Sage Grouse in southeastern Idaho. M.S. thesis, University of Idaho, Moscow.

Walkinshaw, L. 1966. Summer biology of Traill's Flycatcher. Wilson Bulletin 78:31-46.

Wallestad, R. O. 1971. Summer movements and habitat use by Sage Grouse broods in central Montana. J. Wildlife Management. 35:129-136.

Ward, J. V. 1998. Riverine landscapes: Biodiversity patterns, disturbance regimes, and aquatic conservation. Biological Conservation 83(3):269-278.

Welch, B. L., F. G. Wagstaff, and J. A. Roberson. 1991. Preference of wintering Sage Grouse for big sagebrush. Journal of Range Management 44:462-465.

West, N. E. 1988. Intermountain deserts, shrub steppes and woodlands. Pages 209-230 *in* M. G. Barbour and W. D. Billings, editors. North American terrestrial vegetation. Cambridge University Press. Cambridge, U.K.

West, N. E. 1996. Strategies for maintenance and repair of biotic community diversity on rangelands. Pages 326-346 *in* R. C. Szaro and D. W. Johnston, editors. Biodiversity in managed landscapes. Oxford University Press. New York, NY.

West, N. E., R. J. Tausch, and P. T. Tueller. 1998. A management oriented classification of pinyon-juniper woodlands of the Great Basin. USDA Forest Service General Technical Report RMRS-GTR-12. 42pp.

Whisenant, S. G. 1990. Changing fire frequencies on Idaho's Snake River Plains: Ecological management implications. Pages 4-10 *in* E. D. McArthur, E. M. Romney, and P. T. Tueller, editors. Proceedings of the symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management. USDA Forest Service General Technical Report INT-276, Intermountain Research Station, Ogden, UT.

Wiens, J. A., and J. T. Rotenberry. 1979. Diet niche relationships among North American grassland and shrubsteppe birds. Oecologia 42:253-292.

Wiens, J. A., and J. T. Rotenberry. 1981. Habitat associations and community structure of birds in shrubsteppe environments. Ecological Monographs 51:21-41.

Wiens, J. A., and J. T. Rotenberry. 1985. Response of breeding passerine birds to rangeland alteration in a North American shrubsteppe locality. Journal of Applied Ecology 22:655-668.

Wiens, J. A., J. T. Rotenberry, and B. Van Horne. 1985. Territory size variations in shrubsteppe birds. Auk 102:500-505.

Wiens, J. A., J. T. Rotenberry, and B. Van Horne. 1986. A lesson in the limitation of field experiments: Shrubsteppe birds and habitat alteration. Ecology 67:365-376.

Wiens, J. A., B. Van Horne, and J. T. Rotenberry. 1987. Temporal and spatial variations in the behavior of shrubsteppe birds. Oecologia 73:60-70.

Woodbridge, B. 1995. Personal communication (telephone conversation, February). USDA Forest Service Klamath National Forest, Yreka, CA.

Woods, C. P., and T. J. Cade. 1996. Nesting habitats of the Loggerhead Shrike in sagebrush. Condor 98:75-81.

Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). No. 231 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Young, J. A. 1994. Changes in plant communities in the Great Basin induced by domestic livestock grazing. Pages 113-123 *in* K. T. Harper, L. L. St. Clair, K. H. Thorne and W. M. Hess, editors. Natural history of the Colorado Plateau and Great Basin. University Press of Colorado. Niwot.

Young, J. A., and R. A. Evans. 1978. Population dynamics after wildfire in sagebrush grasslands. Journal of Range Management 31:283-289.

Zeiner, D. C., W. Laudenslayer, Jr., K. Mayer, and M. White, editors. 1990. California's wildlife, Vol. 2, Birds. California Department of Fish and Game, Sacramento. 732 pp.

Zimmerman, G. T., and L. F. Neuenschwander. 1984. Livestock grazing influences on community structure, fire intensity, and fire frequency within the Douglas-fir/ninebark habitat type. Journal of Range Management 37(2):104-110.

APPENDIX 1.

Birds that are confirmed (B) or suspected (b) to breed in Idaho, shown by Physiographic Area. Also shows the one to five habitat associations assigned by Idaho PIF (See Table 1).

Species	PR64	PR89	PR80	Breeding Habitats[a]
Common Loon	B			Marsh
Pied-billed Grebe	B	B	B	Marsh
Horned Grebe		b		Marsh
Red-necked Grebe	B			Marsh
Eared Grebe		B	B	Marsh
Western Grebe	B	B	B	Marsh
Clark's Grebe		B	b	Marsh
A. White Pelican		B	B	Marsh
Double-c. Cormorant	B	B	B	Marsh
American Bittern	B	B	B	Marsh
Great Blue Heron	B	B	B	Riparian, Marsh
Great Egret		B	B	Marsh, Riparian
Snowy Egret		B	B	Marsh
Cattle Egret		B	B	Marsh
Black-c. Night-Heron		B	B	Marsh, Riparian
White-faced Ibis		B	B	Marsh
Turkey Vulture	B	B	B	Cliff,Sage,Locon,Juniper,Mt. Brush
Canada Goose	B	B	B	Marsh, Riparian
Trumpeter Swan	B	B	B	Marsh
Wood Duck	B	B		Riparian,Marsh
Gadwall	B	B	B	Marsh
American Wigeon	B	B	B	Marsh
Mallard	B	B	B	Marsh
Blue-winged Teal	B	B	B	Marsh
Cinnamon Teal	B	B	B	Marsh
Northern Shoveler	B	B	B	Marsh
Northern Pintail	B	B	B	Marsh
Green-winged Teal	B	B	B	Marsh
Canvasback	b	B	B	Marsh
Redhead	B	B	B	Marsh
Ring-necked Duck	B	B	B	Marsh
Lesser Scaup	b	B	B	Marsh
Harlequin Duck	B			Riparian
Bufflehead	B	B		Riparian,Marsh
Common Goldeneye	B	B		Riparian,Marsh
Barrow's Goldeneye	B	B	B	Riparian,Marsh
Hooded Merganser	B	B		Riparian,Marsh
Common Merganser	B	B		Riparian,Marsh
Ruddy Duck	B	B	B	Marsh
Osprey	B	B	B	Locon,Riparian,Marsh
Bald Eagle	B	B	B	Riparian,Locon,Marsh
Northern Harrier	B	B	B	Marsh,Grass, Sage

Appendix 1. continued

Species	PR64	PR89	PR80	Breeding Habitats[a]
Sharp-shinned Hawk	B	B	B	Locon,Aspen,Riparian
Cooper's Hawk	B	B	B	Riparian,Aspen, Locon
Northern Goshawk	B	B	B	Locon,Aspen,Riparian
Swainson's Hawk	B	B	B	Sage,Riparian,Grass
Red-tailed Hawk	B	B	B	Riparian,Sage,Locon,Aspen,Grass
Ferruginous Hawk		B	B	Juniper,Sage,Grass,Cliff
Golden Eagle	B	B	B	Cliff,Sage,Alpine
American Kestrel	B	B	B	Sage,Riparian,Grass
Merlin		B	B	Riparian,P.Pine,Sage
Peregrine Falcon	B	B		Cliff,Marsh,Sage,Grass
Prairie Falcon	B	B	B	Cliff,Sage,Grass
Chukar	B	B		Cliff,Grass,Sage
Gray Partridge	B	B	B	Grass,Sage
Ring-necked Pheasant	B	B	B	Grass,Marsh,Sage
Ruffed Grouse	B	B	B	Aspen,Riparian,Locon,Hicon,LPPine
Sage Grouse	B	B	B	Sage,Grass
Spruce Grouse	B	B		LPPine,Hicon,Locon,Mt.Brush
Blue Grouse	B	B	B	Riparian,Locon,LPPine,Aspen,Hicon
Sharp-tailed Grouse	b	B	B	Grass,Sage
Wild Turkey	B	B		P.Pine,Locon,Riparian,LPPine,Mt.Brush
Mountain Quail	B	B		Riparian,Mt.Brush,Locon,P.Pine,Sage
California Quail	B	B		Grass,Sage,Riparian,Cliff
Gambel's Quail	B			Sage,Grass,Riparian
Virginia Rail	B	B	B	Marsh,Grass
Sora	B	B	B	Marsh
American Coot	B	B	B	Marsh
Sandhill Crane	B	B	B	Marsh,Grass,Riparian
Snowy Plover		b		Marsh
Killdeer	B	B	B	Marsh,Grass,Riparian
Black-necked Stilt		B	B	Marsh
American Avocet	B	B	B	Marsh
Willet	B	B	B	Marsh,Grass
Spotted Sandpiper	B	B	B	Riparian
Upland Sandpiper	B			Grass,Marsh
Long-billed Curlew	B	B	B	Grass,Sage
Common Snipe	B	B	B	Grass,Marsh
Wilson's Phalarope	B	B	B	Marsh
Franklin's Gull	b	B	B	Marsh,Grass
Ring-billed Gull	B	B	B	Marsh,Grass
California Gull	B	B	B	Marsh,Grass
Caspian Tern		B	B	Marsh,Riparian
Common Tern		b	b	Marsh
Forster's Tern		B	B	Marsh
Black Tern	B	B	B	Marsh
Rock Dove	B	B	B	Cliff,Grass,Sage
Mourning Dove	B	B	B	Sage,Juniper,Grass
Black-billed Cuckoo		b		Riparian

Appendix 1. continued

Species	PR64	PR89	PR80	Breeding Habitats[a]
Yellow-billed Cuckoo	b	B		Riparian
Barn Owl	B	B	B	Grass,Locon,Cliff,Riparian,Marsh
Flammulated Owl	b	B	B	P.Pine,Locon,Aspen
Western Screech-Owl	b	B	B	Riparian,Locon,Aspen,Marsh
Great Horned Owl	B	B	B	Locon,Riparian,P.Pine,Cliff,Aspen
N. Pygmy-Owl	B		b	Locon,Hicon,Riparian,P.Pine,Aspen
Burrowing Owl	B	B		Sage,Grass
Barred Owl	B	b		Locon,Hicon,LPPine,Cedar,Riparian
Great Gray Owl	B	B	B	Hicon,Locon,LPPine,Riparian,Marsh
Long-eared Owl	B	B	B	Riparian,Locon,Aspen
Short-eared Owl	B	B	B	Sage,Marsh,Grass
Boreal Owl	B		b	Hicon,Aspen
N. Saw-whet Owl	B	B	B	Locon,Hicon,LPPine,Riparian,Cedar
Common Nighthawk	B	B	B	Sage,Grass
Common Poorwill	b	B	B	Juniper,Sage,Mt. Brush
Black Swift	b			Cliff,Riparian
Vaux's Swift	B			Cedar,Locon,Hicon
White-throated Swift	B	B	b	Cliff,Sage,Riparian
Black-chinned Hum.	B	B	B	Riparian,Sage,Mt. Brush
Calliope Hummingbird	B	B	B	Riparian,Mt. Brush,Alpine
Broad-tailed Hum.	b	B	B	Riparian,Locon,Hicon,Aspen
Rufous Hummingbird	B	B	B	Riparian,Locon,P.Pine,Mt. Brush,Aspen
Belted Kingfisher	B	B	B	Riparian
Lewis' Woodpecker	B	B	b	Locon,P.Pine,Riparian
Williamson's Sapsucker	B	B	B	Locon,Hicon,LPPine,Aspen
Red-naped Sapsucker	B	B	B	Aspen,Locon,Riparian
Downy Woodpecker	B	B	B	Riparian,Locon,Aspen,P.Pine
Hairy Woodpecker	B	B	B	Locon,P.Pine,Hicon,Riparian,LPPine
White-headed Woodp.	B	B		P.Pine,Locon
Three-toed Woodpecker	B		b	Hicon,Locon,LPPine,Cedar
Black-backed Woodp.	B	B		Locon,Hicon,LPPine,P.Pine
Northern Flicker	B	B	B	Locon,P.Pine,Riparian,Aspen,LPPine
Pileated Woodpecker	B			Locon,P.Pine,Cedar,Hicon
Olive-sided Flycatcher	B		b	Hicon,Locon
Western Wood-Pewee	B	B	B	Riparian,Aspen,P.Pine,Locon
Willow Flycatcher	B	B	B	Riparian
Hammond's Flycatcher	B		B	Hicon,Locon,Aspen
Gray Flycatcher	b	B	B	Juniper,Sage
Dusky Flycatcher	B	B	B	Riparian,Locon,Aspen
Cordilleran Flycatcher	B	B	B	Aspen,Locon
Say's Phoebe	B	B	b	Sage,Grass
Ash-throated Flycatcher		B	B	Juniper,Sage
Western Kingbird	B	B	B	Riparian,Sage,Grass
Eastern Kingbird	B	B	B	Riparian
Loggerhead Shrike		B	B	Sage,Juniper
Plumbeous Vireo[b]	?	B	B	Juniper,Riparian
Cassin's Vireo[b]	B	?	?	Locon,Hicon,P.Pine,LPPine?

Appendix 1. continued

Species	PR64	PR89	PR80	Breeding Habitats[a]
Warbling Vireo	B	B	B	Aspen,Locon,Riparian
Red-eyed Vireo	B	b		Riparian
Gray Jay	B	B	B	Hicon,LPPine,Locon,Cedar
Steller's Jay	B	B	B	Locon,Hicon,LPPine,P.Pine,Cedar
Western Scrub-Jay		B	B	Juniper
Pinyon Jay		B	B	Juniper
Clark's Nutcracker	B	B	b	Hicon,Locon,LPPine,P.Pine,Alpine
Black-billed Magpie	B	B	B	Riparian,Sage,Juniper,Grass
American Crow	B	B	B	Riparian,Grass,Locon
Common Raven	B	B	B	Locon,Hicon,LPPine,Cliff,P.Pine
Horned Lark	B	B	B	Grass,Sage
Tree Swallow	B	B	B	Aspen,Locon,Riparian
Violet-gr. Swallow	B	B	B	Hicon,Cliff,Alpine
N. Rough-winged Swall.	B	B	B	Marsh,Riparian,Sage
Bank Swallow	B	B	B	Marsh,Riparian
Cliff Swallow	B	B	B	Cliff,Riparian,Sage
Barn Swallow	B	B	B	Marsh,Riparian
Black-capped Chickadee	B	B	B	Locon,Riparian,LPPine,Aspen,P.Pine
Mountain Chickadee	B	B	B	Locon,Hicon,LPPine,P.Pine,Aspen
Chestnut-backed Chick.	B			Locon,Hicon,Cedar,P.Pine,LPPine
Boreal Chickadee	B			Hicon,LPPine
Juniper Titmouse		B	B	Juniper
Bushtit		B	B	Juniper,Riparian,Mt. Brush
Red-breasted Nuthatch	B	B	B	Locon,P.Pine,Hicon,LPPine,Cedar
White-breasted Nuthatch	B	B	b	Locon,P.Pine,Hicon,LPPine,Riparian
Pygmy Nuthatch	B			P.Pine,Locon
Brown Creeper	B	B	B	Locon,Cedar,Hicon,P.Pine
Rock Wren	B	B	B	Sage,Cliff
Canyon Wren	b	B		Cliff
Bewick's Wren	B			Riparian
House Wren	B	B	B	Riparian,Locon,Aspen
Winter Wren	B			Locon,Hicon,Cedar,LPPine,Riparian
Marsh Wren	B	B	B	Marsh,Riparian
American Dipper	B	B	B	Riparian
Golden-crowned Kinglet	B	B	b	Hicon,Locon,Aspen
Ruby-crowned Kinglet	B	B	B	Hicon,Locon,Juniper
Blue-gray Gnatcatcher		B	B	Juniper,Riparian,Mt. Brush
Western Bluebird	B	B		Locon,Juniper,Riparian
Mountain Bluebird	B	B	B	Sage,Grass,Hicon,Alpine,Locon
Townsend's Solitaire	B	b	B	Locon,Hicon,Juniper
Veery	B	B	B	Riparian
Swainson's Thrush	B	B	B	Locon,Hicon,Aspen,Riparian
Hermit Thrush	B	B	b	Hicon,Locon,P.Pine
American Robin	B	B	B	Riparian,Mt. Brush,Juniper,Locon
Varied Thrush	B			Locon,Hicon,LPPine,Cedar
Gray Catbird	B	B	B	Riparian
N. Mockingbird		B	b	Riparian,Sage

Appendix 1. continued

Species	PR64	PR89	PR80	Breeding Habitats[a]
Sage Thrasher	b	B	B	Sage
European Starling	B	B	B	Grass,Aspen,Marsh,Riparian
American Pipit	B	B		Alpine,Grass
Bohemian Waxwing	B			Riparian
Cedar Waxwing	B	B	B	Juniper,Riparian
Orange-crown. Warbler	B	B	B	Riparian,Aspen
Nashville Warbler	B	B		P.Pine,Locon,Riparian
Virginia's Warbler		B	B	Juniper
Yellow Warbler	B	B	B	Riparian
Yellow-rumped Warbler	B	B	B	Locon,Hicon,Aspen,Riparian
Black-thr. Gray Warbler		B	B	Juniper
Townsend's Warbler	B	b	B	Locon
American Redstart	B	b	b	Riparian
Northern Waterthrush	B	B		Riparian,Aspen
MacGillivray's Warbler	B	B	B	Riparian,Mt. Brush,Locon
Common Yellowthroat	B	B	B	Marsh,Riparian
Wilson's Warbler	B	B		Riparian
Yellow-breasted Chat	B	B	B	Riparian,Marsh
Western Tanager	B	B	B	Locon,P.Pine,Juniper,Aspen,Riparian
Green-tailed Towhee	b	B	B	Mt. Brush,Juniper
Spotted Towhee	B	B	B	Mt. Brush
Chipping Sparrow	B	B	B	Locon,Juniper
Brewer's Sparrow	B	B	B	Sage
Vesper Sparrow	B	B	B	Grass,Sage
Lark Sparrow	b	B	B	Sage,Juniper
Black-throated Sparrow	b	B		Sage
Sage Sparrow	B	B	B	Sage
Lark Bunting	b	B	b	Grass,Sage
Savannah Sparrow	B	B	B	Grass,Riparian,Marsh
Grasshopper Sparrow	B	B	b	Grass
Fox Sparrow	B	B	B	Mt. Brush,Riparian
Song Sparrow	B	B	B	Riparian,Marsh
Lincoln's Sparrow	B		B	Riparian
White-crowned Sparrow	B	B	B	Riparian,Hicon,Alpine
Dark-eyed Junco	B	B	B	Hicon,Locon,Juniper
Black-headed Grosbeak	B	B	B	Riparian,Mt. Brush,Locon
Blue Grosbeak		B	b	Riparian
Lazuli Bunting	B	B	B	Mt. Brush,Riparian,Juniper,Locon
Bobolink	B	B	B	Grass
Red-winged Blackbird	B	B	B	Marsh,Riparian
Western Meadowlark	B	B	B	Grass,Sage
Yellow-headed Blackbird	B	B	B	Marsh
Brewer's Blackbird	B	B	B	Sage,Riparian,Grass
Common Grackle	B	B	B	Riparian,Locon
Great-tailed Grackle[b]		b		Riparian
Brown-headed Cowbird	B	B	B	Sage,Grass,Locon,Hicon,Marsh
Bullock's Oriole	B	B	B	Riparian

Appendix 1. continued

Species	PR64	PR89	PR80	Breeding Habitats[a]
Scott's Oriole		B	B	Juniper,Riparian
Gray-crowned Rosy-Finch	B			Alpine,Hicon,Grass,Cliff,LPPine
Black Rosy-Finch	B	b		Alpine,Hicon,Grass,Cliff,LPPine
Pine Grosbeak	B		b	Hicon,Locon,LPPine,Cedar,Alpine
Cassin's Finch	B	B	B	Hicon,Locon,LPPine
House Finch	B	B	B	Riparian,Locon,P.Pine,LPPine
Red Crossbill	B	b	B	Locon,Hicon,LPPine,Cedar
White-winged Crossbill	b			Hicon,Locon,LPPine
Pine Siskin	B	B	B	Locon,Hicon,P.Pine,Juniper
Lesser Goldfinch		B	B	Riparian
American Goldfinch	B	B	B	Riparian
Evening Grosbeak	B		b	Locon,Hicon,LPPine,Cedar
House Sparrow	B	B	B	Riparian

[a] Habitats are described in Table 1. These are important breeding or foraging habitats.
[b] The distribution and habitat associations for the Plumbeous and Cassin's Vireos and the habitat association for the Great-tailed Grackle are preliminary estimates.

APPENDIX 2.

Prioritization scores for high priority breeding bird species in Idaho. Species are included on this list if their Idaho or Physiographic Area (PA) total scores ≥ 22, **or** their total scores = 18-21 and AI + PT ≥8.[ab] The Total Score is based on the Planning Unit shown; the Idaho score was shown unless a higher score occurred in one of the Physiographic Areas, as indicated in the Planning Unit column. Individual criterion scores are those for the Planning Unit shown. Percent population is only given when it was ≥ 10% in the Physiographic Area shown.

Species	Total Score	Planning Unit	AI	PT	TB	RA	BD	ND	TN	% Pop.
Western Grebe	22	Idaho	5	3	3	3	3	3	2	
American White Pelican	24	PA 80	5	3	4	3	3	3	3	18.2 (80)
										16.3 (64)
White-faced Ibis	20	PA 89	5	3	4	3	1	1	3	59.8 (80)
										14.6 (89)
Trumpeter Swan[c]	26	Idaho	3	3	4	4	4	4	4	10? (64)
Cinnamon Teal	21	PA 80	5	4	3	3	2	1	3	35.8 (80)
										22.9 (89)
Redhead	22	PA 89	5	3	4	3	2	2	3	21.7 (89)
										15.5 (80)
Barrow's Goldeneye	24	PA 64	5	3	3	4	3	4	2	35.5 (64)
Hooded Merganser	22	PA 64	4	3	3	4	2	4	2	24.1 (64)
Sharp-shinned Hawk	18	PA 64	5	3	3	3	1	1	2	32.4 (64)
Northern Goshawk	21	PA 64	5	4	3	4	1	1	3	10? (64)
Swainson's Hawk	23	PA 89	4	3	4	3	2	3	4	
Ferruginous Hawk	23	Idaho	4	3	4	4	2	3	3	10.5 (64)
										13.6 (80)
										10.2 (89)
Golden Eagle	19	PA 89	5	3	3	4	1	1	2	30.6 (80)
										11.6 (89)
Prairie Falcon	24	PA 80	5	5	3	4	2	2	3	32.7 (89)
										28.0 (80)
Ruffed Grouse	21	PA 64	3	5	4	3	2	2	2	10? (64)
Sage Grouse	25	Idaho	3	4	4	4	3	3	4	29.3 (80)
										25? (64)
Blue Grouse	24	PA 64	3	5	4	3	3	3	3	14.2 (64)
Sharp-tailed Grouse	20	PA 89	3	3	5	3	2	2	2	
Mountain Quail	24	PA 89	3	3	4	3	4	4	3	
Sandhill Crane	24	Idaho	5	4	3	3	2	4	3	
Killdeer	19	Idaho	4	5	2	2	1	2	3	
Black-necked Stilt	18	PA 80	5	3	3	3	1	1	2	48.2 (80)
American Avocet	23	PA 80	5	3	3	3	2	4	3	53.0 (80)
Long-billed Curlew[c]	23	PA 80	5	2	3	3	3	4	3	10.5 (64)
										15.3 (80)
										15.7 (89)
Franklin's Gull[c]	24	PA 80	5	3	4	3	3	4	2	39.6 (80)
Flammulated Owl	22	Idaho	3	3	3	3	3	4	3	

Appendix 2 continued.

Species	Total Score	Planning Unit	AI	PT	TB	RA	BD	ND	TN	% Pop.
Short-eared Owl[c]	23	Idaho	5	3	4	4	1	1	4	25.6 (80)
										12.5 (89)
Black Swift[c]	23	Idaho	3	3	3	4	3	4	3	12.1 (64)
Vaux's Swift	23	Idaho	5	3	3	3	3	3	3	41.3 (64)
Black-chinned Hummingbird	23	PA 89	3	3	4	3	3	5	2	
Calliope Hummingbird	23	Idaho	5	3	2	3	3	5	2	76.0 (64)
Rufous Hummingbird[c]	22	PA 89	4	3	2	3	3	5	2	18.4 (64)
Lewis' Woodpecker[c]	23	Idaho	3	3	4	4	3	3	3	23.8 (64)
Williamson's Sapsucker	22	PA 64	4	3	3	3	3	3	3	47.6 (64)
White-headed Woodpecker[c]	25	PA 89	3	3	5	3	4	4	3	22.1 (64)
Black-backed Woodpecker	22	PA 64	3	4	4	4	2	2	3	
Olive-sided Flycatcher	21	Idaho	4	5	3	3	1	2	3	
Willow Flycatcher	21	Idaho	4	4	3	3	1	4	2	29.8 (64)
Hammond's Flycatcher	23	Idaho	5	3	3	3	3	4	2	29.4 (64)
Gray Flycatcher	24	PA 89	5	2	4	3	4	4	3	33.1 (80)
Dusky Flycatcher	22	PA 64	5	2	3	3	3	4	2	32.2 (64)
Loggerhead Shrike	20	PA 80	3	5	4	3	1	1	3	
Plumbeous Vireo	22	PA 64	5	3	3	3	2	4	2	41.5?(64)
Pinyon Jay	22	PA 80	5	4	3	2	3	3	2	31.0 (80)
Black-billed Magpie	19	Idaho	5	4	2	2	2	2	2	12.0 (64)
										12.7 (80)
										11.3 (89)
Brown Creeper	18	PA 64	3	5	3	3	1	1	2	11.7 (64)
Rock Wren	19	PA 89	5	3	3	3	1	2	2	10.7 (80)
										21.3 (89)
American Dipper	22	Idaho	5	3	3	4	2	2	3	55.4 (64)
Varied Thrush	22	Idaho	5	4	3	2	2	4	2	
Sage Thrasher	22	PA 89	5	2	5	2	3	3	2	37.1 (80)
										30.9 (89)
Virginia's Warbler[c]	24	Idaho	3	3	3	3	4	5	3	
Yellow Warbler	18	PA 64	5	4	4	2	1	1	1	10.7 (64)
Black-throated Gray Warbler	22	PA 89	3	3	3	3	3	4	3	
Townsend's Warbler	22	Idaho	5	3	3	2	3	3	3	44.3 (64)
MacGillivray's Warbler	21	Idaho	5	3	2	2	3	3	3	36.0 (64)
Western Tanager	20	Idaho	5	3	3	2	2	3	2	38.1 (64)
Brewer's Sparrow[c]	24	PA 89	5	5	5	1	3	3	2	32.1 (80)
										28.1 (89)
Lark Sparrow	20	PA 89	3	5	4	2	1	3	2	
Sage Sparrow[c]	25	PA 89	5	3	5	2	3	4	3	47.2 (80)
										21.2 (89)
Grasshopper Sparrow	20	PA 64	3	5	4	2	1	2	3	
Western Meadowlark	18	Idaho	3	5	3	1	1	2	3	
Black Rosy-Finch	23	PA 80	4	3	2	4	4	4	2	100? (64)

Appendix 2 continued.

---

[a] AI = Area of Importance; PT = Population Trend. See Text for definitions of these and other scores.
[b] The Snowy Plover scored 22, but was deleted from this list because of lack of confirmed breeding.
[C] Watch List species

APPENDIX 3.

Moderate priority species that should be considered in habitat management plans or monitoring plans in Idaho but are not considered high priority species. The Total Score is based on the Planning Unit shown; the Idaho score was shown unless a higher score occurred in one of the Physiographic Areas, as indicated in the Planning Unit column. Individual criterion scores are those for the Planning Unit shown. Percent population is only given when it was ≥ 10% in the Physiographic Area shown.

Species	Total Score	Planning Unit	AI[a]	PT	TB	RA	BD	ND	TN	% Pop.
A. National Audubon Society Watch List species not included in Table 2 or Appendix 2.										
Willet	20	PA 80	4	3	3	3	3	2	2	15.1 (89)
Lark Bunting[b]	21	PA 89	3	3	5	1	3	3	3	
Bobolink	21	PA 80	2	3	4	2	2	2	4	
B. Species for which we have high responsibility (Percent Population ≥ 10% for Physiographic Areas 64, 80, or 89), and are not included in Table 2, Appendix 2, or in section A of this table. Species are given in order of Percent Population score.										
Cassin's Finch	19	Idaho	5	2	3	2	3	2	2	59.8 (64)
Red-naped Sapsucker	21	PA 64,80	5	1	3	3	3	3	3	59.3 (64)
										11.0 (80)
Yellow-rumped Warbler	16	PA 64	4	5	2	2	1	1	1	50.7 (64)
Dark-eyed Junco	13	Idaho	4	2	2	2	1	1	1	44.5 (64)
Red Crossbill	17	Idaho	4	3	3	2	1	1	3	40.5 (64)
Clark's Nutcracker	18	Idaho	4	3	2	3	2	2	2	39.3 (64)
										19.5 (80)
Lazuli Bunting	19	PA 64	5	1	2	2	2	5	2	38.5 (64)
Red-breasted Nuthatch	14	Idaho	4	2	2	2	1	1	2	32.7 (64)
Nashville Warbler	20	PA 89	3	3	4	2	2	4	2	31.8 (64)
Northern Flicker	15	Idaho	5	3	2	2	1	1	1	31.2 (64)
Mountain Chickadee	16	Idaho	3	3	2	2	2	2	2	29.9 (64)
Pine Siskin	14	Idaho	4	4	1	2	1	1	1	29.4 (64)
Cordilleran Flycatcher	21	Idaho	4	3	2	3	3	4	2	29.1 (64)
Caspian Tern	17	PA 89	5	3	3	2	1	1	2	29.0 (89)
Black-throated Sparrow	21	PA 89	4	1	2	1	3	3	2	27.9 (80)
Townsend's Solitaire	19	Idaho	3	4	3	3	2	2	2	26.5 (64)
Osprey	17	Idaho	4	3	2	3	1	1	3	24.9 (64)
Warbling Vireo	18	Idaho	4	3	2	2	1	4	2	24.1 (64)
Ring-necked Duck	20	PA 64	2	3	3	3	2	2	3	16.3 (64)
Western Wood-Pewee	17	Idaho	4	3	2	2	1	2	3	16.0 (64)
Ring-billed Gull	15	PA 89	4	3	1	2	3	1	1	14.9 (89)
Violet-green Swallow	17	Idaho	3	3	2	2	1	3	3	14.4 (64)
Pygmy Nuthatch	20	Idaho	3	3	3	2	3	3	3	14.0 (64)
Snowy Egret	14	PA 80	3	3	2	2	1	1	2	14.0 (80)
Forster's Tern	20	PA 89	3	3	3	3	3	3	2	14.0 (80)

Appendix 3 continued.

Species	Total Score	Planning Unit	AI	PT	TB	RA	BD	ND	TN	% Pop.
Green-tailed Towhee	19	Idaho	3	2	3	2	3	3	2	13.8 (64) 16.9 (80)
White-throated Swift	18	PA 89	4	3	2	2	2	3	2	13.8 (84)
N. Rough-winged Swallow	19	PA 89	4	3	4	2	1	3	2	12.9 (64)
Canvasback	20	PA 89	4	3	4	3	1	2	3	12.4 (89)
Chipping Sparrow	16	PA 89	3	5	2	2	1	2	1	12.3 (64)
Eared Grebe	15	PA 64	4	3	2	2	1	1	2	12.3 (80)
California Gull	19	Idaho	4	3	2	2	3	4	1	12.3 (89)
Brewer's Blackbird	15	Idaho	4	4	2	1	2	1	1	12.1 (64)
Wilson's Phalarope	21	PA 89	4	3	3	2	2	4	3	11.9 (80)
Common Poorwill	21	PA 89	3	3	4	3	2	3	3	11.5 (80)
Vesper Sparrow	16	PA 80	3	5	2	1	1	2	2	11.4 (64)
Lesser Scaup	17	Idaho	4	3	2	2	2	1	3	11.3 (64)
Gadwall	17	PA 89	5	3	3	2	1	1	2	10.8 (89)
Yellow-headed Blackbird	18	PA 80,89	3	2	4	1	2	3	3	10.7 (80)
Northern Harrier	18	PA 80,89	5	2	4	3	1	1	3	10.7 (89)
Spotted Towhee	17	Idaho	3	3	3	2	2	2	2	10.3 (64)
Black-capped Chickadee	13	Idaho	3	2	2	2	1	1	2	10.0 (64)

C. Species scoring 18-21 and are specialists and not included in Table 2, Appendix 2, or sections A or B of this table. Species are listed in the order recognized by the American Ornithologists' Union (1998).

Red-necked Grebe	19	PA 64	4	3	3	3	1	2	2
Clark's Grebe	20	Idaho	3	3	3	3	3	3	2
American Bittern	19	PA 89	3	3	4	3	1	2	3
Wood Duck	19	PA 64	3	3	3	4	1	2	3
Harlequin Duck	20	Idaho	3	3	3	3	2	3	3
Bufflehead	18	Idaho	3	3	3	3	2	1	3
Ruddy Duck	19	PA 89	4	3	3	2	2	2	3
Upland Sandpiper	20	Idaho	3	3	3	2	2	3	4
Black Tern	18	Idaho	3	3	4	2	1	2	3
Black-billed Cuckoo[b]	20	PA 89	3	3	4	3	2	2	3
Yellow-billed Cuckoo[b]	19	PA 89	3	3	4	3	1	2	3
Burrowing Owl	19	Idaho	3	3	4	3	1	2	3
Boreal Owl	18	Idaho	3	3	2	4	2	2	2
Ash-throated Flycatcher	18	PA 89	2	3	4	2	2	3	2
Western Scrub-Jay	18	Idaho	3	3	2	2	3	3	2
Juniper Titmouse	21	Idaho	3	3	3	3	3	3	3
Canyon Wren	18	PA 80	3	3	3	3	2	2	2
Marsh Wren	20	PA 89	4	3	4	2	2	2	3
Veery	19	Idaho	3	4	3	2	2	2	3
Blue Grosbeak	18	PA 89	3	3	4	2	1	3	2
Bullock's Oriole	19	Idaho	3	4	3	2	1	4	2

Appendix 3 continued.

Species	Total Score	Planning Unit	AI	PT	TB	RA	BD	ND	TN	% Pop.
Scott's Oriole[b]	21	PA 80	3	3	3	3	3	4	2	
D. Species federally listed as threatened or recently delisted and are not included in Table 2, Appendix 2, or in Sections A, B, or C of this table.										
Bald Eagle	19	PA 89	3	3	4	3	2	1	3	
Peregrine Falcon	19	Idaho	3	3	4	4	1	1	3	
E. Species that Idaho PIF members requested be raised to priority status because of disagreement with scores as given by the Colorado Bird Observatory, and are not included in Table 2, Appendix 2, or in sections A, B, C, or D of this table. Only those species that, with revised scores, have a total score of ≥18 are included. Changed scores are shown in bold face.										
Three-toed Woodpecker[c]	19	Idaho	3	3	4	4	1	1	3	
Bushtit[d]	**18**	Idaho	3	3	**4**	2	2	2	2	

[a] See Text for description of scores.
[b] Peripheral species.
[c] Concerns similar as for Black-backed Woodpecker.
[d] Extirpated in some areas; rare.

APPENDIX 4

Idaho breeding bird species list by habitat. Species for which a habitat is its primary breeding habitat are listed in bold face. Breeding habitat can also include important foraging habitat during the breeding season. High = High priority species, Mod = Moderate priority species.

Alpine

Golden Eagle--High
Calliope Hummingbird--High
Clark's Nutcracker--Mod
Violet-green Swallow--Mod
Mountain Bluebird
American Pipit
White-crowned Sparrow
Gray-crowned Rosy-Finch
Black Rosy-Finch--High
Pine Grosbeak

High-elevation Mixed Conifer Forest

Ruffed Grouse--High
Spruce Grouse
Blue Grouse--High
Northern Pygmy-Owl
Barred Owl
Great Gray Owl
Boreal Owl--Mod
Northern Saw-whet Owl
Vaux's Swift--High
Broad-tailed Hummingbird
Williamson's Sapsucker--High
Hairy Woodpecker
Three-toed Woodpecker--Mod
Black-backed Woodpecker--High
Pileated Woodpecker
Olive-sided Flycatcher--High
Hammond's Flycatcher--High
Cassin's Vireo
Gray Jay
Steller's Jay
Clark's Nutcracker--Mod
Common Raven
Violet-green Swallow--Mod
Mountain Chickadee--Mod
Chestnut-backed Chickadee
Boreal Chickadee
Red-breasted Nuthatch--Mod
White-breasted Nuthatch
Brown Creeper--High
Winter Wren
Golden-crowned Kinglet--Mod
Ruby-crowned Kinglet
Mountain Bluebird
Townsend's Solitaire--Mod
Swainson's Thrush
Hermit Thrush
Varied Thrush--High
Yellow-rumped Warbler
White-crowned Sparrow
Dark-eyed Junco--Mod
Brown-headed Cowbird
Gray-crowned Rosy-Finch
Black Rosy-Finch--High
Pine Grosbeak
Cassin's Finch--Mod
Red Crossbill--Mod
White-winged Crossbill
Pine Siskin--Mod
Evening Grosbeak

Lodgepole Pine

Ruffed Grouse--High
Spruce Grouse
Blue Grouse--High
Wild Turkey
Barred Owl
Great Gray Owl
Northern Saw-whet Owl
Williamson's Sapsucker--High
Hairy Woodpecker
Three-toed Woodpecker--Mod

Black-backed Woodpecker--High
Northern Flicker--Mod
Cassin's Vireo?
Gray Jay
Steller's Jay
Clark's Nutcracker--Mod
Common Raven
Black-capped Chickadee--Mod
Mountain Chickadee--Mod
Chestnut-backed Chickadee
Boreal Chickadee
Red-breasted Nuthatch--Mod
White-breasted Nuthatch
Winter Wren
Varied Thrush--High
Gray-crowned Rosy-Finch
Black Rosy-Finch--High
Pine Grosbeak
Cassin's Finch--Mod
House Finch
Red Crossbill--Mod
White-winged Crossbill
Evening Grosbeak

Cedar and Hemlock Forest

Barred Owl
Northern Saw-whet Owl
Vaux's Swift--High
Three-toed Woodpecker--Mod
Pileated Woodpecker
Gray Jay
Steller's Jay
Chestnut-backed Chickadee
Red-breasted Nuthatch--Mod
Brown Creeper--High
Winter Wren
Varied Thrush--High
Pine Grosbeak
Red Crossbill--Mod
Evening Grosbeak

Low-elevation Mixed Conifer Forest

Turkey Vulture
Osprey--Mod
Bald Eagle--Mod
Sharp-shinned Hawk--High
Cooper's Hawk
Northern Goshawk--High
Red-tailed Hawk
Ruffed Grouse--High
Spruce Grouse
Blue Grouse--High
Wild Turkey
Mountain Quail--High
Barn Owl
Flammulated Owl--High
Western Screech-Owl
Great Horned Owl
Northern Pygmy-Owl
Barred Owl
Great Gray Owl
Long-eared Owl
Northern Saw-whet Owl
Vaux's Swift--High
Broad-tailed Hummingbird
Rufous Hummingbird--High
Lewis' Woodpecker--High
Red-naped Sapsucker--Mod
Williamson's Sapsucker--High
Downy Woodpecker
Hairy Woodpecker
White-headed Woodpecker--High
Three-toed Woodpecker--Mod
Black-backed Woodpecker--High
Northern Flicker--Mod
Pileated Woodpecker
Olive-sided Flycatcher--High
Western Wood-Pewee--Mod
Hammond's Flycatcher--High
Dusky Flycatcher--High
Cordilleran Flycatcher--Mod
Tree Swallow
Cassin's Vireo
Warbling Vireo--Mod

Gray Jay
Steller's Jay
Clark's Nutcracker--Mod
American Crow
Common Raven
Black-capped Chickadee--Mod
Mountain Chickadee--Mod
Chestnut-backed Chickadee
Red-breasted Nuthatch--Mod
White-breasted Nuthatch
Pygmy Nuthatch--Mod
Brown Creeper--High
House Wren
Winter Wren
Golden-crowned Kinglet--Mod
Ruby-crowned Kinglet
Western Bluebird
Mountain Bluebird
Townsend's Solitaire--Mod
Swainson's Thrush
Hermit Thrush
American Robin
Varied Thrush--High
Nashville Warbler--Mod
Yellow-rumped Warbler--Mod
Townsend's Warbler--High
MacGillivray's Warbler--High
Western Tanager--High
Chipping Sparrow--Mod
Dark-eyed Junco--Mod
Black-headed Grosbeak
Lazuli Bunting--Mod
Common Grackle
Brown-headed Cowbird
Pine Grosbeak
Cassin's Finch--Mod
House Finch
Red Crossbill--Mod
White-winged Crossbill
Pine Siskin--Mod
Evening Grosbeak

<u>Ponderosa Pine Forest</u>

Merlin
Wild Turkey
Mountain Quail--High
Flammulated Owl--High
Great Horned Owl
Northern Pygmy-Owl
Rufous Hummingbird--High
Lewis' Woodpecker--High
Downy Woodpecker
Hairy Woodpecker
White-headed Woodpecker--High
Black-backed Woodpecker--High
Northern Flicker--Mod
Pileated Woodpecker
Western Wood-Pewee--Mod
Cassin's Vireo
Steller's Jay
Clark's Nutcracker--Mod
Common Raven
Black-capped Chickadee--Mod
Mountain Chickadee--Mod
Chestnut-backed Chickadee
Red-breasted Nuthatch--Mod
White-breasted Nuthatch
Pygmy Nuthatch--Mod
Brown Creeper--High
Hermit Thrush
Nashville Warbler--Mod
Western Tanager--High
House Finch
Pine Siskin--Mod

Juniper/Pinyon/Mt. Mahogany

Turkey Vulture
Ferruginous Hawk--High
Mourning Dove
Common Poorwill--Mod
Gray Flycatcher--High
Ash-throated Flycatcher--Mod
Loggerhead Shrike--High
Plumbeous Vireo--High
Western Scrub-Jay--Mod
Pinyon Jay--High
Black-billed Magpie--High
Juniper Titmouse--Mod
Bushtit--Mod
Ruby-crowned Kinglet
Blue-gray Gnatcatcher
Western Bluebird
Townsend's Solitaire--Mod
American Robin
Cedar Waxwing
Virginia's Warbler--High
Black-throated Gray Warbler--High
Western Tanager--High
Green-tailed Towhee--Mod
Chipping Sparrow--Mod
Lark Sparrow--High
Dark-eyed Junco--Mod
Lazuli Bunting--Mod
Scott's Oriole--Mod
Pine Siskin--Mod

Aspen

Sharp-shinned Hawk--High
Cooper's Hawk
Northern Goshawk--High
Red-tailed Hawk
Ruffed Grouse--High
Blue Grouse--High
Flammulated Owl--High
Western Screech-Owl
Great Horned Owl
Northern Pygmy-Owl
Long-eared Owl
Boreal Owl--Mod
Broad-tailed Hummingbird
Rufous Hummingbird--High
Williamson's Sapsucker--High
Red-naped Sapsucker--Mod
Downy Woodpecker
Northern Flicker--Mod
Western Wood-Pewee--Mod
Hammond's Flycatcher--High
Dusky Flycatcher--High
Cordilleran Flycatcher--Mod
Warbling Vireo--Mod
Tree Swallow
Black-capped Chickadee--Mod
Mountain Chickadee--Mod
House Wren
Golden-crowned Kinglet--Mod
Swainson's Thrush
European Starling
Orange-crowned Warbler
Yellow-rumped Warbler--Mod
Northern Waterthrush
Western Tanager--High

Mountain Brush

Turkey Vulture
Spruce Grouse
Sharp-tailed Grouse (winter)
Wild Turkey
Mountain Quail--High
Common Poorwill--Mod
Black-chinned Hummingbird--High
Calliope Hummingbird--High
Rufous Hummingbird--High
Blue-gray Gnatcatcher
Bushtit--Mod
American Robin
MacGillivray's Warbler--High
Black-headed Grosbeak

Green-tailed Towhee--Mod
Spotted Towhee--Mod
Lazuli Bunting--Mod
Fox Sparrow

Sagebrush/Salt Desert Shrub

Turkey Vulture
Northern Harrier--Mod
Swainson's Hawk--High
Red-tailed Hawk
Ferruginous Hawk--High
Golden Eagle--High
American Kestrel
Merlin
Peregrine Falcon--Mod
Prairie Falcon--High
Chukar
Gray Partridge
Ring-necked Pheasant
Sage Grouse--High
Sharp-tailed Grouse--High
Mountain Quail--High
California Quail
Gambel's Quail
Long-billed Curlew--High
Rock Dove
Mourning Dove
Burrowing Owl--Mod
Short-eared Owl--High
Common Nighthawk
Common Poorwill--Mod
White-throated Swift--Mod
Black-chinned Hummingbird--High
Gray Flycatcher--High
Say's Phoebe
Ash-throated Flycatcher--Mod
Western Kingbird
Loggerhead Shrike--High
Black-billed Magpie--High
Horned Lark
Northern Rough-winged Swallow--Mod
Cliff Swallow
Rock Wren--High
Mountain Bluebird
Northern Mockingbird
Sage Thrasher--High
Brewer's Sparrow--High
Vesper Sparrow--Mod
Lark Sparrow--High
Black-throated Sparrow--Mod
Sage Sparrow--High
Lark Bunting--Mod
Western Meadowlark--High
Brewer's Blackbird--Mod
Brown-headed Cowbird

Grassland

Northern Harrier--Mod
Swainson's Hawk--High
Red-tailed Hawk
Ferruginous Hawk--High
American Kestrel
Peregrine Falcon--Mod
Prairie Falcon--High
Chukar
Gray Partridge
Ring-necked Pheasant
Sage Grouse--High
Sharp-tailed Grouse--High
California Quail
Gambel's Quail
Virginia Rail
Sandhill Crane--High
Killdeer--High
Willet--Mod
Upland Sandpiper--Mod
Long-billed Curlew--High

Common Snipe
Franklin's Gull--High
Ring-billed Gull--Mod
California Gull--Mod
Rock Dove
Mourning Dove
Barn Owl
Burrowing Owl--Mod
Short-eared Owl--High
Common Nighthawk
Say's Phoebe
Western Kingbird
Black-billed Magpie--High
American Crow
Horned Lark
Mountain Bluebird
American Pipit
European Starling
Vesper Sparrow--Mod
Lark Bunting--Mod
Savannah Sparrow
Grasshopper Sparrow--High
Bobolink--Mod
Western Meadowlark--High
Brewer's Blackbird--Mod
Brown-headed Cowbird
Gray-crowned Rosy-Finch
Black Rosy-Finch--High

<u>Non-Riverine Wetlands (Marshes, Lakes, Ponds)</u>

Common Loon
Pied-billed Grebe
Horned Grebe
Red-necked Grebe--Mod
Eared Grebe--Mod
Western Grebe--High
Clark's Grebe--Mod
American White Pelican--High
Double-crested Cormorant
American Bittern--Mod
Great Blue Heron
Great Egret
Snowy Egret--Mod
Cattle Egret
Black-crowned Night-Heron
White-faced Ibis--High
Canada Goose
Trumpeter Swan--High
Wood Duck--Mod
Gadwall--Mod
American Wigeon
Mallard
Blue-winged Teal
Cinnamon Teal--High
Northern Shoveler
Northern Pintail
Green-winged Teal
Canvasback--Mod
Redhead--High
Ring-necked Duck--Mod
Lesser Scaup--Mod
Bufflehead--Mod
Common Goldeneye
Barrow's Goldeneye--High
Hooded Merganser--High
Common Merganser
Ruddy Duck--Mod
Osprey--Mod
Bald Eagle--Mod
Northern Harrier--Mod
Peregrine Falcon--Mod
Ring-necked Pheasant
Virginia Rail
Sora
American Coot
Sandhill Crane--High
Snowy Plover
Killdeer--High
Black-necked Stilt--High
American Avocet--High
Willet--Mod
Upland Sandpiper--Mod
Common Snipe
Wilson's Phalarope--Mod
Franklin's Gull--High
Ring-billed Gull--Mod
California Gull--Mod
Caspian Tern--Mod
Common Tern
Forster's Tern--Mod

Black Tern--Mod
Barn Owl
Western Screech-Owl
Great Gray Owl
Short-eared Owl--High
Northern Rough-winged Swallow--Mod
Bank Swallow
Barn Swallow
Marsh Wren--Mod
European Starling
Common Yellowthroat
Yellow-breasted Chat
Savannah Sparrow
Song Sparrow
Red-winged Blackbird
Yellow-headed Blackbird--Mod
Brown-headed Cowbird

Riparian

Great Blue Heron
Great Egret
Black-crowned Night-Heron
Canada Goose
Wood Duck--Mod
Harlequin Duck--Mod
Bufflehead--Mod
Common Goldeneye
Barrow's Goldeneye--High
Hooded Merganser--High
Common Merganser
Osprey--Mod
Bald Eagle--Mod
Sharp-shinned Hawk--High
Cooper's Hawk
Northern Goshawk--High
Swainson's Hawk--High
Red-tailed Hawk
American Kestrel
Merlin
Ruffed Grouse--High
Blue Grouse--High
Wild Turkey
Mountain Quail--High
California Quail
Gambel's Quail
Sandhill Crane--High
Killdeer--High
Spotted Sandpiper
Caspian Tern--Mod
Black-billed Cuckoo--Mod
Yellow-billed Cuckoo--Mod
Barn Owl
Western Screech-Owl
Great Horned Owl
Northern Pygmy-Owl
Barred Owl
Great Gray Owl
Long-eared Owl
Northern Saw-whet Owl
Black Swift--High
White-throated Swift--Mod
Black-chinned Hummingbird--High
Calliope Hummingbird--High
Broad-tailed Hummingbird
Rufous Hummingbird--High
Belted Kingfisher
Lewis' Woodpecker--High
Red-naped Sapsucker--Mod
Downy Woodpecker
Hairy Woodpecker
Northern Flicker--Mod
Western Wood-Pewee--Mod
Willow Flycatcher--High
Dusky Flycatcher--High
Western Kingbird
Eastern Kingbird
Plumbeous Vireo--High
Warbling Vireo--Mod
Red-eyed Vireo
Black-billed Magpie--High
American Crow
Tree Swallow
Northern Rough-winged Swallow--Mod
Bank Swallow
Cliff Swallow
Barn Swallow
Black-capped Chickadee--Mod
Bushtit--Mod
White-breasted Nuthatch
Bewick's Wren
House Wren

Winter Wren
Marsh Wren--Mod
American Dipper--High
Blue-gray Gnatcatcher
Western Bluebird
Veery--Mod
Swainson's Thrush
American Robin
Gray Catbird
Northern Mockingbird
European Starling
Bohemian Waxwing
Cedar Waxwing
Orange-crowned Warbler
Nashville Warbler--Mod
Yellow Warbler--High
Yellow-rumped Warbler--Mod
American Redstart
Northern Waterthrush
MacGillivray's Warbler--High
Common Yellowthroat
Wilson's Warbler
Yellow-breasted Chat
Western Tanager--High
Savannah Sparrow
Fox Sparrow
Song Sparrow
Lincoln's Sparrow
White-crowned Sparrow
Black-headed Grosbeak
Blue Grosbeak--Mod
Lazuli Bunting--Mod
Red-winged Blackbird
Brewer's Blackbird--Mod
Common Grackle
Great-tailed Grackle
Bullock's Oriole--Mod
Scott's Oriole--Mod
House Finch
Lesser Goldfinch
American Goldfinch
House Sparrow

<u>Cliffs/Rock Outcrops/Talus</u>

Turkey Vulture
Ferruginous Hawk--High
Golden Eagle--High
Peregrine Falcon--Mod
Prairie Falcon--High
Chukar
California Quail
Rock Dove
Barn Owl
Great Horned Owl
Black Swift--High
White-throated Swift--Mod
Common Raven
Violet-green Swallow--Mod
Cliff Swallow
Rock Wren--High
Canyon Wren--Mod
Gray-crowned Rosy-Finch
Black Rosy-Finch--High

Appendix 5.

Species accounts by habitat for priority and focal bird species mentioned in the Idaho Bird Conservation Plan. For information about other bird species in Idaho, consult the *Atlas of Idaho's Wildlife* (Groves et al. 1997). Information on each species' total range is from Groves et al. (1997).

SAGEBRUSH PRIORITY SPECIES ACCOUNTS

Except where other sources are cited, the following sagebrush species accounts are based on these major compilations of bird life histories:*Birds of the Great Basin* (Ryser 1985), *The Birder's Handbook* (Ehrlich et al. 1988), *Conservation and Management of Neotropical Migrant Birds in the Northern Rockies and Great Plains* (Dobkin 1994), *The Sparrows of the United States and Canada* (Rising 1996), the *Atlas of Idaho's Wildlife* (Groves et al. 1997), and the Idaho Heritage Program's vertebrate characterization abstracts database. These accounts were compiled by Paige and Ritter (1999).

Swainson's Hawk

Distribution. Swainson's Hawk breeds in portions of Alaska and western Canada, east to Minnesota and Illinois, and south to southern California, parts of Mexico, Texas, and Missouri. In Idaho, it breeds throughout the southern half of the state, and in latilong 4 (Stephens and Sturts 1998). Highly migratory, the species mostly winters from south of the United States to South America. Birds from throughout North America winter in concentrations of hundreds to thousands of hawks in the Pampas of Argentina where they forage on locust and grasshopper outbreaks, and roost in woodlands and shelterbelts.

Ecology and Habitat Requirements. The Swainson's Hawk is found in sagebrush shrublands, prairies, and cultivated land (e.g., hay, alfalfa, and grain fields) with scattered trees. Open sagebrush/bunchgrass, juniper/sagebrush/bunchgrass, aspen/grassland, and aspen/sagebrush/bunchgrass communities are important as breeding and feeding habitat in the northern Great Basin (Maser et al. 1984). Tall trees (riparian, juniper, aspen, and shelterbelts) next to open fields are used for nest and roost sites. However, the increase in perch sites in most shrublands (telephone poles, fence posts, and trees) favors the red-tailed hawk over the Swainson's Hawk (Houston and Bechard 1983). Nesting density varies from 0.3 to 4 nests per mi^2 (0.1 to 1.6 per 10 km^2) throughout their range .

The Swainson's Hawk constructs its nest of large twigs in isolated trees or in riparian zones adjacent to open country. The nest is often in a deciduous tree, sometimes in a conifer or shrub. In the Great Basin, nests are often in juniper and not necessarily associated with riparian zones. In a treeless area, the nest may also be placed on a cliff ledge or on the ground.

The Swainson's Hawk feeds in low vegetation in openings of low sagebrush, other shrubs, woodlands, and wet meadows (Maser et al. 1984). Bechard (1982) found that the hawks used cultivated fields after during and after harvesting, taking advantage of reduced plant cover. Locusts, grasshoppers, and crickets are favorite prey, but the Swainson's Hawk also takes small mammals (rabbits, prairie dogs, ground squirrels, mice, voles), birds, amphibians, snakes, and beetles. The species apparently evolved to follow outbreaks of locusts and grasshoppers, however eradication of North American locusts and widespread grasshopper control shifted its diet to small mammals in many areas (B. Woodbridge pers. comm.).

Threats. According to historical accounts, the Swainson's Hawk was once the most common hawk in suitable habitat. In the West, it has been in decline since the early part of the century and is now a rare breeder in the Great Basin (Ryser 1985; Harlow and Bloom 1989). A long-term decrease in productivity has also been documented in Saskatchewan (Houston 1993). Although BBS trends show stable to increasing trends across the West from 1968 to 1995, and across the United States since 1980, these estimates seem to be driven by increases in Montana and Texas. BBS trends for many other areas are less certain due to small sample sizes. Populations in Colorado and Wyoming have declined steadily since 1968, and the central Great Plains show sharp declines since 1980. Relative abundances are low throughout the hawk's breeding range. Declines may be associated with loss of native bunchgrass prairies and perennial grasslands for breeding, foraging, and wintering habitat, widespread pesticide application on wintering grounds, and habitat changes that favor Red-tailed Hawks (Harlow and Bloom 1989). Organophosphate pesticide applications on wintering grounds have inadvertently killed thousands of roosting hawks in recent years (B. Woodbridge pers. comm.).

Ferruginous Hawk

Distribution. The Ferruginous Hawk breeds from eastern Washington, southern Alberta, southern Saskatchewan, and southwestern Manitoba, south to eastern Oregon, Nevada, Arizona, New Mexico, north-central Texas, western Oklahoma, and western Kansas. In Idaho, breeding records are restricted to the southern half of the state (Stephens and Sturts 1998). The breeding populations in the Raft River and Curlew Valleys of southcentral Idaho resulted in classification of this area as a Globally Important Bird Area. This species winters from southwestern United States to Baja California and central Mexico, although a few winter on the breeding grounds.

Ecology and Habitat Requirements. The Ferruginous Hawk is found in flat or rolling landscapes in sagebrush shrublands and other arid shrublands, dry open prairie grasslands, and badlands of western North America. Its optimal habitat is extensive ungrazed or lightly grazed prairie or sagebrush shrublands with nesting sites that command a view (Gilmer and Stewart 1983).

The Ferruginous Hawk prefers to nest in a tree (deciduous or conifer, often juniper) or on rimrock or a cliff ledge with a view. It will also nest on an outcrop, shrub, hillside, haystack, or elevated ground. In Wyoming, nests were observed in junipers, but were most often found in sagebrush shrublands on spires and outcrops (S. Ritter, unpub. data). In the Globally Important Bird Area of southern Idaho, almost all nests are located in juniper trees (P. Makela, pers. commun.). In western Colorado, they nest in lone or small clumps of junipers at the desert edge or the rock outcrops on hillsides (R. Lambeth, pers. comm.). This hawk builds a large nest of heavy sticks and debris and will reuse a nest site and nest from year to year. It will also use artificial nest platforms.

Small mammals (chiefly ground squirrels and pocket gophers east of the Continental Divide, and jackrabbits or cottontails west of the Divide) are the mainstay of this hawk's diet (Bechard and Schmutz 1995). It will also feed on songbirds, ducks, grouse, snakes, lizards, and large insects. The Ferruginous Hawk's breeding density and productivity apparently tracks the abundance of its major prey (Bechard and Schmutz 1995).

Threats. Ferruginous Hawk populations suffered large declines in this century due to severe persecution, loss of native prairie habitats, and reduced prey availability including the elimination of prairie dog towns and ground squirrel colonies (Harlow and Bloom 1989). Nest abandonment has been linked to mining developments (Bechard and Schmutz 1995).

Prairie Falcon

Distribution. The Prairie Falcon breeds from southeastern British Columbia, southern Alberta, southern Saskatchewan, and northern North Dakota, south to Baja California, parts of the southwestern U.S.A., and northern Mexico. In Idaho, They primarily breed in the southern half of the state, with some scattered northern breeding areas (Stephens and Sturts 1998). The species mostly winters from southern Canada to Baja California and northern Mexico, often at lower elevations than during breeding season. In fall and winter, Prairie Falcons wander and may congregate locally, possibly following the occurrence of horned larks, a principle prey species.

Ecology and Habitat Requirements. Most associated with prairie grasslands and sagebrush shrublands, the Prairie Falcon can be found in many open habitats from prairies and arid valleys to dry alpine tundra. Availability of cliff nest sites and a prey base of small mammals and birds are important factors. The highest known nesting density in North America is in southwest Idaho where average home range size is 20 to 29 mi^2 (49 to 73 km^2).

The Prairie Falcon nests in a shallow scrape on protected ledges of cliffs and outcrops. Nest sites are usually in a crevice or cavity beneath a protective overhang on a sheer cliff. Most eyries face south or east and overlook open habitats. This falcon will re-use old nest sites as well as finding new sites within a territory. It will also use man-made holes on otherwise unsuitable cliffs.

This falcon preys on small birds (especially horned larks, western meadowlarks, and mourning doves) and small mammals, including ground squirrels and rabbits. Reptiles and insects make up a small portion of its diet. It will flush prey by flying low over the ground, will stoop on flying birds from above, or hunt from a tall perch.

Threats. In Montana, Leedy (1972) found that eggshell thinning from organochloride pesticide poisoning was associated with expanding alfalfa production. In Idaho, the species showed a negative response to moderate grazing in big sagebrush/bluebunch wheatgrass (Reynolds and Trost 1981). Prairie Falcons may be disturbed by mining or other activities near, and especially above, their eyries during the nesting season.

Sage Grouse

Distribution. Sage Grouse were once more widespread, formerly ranging across 14 western states and into three Canadian provinces. Populations were seriously reduced by the 1930s. The Sage Grouse was extirpated in parts of its range, and declined by more than 50% of its former population in Washington, Oregon, California, Nevada, and Utah (DeSante and George 1994). Surveys show a steady and significant decline since 1960 in Idaho and Oregon. A recent summary of Sage Grouse status by Drut (1994) indicates decreasing populations in Washington, Oregon, Montana, and Wyoming, and stable populations in Idaho, Nevada, and Utah. In Idaho, they only breed in the southern half of the state (Stephens and Sturts 1998).

Ecology and Habitat Requirements. A sagebrush obligate in nearly every way, the Sage Grouse is found associated with both tall and short species of sagebrush in foothills, sagebrush shrublands, and mountain slopes. Sage Grouse also occur in mosaics of sagebrush, grasslands, and aspen, but not in pinyon-juniper woodlands or in shadscale shrublands. Habitat requirements vary over the course of the year. Summer home ranges may be 1-2.5 mi^2 (3 to 7 km^2; Connelly and Markham 1983, Gates 1983),

and annual home ranges may be as large as 577 mi^2 (1500 km^2; Connelly, unpublished. data.).

Males display on leks in gatherings of a few to a few hundred birds; leks are used exclusively for display and mating. Leks are in open areas surrounded by sagebrush, or where sagebrush density is low, such as on exposed ridges and knolls.

During early brood-rearing, wet meadows, springs, seeps, and other green areas within gently sloping, sagebrush shrublands (15-25% canopy coverage) close to the nest site are important for insect foraging (Idaho Sage Grouse Task Force 1997). As sagebrush areas dry in June and July, Sage Grouse move to wetter sites with succulent forbs, including wet meadows, irrigated areas, and riparian bordered by sagebrush (Connelly et al. 1988). In a Nevada study, broods used meadows with effective cover 3 to 6 in (7 to 16 cm) tall (Klebenow 1982). Broods used upland habitats with big sagebrush ranging from 1 to 25 % canopy cover and 6 to 8 in tall (15 to 20 cm; Wallestad 1971, Klebenow 1982).

The Sage Grouse's nest is a shallow ground depression lined with grass and sage leaves. The hen conceals its nest most often beneath big sagebrush, but sometimes uses other shrubs. Grouse nests under sagebrush are reportedly more successful than those under other plant species (Connelly et al. 1991). For nesting, hens select sagebrush stands with higher canopy cover (15% to 40%) than surrounding stands, and choose one of the tallest shrubs in the stand (14 to 31 in; 36 to 80 cm) with high lateral cover (Roberson 1986; Wakkinen 1990). Grass cover is important for both concealment and for a warmer microclimate (Call and Maser 1985; Gregg et al. 1994). Compared to random sites, Sage Grouse select sites with taller grass cover (>7 in; 18 cm; Gregg et al. 1994; Connelly et al. 1991). A review by Dobkin (1995) indicates good nesting habitat contains 15% to 35% shrub canopy cover and at least 20% herbaceous cover.

Sage Grouse may migrate only a short distance, not at all, or as much as 47 mi (75 km) between winter, breeding, and summer habitats (Dalke et al. 1963; Braun et al. 1977; Connelly et al. 1988). Fall movement to winter range can span several months (Connelly et al. 1988). Males and females flock separately. Winter ranges may exceed 54 mi^2 (140 km^2; Robertson 1991). Sage Grouse select winter sites based on topography, snow depth, and availability of sagebrush above snow level. They select stands with patches of the highest available canopy cover (10% to 40%) with heights of 10-12 in (25-30 cm) above the snow (Braun et al. 1977; Call and Maser 1985; Idaho Sage Grouse Task Force 1997). They forage in drainages and on slopes with south and west aspects. Wintering grouse feed almost exclusively on sagebrush, choosing plants containing the most protein. In feeding trials, wintering grouse preferred certain subspecies of big sagebrush--mountain big sagebrush, Wyoming big sagebrush, and basin big sagebrush (Welch et al. 1991). Suitable winter habitat in sagebrush may be the most limiting factor in some areas.

The Sage Grouse is restricted to eating soft foods by lack of a muscular gizzard. In the breeding season, sage grouse eat sagebrush and the leaves, flowers, and buds of associated forbs and grasses. They also eat ants and grasshoppers, focusing almost exclusively on grasshoppers during an irruption. In winter, it feeds almost exclusively on the evergreen leaves of sagebrush, most often selecting species and shrubs with high protein levels.

Threats. Sagebrush conversion to agriculture, grazing, and eradication of sagebrush with herbicides eliminated the Sage Grouse from much of its former range, particularly in the Northwest. Destruction and degradation of springs, seeps, and wet meadows by overgrazing, and hunting and poaching pressure also took their toll. During the breeding season, nests and broods may be vulnerable to trampling by livestock. Sage Grouse can be adversely affected by organophosphate and carbamate pesticides (Blus et al. 1989). Use of these pesticides should be avoided near breeding and brood-

rearing habitats (J. Connelly pers. comm.). Idaho Sage Grouse Task Force (1997) states that the number of Sage Grouse in Idaho is at a record low.

Sharp-tailed Grouse

Distribution. Historically, the Columbian subspecies of the Sharp-tailed Grouse ranged in suitable habitats from British Columbia south through eastern Oregon and Washington, Idaho, western Montana, Wyoming, and Colorado, and northern Utah, Nevada, and California (Fig. 1 in Ulliman et al. 1998). Many remaining populations are small and widely separated from other populations. Idaho has the best remaining populations, with 75% of the remaining birds; the subspecies has been extirpated from Oregon, California, and Nevada and they are nearly gone in Montana (Ulliman et al. 1998). In Idaho, they currently only breed in the southwestern and southeastern corners of the state. There are breeding records in latilongs 2 and 4 in the northern part of the state, all from pre-1920 (Burleigh 1972; (Stephens and Sturts 1998).

Ecology and Habitat Requirements. Columbian Sharp-tailed Grouse are associated with prairie grasslands and sagebrush-grasslands. In Idaho, Saab and Marks (1992) found sharp-tails selected big sage habitat types during summer. They use areas dominated by perennial bunchgrasses like bluebunch wheatgrass or Idaho fescue (that have a high percentage of leaves to stem) and the shrub layer, if present, is dominated by big sagebrush and/or antelope bitterbrush (Ulliman et al. 1998). They use grasslands with only small amounts of shrubs to sagebrush/grass areas with shrub cover up to 40%. The common denominator appears to be the amount of cover provided by the vegetation, whether it is herbaceous, shrubs, or a combination. Brood sites are similar to nest sites, but they are usually close to broad-leaved brush patches or shrubby riparian zones. They will also nest and raise broods in cultivated fields (e.g., irrigated pasture, alfalfa hay, grain stubble, dryland seedings; Ulliman et al. 1998). Sharp-tailed Grouse need habitat with moderate vegetative cover, high plant diversity, and high structural diversity. They are predominately associated with flat to rolling terrain during the breeding season. A self-sustaining population of Sharp-tailed Grouse needs thousands of acres (hectares).

Males display on leks, usually in open areas such as a small knoll, bench, or ridge top. Their mating displays, or dancing, occur from March through June, peaking in April. Leks contain as few as two males to as many as 30 or more, but average about 12 males (Ulliman et al. 1998). The females come to the lek to mate, then return to the surrounding grassland or shrubland to nest. Most nest and brood locations are within 1.2 mi (2 km) of the lek where the hen was bred (Ulliman et al. 1998).

Sharp-tailed Grouse nest on the ground in a shallow depression lined with grass, leaves, and other vegetative materials. They nest in sites with an overhead canopy of vegetation, provided either by grasses or shrubs.

Tall, broad-leaved mountain shrub and riparian cover types are critical components of winter habitat for Sharp-tailed Grouse (Saab and Marks 1992). They often move to higher elevations to get into moister sites that support greater amounts of these types of shrubs (Ulliman et al. 1998). However, in mild winters, they often stay in the open grasslands and shrubland communities that they used for nesting and brood-rearing. Suitable winter sites need to be no more than 4 mi (6.4 km) from leks to be useful to sharp-tails (Ulliman et al. 1998). They form mixed-sex winter flocks of 10-35 birds, occasionally up to 100.

Sharp-tailed Grouse feed on leaves, buds, flowers, seeds, and fruit. The young in their first two to three weeks mostly eat insects. In the winter, they eat the buds of broad-leaved trees and shrubs. In Idaho,

the fruits of hawthorn and snowberry are favored as are the buds of chokecherry and serviceberry (Ulliman et al. 1998). Alfalfa, wheat, and barley fields can provide important food resources, but they must be located near permanent cover that provides nesting, brood-rearing, and winter habitat (Ulliman et al. 1998).

Threats. The subspecies Columbian Sharp-tailed Grouse has undergone a significant rangewide decline; they currently occupy less than 10% of their former range (Ulliman et al. 1998). The conversion of native grassland and shrub/grass communities to agriculture and other unsuitable land uses has been primarily responsible for the reduction in Columbian Sharp-tailed Grouse populations (Ulliman et al. 1998). Much of the remaining historical habitat that has not been converted to other uses has been degraded by fire (too much in some areas, not enough in other areas), invasion of non-native annual vegetation, and excessive grazing by livestock (Ulliman et al. 1998). Sharp-tailed Grouse require thousands of acres (hectares) to support a self-sustaining population; large blocks of agriculture are not conducive to sharp-tail occupancy (Ulliman et al. 1998).

Long-billed Curlew

Distribution. The Long-billed Curlew breeds from southwestern Canada, south to eastern Washington, northeastern California, Nevada, Utah, southern Colorado, New Mexico and northern Texas, and east to southwestern Kansas. In Idaho, they breed throughout the southern half of the state and along the western latilong into the Idaho Panhandle (Stephens and Sturts 1998). Long-billed curlews use beaches and mudflats during migration. They migrate to coastal and grassland habitats in California, Mexico, and Central America, and winter in flocks on tidal flats, inland grassland, and agricultural fields.

Ecology and Habitat Requirements. Although a shorebird, the Long-billed Curlew is not associated with water during the breeding season. It breeds in shortgrass uplands, grazed mixed-grass prairie, meadows, arid scrub prairies, and short, open sagebrush. Curlews prefer open areas for nesting with a wide view. They will nest in recently-grazed areas of short vegetation, desert, dry prairies, sagebrush shrublands, grasslands, and moist meadows .

The curlew nests in an open scrape on the ground, usually on a well-drained site with gravelly soils, in a grassy hollow, or on a small slope. It often places the nest near a rock, manure pile, or other object, and lines the scrape with grass, weeds, and bits of cow chips. An Idaho study in grazed cheatgrass found that curlews preferred to nest in areas with short vegetation (4 to 8 in; 10 to 20 cm) and wide visibility, and required a 327 to 5445 yd (300-500 m) buffer zone around a territory that is unoccupied by other curlews. Territories averaged 35 ac (14 ha; Bicak et al. 1982). In Wyoming, nests in sagebrush shrublands were in areas where the sagebrush was short (<1 ft or 0.3 m) and open (S. Ritter, unpub. data). In Utah, nests were in vegetation from 1.8 to 2.5 in tall (4.5 to 6 cm) in small clumps of live and dead vegetation near patches of barren ground (Paton and Dalton 1994). Nest predators include many medium-sized mammals, magpies, gulls, and raptors. The precocial chicks feed themselves from hatching, and remain in dry grasslands until they are able to fly, feeding on items picked from the ground.

Adults pick items from the soil or probe into wet sand and mud, feeding on insects (grasshoppers, beetles, caterpillars, larvae) and other invertebrates, especially worms, crustaceans, mollusks, small amphibians, and the eggs and nestlings of small birds. The long-billed curlew will also consume berries before fall migration.

Threats. Long-billed Curlew populations were decimated by uncontrolled hunting in the 19th and

early 20th centuries. Protected populations in the arctic recovered, but pesticide poisoning and widespread agricultural conversion of grassland habitats in the central and western states have not permitted the same population recovery. Long-billed Curlews generally respond positively to grazing prior to the onset of nesting to create short-grass habitat (Ryder 1980; Bicak et al. 1982; Medin and Clary 1990). A study in the northern plains, however, showed no response to heavy or moderate grazing in mixed-grass habitats (Kantrud and Kologiski 1982), and Reynolds and Trost (1981) found a negative response to moderate grazing in big sage/bluebunch wheatgrass. During the breeding season livestock can trample nests and nestlings.

Burrowing Owl

Distribution. The Burrowing Owl breeds in southwestern Canada, south through the western U.S.A., central Mexico, and central and southern Florida, to much of South America. In Idaho, breeding records mostly are restricted to the southern half of the state, with unconfirmed breeding in latilong 4 in northern Idaho (Stephens and Sturts 1998). The Burrowing Owl migrates from the northernmost areas of its breeding range in the Great Plains and Great Basin to winter in the Southwest, Mexico, and Central America.

Ecology and Habitat Requirements. The Burrowing Owl is found in open, treeless country including dry prairies, grasslands, meadows, open sagebrush shrublands, and agricultural lands, but not in mountain meadows. Where free from direct harassment, it will also use outlying areas of airports, golf courses, road rights-of-way, and vacant lots. The presence of abandoned small mammal burrows in grazed, level grasslands for nest and roost sites is of primary importance (Haug et al. 1993) and it is frequently associated with prairie dog and ground squirrel colonies.

This owl nests in the abandoned burrows of small mammals, especially prairie dogs, ground squirrels, marmots, and badgers. Burrowing Owls in the West do not excavate their own burrows although owls in Florida have been known to do so. The owls prefer areas with a high density of burrows that may provide escape for young owls, and often nest in loose colonies. Owls maintain burrows throughout the nesting season and will return to the same burrow the following year. Badgers are a major nest predator. Other predators are domestic cats and dogs, opossums, weasels, and skunks (Haug et al. 1993). Burrowing Owls will also use human-made structures such as culverts, overflow pipes, and artificial nest burrows.

Active both night and day, the Burrowing Owl hunts mostly at dawn, dusk, and at night. It is an opportunistic predator and feeds on insects, small mammals (kangaroo rats and voles), small birds, and other small vertebrates. It hunts from a perch, from low flight, or by stalking prey on the ground, and forages in short grass, including mowed or grazed pastures.

Threats. Prairie dog and ground squirrel control efforts and agricultural conversion reduced the prey base and nesting habitat for the burrowing owl in many parts of its range. Predators, pesticides, shooting, and vehicle collisions also take a heavy toll on birds. A summary of grazing studies shows mixed responses to grazing in sagebrush and grassland habitats (Saab et al. 1995). Owls will use well-grazed, early successional grasslands that emulate prairie dog towns (MacCracken et al. 1985).

Gray Flycatcher

Distribution. The Gray Flycatcher breeds from central Oregon, southern Idaho, southwestern

Wyoming, northeastern Utah, and central Colorado, south to east-central California, southern Nevada, central Arizona, and west-central New Mexico. In Idaho, there are breeding records in only 6 latilongs in the southern quarter of the state, coinciding with the distribution of juniper (Stephens and Sturts 1998). The species winters from the Southwestern United States to southern Baja and central Mexico in desert sagebrush shrublands, savannahs, and gallery forests (Rappole et al. 1983).

Ecology and Habitat Requirements. Restricted to the arid west, the Gray Flycatcher is a common breeding migrant of the Great Basin, principally associated with juniper woodlands (Ryser 1985). In the western reaches of the Great Basin, the species nests in mature big sagebrush where the sagebrush is luxuriant and reaches the size of small trees. Arid open woodlands (such as juniper, pinyon-juniper, and oak-pine), aspen, tall sagebrush/bunchgrass, and mountain mahogany communities are important breeding and feeding habitat. Riparian woodlands are also important for feeding (Maser et al. 1984).

The Gray Flycatcher constructs a cup nest in a juniper or other low tree or sagebrush, usually within 3 to 12 ft (1 to 4 m) of the ground. Ryser (1985) notes that it may place its nest in or under the same tree as a Swainson's Hawk nest in a passive nesting association, taking advantage of the hawk's defense of its own nest site from snakes, crows, and ravens.

An insectivore, the Gray Flycatcher feeds on beetles, grasshoppers, moths, and other small insects. It flycatches close to ground, sallying out from perches on tops of shrubs and trees. It also catches and gleans insects from the ground and low plants.

Threats. The decline in old-growth juniper and mature big sagebrush stands is a threat to this species. A summary of grazing studies indicates mixed responses to grazing in sagebrush habitats--a positive response in shadscale/Indian ricegrass and Nevada bluegrass/sedge, but a negative response in big sagebrush/bluebunch wheatgrass (Saab et al. 1995).

Sage Thrasher

Distribution. The Sage Thrasher breeds from southern British Columbia southeast to Wyoming, south to southern California (east of Coast Ranges), west to Utah, and south from there to northern New Mexico, northwestern Texas, and western Oklahoma. In Idaho, they only breeding in the southern half of the state (Stephens and Sturts 1998). The Sage Thrasher winters in the Southwest and southern California, through Baja, and into central Mexico, where it uses arid and semi-arid scrub, brush, and thickets.

Ecology and Habitat Requirements. A sagebrush obligate, the Sage Thrasher is almost always associated with sagebrush shrubland communities dominated by big sagebrush, using shrublands for nesting and security cover. It usually breeds between 3900 to 6500 ft (1300 and 2000 m) elevation (Reynolds and Rich 1978), but may nest as low as 2300 ft (700 m) in the Columbia Basin (B. and N. LaFramboise pers. comm.). In the northern Great Basin, tall sagebrush/bunchgrass, juniper/sagebrush/bunchgrass, mountain mahogany/shrub, and aspen/sagebrush/bunchgrass communities are primary breeding and feeding habitats (Maser et al. 1984). It is positively correlated with shrub cover, bare ground, and measures of horizontal habitat heterogeneity, and negatively correlated with the presence of spiny hopsage, budsage, and grass cover (Rotenberry and Wiens 1980; Wiens and Rotenberry 1981). In an Idaho study, the Sage Thrasher was more likely to occur in sites with higher sagebrush cover and greater spatial similarity (Knick and Rotenberry 1995). In Oregon, Sage Thrashers are not found in extensive patches of crested wheatgrass or annual grasses and forbs, but a few will be present once sagebrush covers 2% to 5% of the area (A. Bammann pers. comm.).

Breeding densities in the Great Basin are rarely more than 78 individuals per mi^2 (30 per km^2; Wiens and Rotenberry 1981; Rotenberry and Wiens 1989).

The Sage Thrasher's selection of a nest site is very specific within sagebrush stands, preferring the tallest, densest clump of shrubs available surrounded by little bare ground. It builds its nest in or beneath a shrub, nearly always sagebrush, with dense foliage overhead and almost invariably a depth of 1.5 ft (0.5 m) from the nest to shrub crown. It most often orients the nest to the southeast, presumably for morning warmth, afternoon shading, and protection from prevailing winds (Peterson and Best 1991). Males sing and display from the tops of shrubs, as well as displaying in flight. The Sage Thrasher is known to eject cowbird eggs from the nest (Rich and Rothstein 1985).

An insectivore, the Sage Thrasher especially favors Mormon crickets and their eggs, also grasshoppers, beetles, weevils, ants and bees, and will also eat small fruits and berries. It forages on the ground between shrubs and gleans food from foliage.

Threats. A summary of several studies shows varying responses to grazing in sagebrush; the Sage Thrasher responded positively to grazing in big sage in 2 studies, and negatively in one study (Saab et al. 1995). Long-term responses to grazing are unknown. As a sagebrush obligate, this species is highly dependent on the presence of sagebrush, especially stands with older, taller sagebrush.

Loggerhead Shrike

Distribution. The Loggerhead Shrike breeds across portions of Canada, south through the Great Basin to Baja California, Mexico, the Gulf Coast, and southern Florida. In Idaho, breeding records are restricted to the southern third of the state (Stephens and Sturts 1998). Northern populations of Loggerhead Shrikes retreat from the breeding grounds, and the species winters throughout the southern tier of North America, including the Great Basin and Colorado Plateau, California, the Southwestern states, and south through Mexico (Yosef 1996).

Ecology and Habitat Requirements. The Loggerhead Shrike is found in open country wherever there is low vegetation for foraging and scattered shrubs and trees for nesting and roosting, often around ecotones between open cover types. Hunting perches are an important component of the habitat. The Loggerhead Shrike occurs in sagebrush shrublands, arid scrub, prairies, mountain meadows, desert shrublands, juniper and pinyon-juniper, mountain mahogany, riparian, and shelterbelts (Yosef 1996). In the northern Great Basin, greasewood/grass, tall sagebrush/bunchgrass, mountain mahogany/shrub, juniper/sagebrush/bunchgrass, and riparian communities are primary habitats (Maser et al. 1984). Wiens and Rotenberry (1981) found it uncommon in the sagebrush shrublands and associated with areas of broken topography.

The Loggerhead Shrike builds an open cup nest in a shrub or tree with dense foliage for protective cover, often preferring thorny vegetation, and sometimes a brush pile or vine tangle. It sometimes uses the same nest, and often the same shrub or tree, from past years (Yosef 1996). In a study in southwestern Idaho, nests were constructed deep within shrubs 3 to 6 ft tall (1 to 2 m) and were found in sagebrush (65%), antelope bitterbrush (20%), and greasewood (12%). The study found nests in this sagebrush shrubland were invariably placed low to the ground, averaging 31 in (79 cm; range 13 to 63 in; 33 to 160 cm) regardless of shrub height, and the authors suggest this may be representative of nest heights in arid western shrublands (Woods and Cade 1996).

The shrike hunts where vegetation is scattered and bare ground is exposed, hunting from perches within 6 ft (2 m) of the ground. It feeds chiefly on insects (beetles and grasshoppers) but also small

birds, small mammals (ground squirrels, mice, and voles), and lizards (Yosef 1996). Shrikes adjust their diet to the availability of prey, taking more vertebrates in winter, migratory birds during spring migration, rodents in mid-summer, and grasshoppers once the larger instars become abundant. Shrikes prefer to forage where substrate vegetation is low (0.4 to 9 in; 1 to 25 cm) and hunt on patchy open ground or swoop on prey in shrubs. Young, inexperienced shrikes prefer to hunt on bare ground where their success in capturing prey is higher (Leu 1995).

Threats. Once abundant, the Loggerhead Shrike has declined sharply since the mid-20th century in much of the East and Midwest. Shrikes were often shot in the past, but sharp declines coincide with the use of organochloride pesticides (e.g., DDE and dieldrin) from the 1940s through the 1970s. BBS data show nearly universal declines across the continent and populations in the West have declined significantly since 1968. Declines are thought to be linked to pesticide contamination, habitat loss (e.g., agricultural conversion of sagebrush shrublands and prairies, urbanization, strip-mining, hedgerow destruction), and winter survival problems, but are not well understood.

In the Canadian prairies, steep declines in shrike numbers coincided with grasshopper control using dieldrin, and declines may be connected more to a reduction in prey base than to the direct effects of chemicals on reproduction, but the full effects of pesticide contamination are not known (Yosef 1996). In a Nevada study, Loggerhead Shrikes responded positively to grazing in shadscale and low sage habitats (Page et al. 1978). They showed no response to grazing in big sage/bluebunch wheatgrass in Idaho (Reynolds and Trost 1980) or in shadscale in Utah (Medin 1986). The shrike would benefit by eliminating pesticides and by maintaining a diverse vegetative structure. Long-term heavy grazing may ultimately reduce prey habitat and degrade the vegetation structure for nesting and roosting. Light to moderate grazing may provide open foraging habitat.

Brewer's Sparrow

Distribution. The Brewer's Sparrow breeds across portions of western Canada and southwestern North Dakota, south to southern California, southern Nevada, central Arizona, and northwestern New Mexico. In Idaho, they mostly breed in the southern half of the state, but there are also unconfirmed records in latilongs 4, 9, and 10 (Stephens and Sturts 1998). The Brewer's Sparrow winters from the Southwest through Baja into central Mexico where it uses low, arid vegetation, including desert scrub and creosote bush. Outside the breeding season it is usually seen in large, vocal flocks, often with other sparrows.

Ecology and Habitat Requirements. Considered a sagebrush obligate, the widespread Brewer's Sparrow is tightly associated with sagebrush shrublands that have abundant, scattered shrubs and short grass. It can also be found in mountain mahogany, rabbit brush, pinyon-juniper or bunchgrass grasslands (Rising 1996). In studies of sagebrush shrubland habitat components, Brewer's Sparrows are positively correlated with sagebrush, shrub cover, above-average vegetation height, bare ground, and measures of horizontal habitat heterogeneity, and are negatively correlated with grass cover, spiny hopsage, and budsage (Rotenberry and Wiens 1980; Wiens and Rotenberry 1981; Larson and Bock 1984). The negative correlation with grass cover indicates that they prefer areas dominated by shrubs compared to areas dominated by grass. Brewer's Sparrows will avoid burned sagebrush shrublands in favor of unburned sagebrush (Bock and Bock 1987) and an Idaho study found Brewer's Sparrows more likely to occur in sites with high shrub cover and large patch size (Knick and Rotenberry 1995). In pinyon-juniper, the species is associated with large openings (Sedgwick 1987). Sagebrush provides perch sites for singing males (Wiens et al. 1987).

The Brewer's Sparrow will breed in high densities. Where it occurs, it usually is the most abundant bird species (R. Lambeth pers. comm. citing Reynolds 1981; Rotenberry and Wiens 1989). Breeding territories measured in Washington, Oregon, and Nevada averaged between 1.5 to 3 ac (0.63 and 1.25 ha) and contracted as population density increased, but did not vary in relation to habitat variables measured (Wiens et al. 1985). In the Great Basin, densities average 390 to 780 individuals per mi^2 (150 to 300 per km^2), but can exceed 1295 per mi^2 (500 per km^2; Wiens and Rotenberry 1981; Rotenberry and Wiens 1989). In Oregon, clutch size increased in wetter years, possibly indicating an ability to adjust reproductive investment with variations in climate and presumably prey productivity (Rotenberry and Wiens 1989, 1991). However, ground squirrels (which are an important nest predator and the prey of other predators) also increase with increased precipitation but show a two-year lag, complicating the relationship between climate and nest success (Rotenberry and Wiens 1989).

The Brewer's Sparrow builds an open cup nest in a shrub, preferring large, living sagebrush. In an Idaho study, the species selected taller shrubs, averaging 27 in tall (69 cm) and ranging from 16.5 to 41 in tall (42 to 104 cm). Shrubs less than 19.5 in tall (50 cm) were rarely used (Peterson and Best 1985b). It constructs its nest low in the shrub, from an inch to 3 ft (a few cm to 1 m) from the ground, and on the finest branches of new growth at the shrub's edge (Rich 1980). Concealment and cover provided by living sagebrush foliage is important (Peterson and Best 1985b). An occasional cowbird host, Brewer's Sparrow populations are vulnerable to parasitism where land conversion to agriculture and the fragmentation of sagebrush shrublands provides a contact zone between cowbirds and sagebrush breeders (Rich 1978).

The Brewer's Sparrow forages chiefly in foliage but also on the ground, feeding on alfalfa weevils, aphids, beet leafhoppers, caterpillars, beetles, spiders, grasshoppers, and the seeds of grasses and forbs.

Threats. Brewer's Sparrows are sensitive to sagebrush control, declining with the loss of shrubs and shifting their diet from insects to seeds with changes in food availability. Because they return to the same breeding territories each year, there can be a time-lag in their response to major habitat changes (Wiens and Rotenberry 1985). In the first year following sagebrush control by herbicides, Brewer's Sparrow numbers decline by more than 50% (Best 1972; Schroeder and Sturges 1975; Kerley and Anderson 1995) and in the years following, they abandon the habitat completely as the sagebrush dies out (Schroeder and Sturges 1975). Castrale (1982) found similar reductions in Brewer's Sparrow numbers on burned plots. In a Wyoming study, 22 years after spraying and nine years after burning, numbers were less than 50% of the species' abundance in untreated continuous sagebrush (Kerley and Anderson 1995). Where sagebrush is not completely eliminated, Brewer's Sparrows may persist (Best 1972; Castrale 1982), but the long-term effects of partial shrub reduction need further study. Cowbird parasitism is also a concern where there is fragmentation and cattle (C. Trost pers. comm.).

Sage Sparrow

Distribution. The Sage Sparrow breeds from central Washington, eastern Oregon, southern Idaho, and southwestern and northwestern Canada, south to southern California, central Baja California, southern Nevada, southwestern Utah, northeastern Arizona and northwestern New Mexico. In Idaho, they only breed in the southern third of the state (Stephens and Sturts 1998). In winter, the Sage Sparrow retreats from the northern part of its range and overwinters in southern Oregon, Nevada, Utah and southern Colorado south into northern Mexico. It uses arid, open lands with scattered shrubs, including sagebrush grasslands, coastal chaparral, and weedy scrub.

Ecology and Habitat Requirements. The Sage Sparrow is a sagebrush obligate associated with

sagebrush shrublands dominated by big sagebrush with perennial bunchgrasses. It is also sometimes found in shadscale, antelope brush, rabbitbrush, and in black greasewood (the latter in western Colorado, R. Lambeth pers. comm.). The species occurs from sea level up to 6500 ft (2000 m) elevation. Observers have noted that the Sage Sparrow is not found in all seemingly suitable sagebrush habitats (Rich 1978). Vander Haegan (pers. comm.), in a study in Washington, did not find Sage Sparrows on patches smaller than about 1/2 section (130 ha), and suggests that they are area-sensitive. On a broad scale, it prefers shrublands with tall shrubs and low grass cover, where sagebrush is clumped in a patchy landscape (Wiens et al. 1986; Peterson and Best 1985a). A landscape analysis by Knick and Rotenberry (1995) found Sage Sparrows most likely to use sites with high sagebrush cover, spatially similar patches, large patch size, low disturbance, and little fragmentation. The species is positively correlated with big sagebrush, shrub cover, bare ground, and above-average shrub height, and negatively correlated with cottonthorn, greasewood, and grass cover (Rotenberry and Wiens 1980; Wiens and Rotenberry 1981, Larson and Bock 1984). In the northern Great Basin, it uses low and tall sagebrush/bunchgrass, juniper/sagebrush, mountain mahogany/shrub, and aspen/sagebrush/ bunchgrass communities as primary breeding and feeding habitats (Maser et al. 1984). Breeding densities average between 130 to 520 individuals per mi^2 (50 to 200 per km^2), and territory size averages 3.7 to 7.5 ac (1.5 to 3 ha; Wiens and Rotenberry 1981; Wiens et al. 1985; Rotenberry and Wiens 1989).

The Sage Sparrow builds an open cup nest, usually placed within a sagebrush shrub or on the small branches at the periphery, and occasionally on the ground beneath a shrub. Nest placement appears to be related to the density of cover over the nest, as the sage sparrow will nest higher in taller sagebrush (Rich 1980). A study in southwestern Idaho found that Sage Sparrows preferred living sagebrush from 20 to 28 in tall (50 to 70 cm) and avoided placing nests in the southwest portion of the shrub (Peterson and Best 1985a). The Sage Sparrow is an occasional cowbird host. Before European settlement, the species was probably isolated from cowbird parasitism for the most part, but is now vulnerable to parasitism where land conversion to agriculture and fragmentation of sagebrush shrublands provides a contact zone between cowbirds and sagebrush breeders (Rich 1978).

The Sage Sparrow forages on the ground and in shrubs, feeding on insects (weevils, grasshoppers, crickets, caterpillars, ants, lacewings) and seeds (Wiens and Rotenberry 1979).

Threats. Males show strong site fidelity to breeding territories and may persist where sagebrush is partially removed within a territory or for a short term where sagebrush is completely removed (Wiens and Rotenberry 1985; Wiens et al. 1986). With complete removal of sagebrush on a broader scale, Sage Sparrows steadily decline within two years (Wiens and Rotenberry 1985). In fragmented sagebrush shrubsteppe, they may be vulnerable to cowbird parasitism where habitat alteration brings cowbirds into contact with sagebrush breeders (Rich 1978). As a ground forager, continuous cheatgrass cover is probably detrimental to the Sage Sparrow's foraging success.

RIPARIAN FOCUS SPECIES ACCOUNTS

Sharp-tailed Grouse

See Sagebrush Priority Species Accounts

Black-chinned Hummingbird

Distribution. The Black-chinned Hummingbird breeds from southwestern British Columbia, Washington, central Idaho, and northwestern Montana, south to northern Mexico and southern Texas, and east to western Wyoming, eastern Colorado, eastern New Mexico, and central Texas. In Idaho, there are breeding records scattered throughout the state (Stephens and Sturts 1998). It winters almost entirely in Mexico and some in southern Texas and California.

Ecology and Habitat Requirements. In Idaho, Black-chinned Hummingbirds are found in semi-arid habitat near water, canyons, slopes, chaparral, riparian woodlands, open woodlands, and scrub. They are also found in parks, orchards, and gardens (Groves et al. 1997).

They build their nests in deciduous trees, frequently near water. Trees used include willow, cottonwood, alder, and apples (Johnsgard 1983). They also nest in woody vines and taller herbaceous plants (Cogswell 1949). Average nest height is 10 ft (3 m; Johnsgard 1983). Nests frequently overhang small creek beds. Males typically occur on the drier canyon sides or desert washes (Johnsgard 1983). The seral stages that have high importance for reproduction range from pole size through large trees with a sparse to open canopy closure (Timossi 1990). They appear to benefit from and seek out edge-type habitats.

Black-chinned Hummingbirds take nectar from flowers, or forage by darting out from a perch to catch insects in the air. They forage in shrub and woodland habitats. They feed on a variety of flowers, with favorite species apparently including honey-suckle and larkspur. They also use non-native species.

Black-chinned Hummingbirds apparently defend three types of territories: a male feeding territory of about 10-20 ft (3-6 m) in diameter during the breeding season, 23-50 ft (7-15 m) afterwards; a female nesting territory that includes the nest site, one or more perches, a roost site, and a feeding site; and a mating territory (Bene 1945). Nest densities in Santa Barbara, CA, averaged 41-130 nests per 100 ac (40 ha; Pitelka 1951).

Threats. This species does not appear to be sensitive to human disturbance, as it nests successfully in residential areas. Any activity that would cause a loss of riparian woodlands or decrease in nectar or insects could adversely affect this species. These activities could include use of pesticides and herbicides, mining, off-road vehicle driving, stream channelization, reservoir creation, and golf course or urban development.

Calliope Hummingbird

Distribution. The Calliope Hummingbird occurs throughout Idaho during the breeding season (Stephens and Sturts 1998), except for non-forested and extreme arid portions in the southern part of the state. It migrates, wintering to central and northwest Mexico (Ehrlich et al. 1988; Stephens and Sturts 1998; Calder and Calder 1994).

Ecology and Habitat Requirements. The Calliope Hummingbird is associated with open coniferous forests, montane meadow-shrublands, riparian thickets of willow and alder, burned areas, and wooded hillsides (Hutto 1995; Baicach and Harrison 1997; Csuti et al. 1997). It nests in riparian areas and open forests at the edge of meadows (Csuti et al. 1997). The Calliope Hummingbird prefers forested areas with open canopies areas near water or wet meadows (Csuti et al. 1997), but has also been reported in open willow or sage meadows near coniferous forest (Merrill et al. 1996) and in moist willow and alder thickets (Ehrlich et al. 1988). Calder and Calder (1994) reported nesting Calliope Hummingbirds in

southwestern Wyoming along willow-lined drainages with nests in adjacent lodgepole pine stands. These drainages were next to sagebrush flats that had abundant growth of scarlet gilia and Indian paintbrush.

Dominant species include: lodgepole and ponderosa pine, grand fir, Douglas-fir, Engelmann spruce, western hemlock, western red-cedar, apple, alder, aspen, shrub-sapling stage of Douglas-fir regeneration, lodgepole pine, birch, and maple (Calder and Calder 1994).

Males arrive late April (British Columbia--Tamm et al. 1989); breeding begins mid-May (Baicich and Harrison 1997). In Oregon, they arrive on the breeding grouns by late April (Csuti et al. 1997). They build their nests in trees, usually on a horizontal branch with another branch overhanging, presumably for shelter and better protection from cold. They may rebuild old nests. A relatively high philopatry to local breeding areas has been documented in some states (Calder and Calder 1994). Temperatures at or above 25° C are required during nesting (Calder and Calder 1994). Territory size was estimated as 0.5 to 0.7 ac (0.2 to 0.3 ha) in British Columbia (Tamm et al. 1989). Males hold feeding/breeding territories but do not participate in nesting. The males leave the breeding grounds while the females are still incubating (Ehrlich et al. 1988).

Calliope Hummingbirds primarily feed on nectar, but will also eat spiders, insects, and tree sap (Ehrlich et al. 1988). Nectar sources include Indian paintbrush, penstemon, columbine, trumpet gilia, and elephant head (Groves et al. 1997).

Threats. Closing up of open ponderosa and lodgepole pine forests due to fire suppression is detrimental to this species. Loss of nectar sources due to excessive grazing, noxious plant invasion, or a change in water availability decreases the food availability.

Red-naped Sapsucker

Distribution. The Red-naped Sapsucker breeds in the Rocky Mountain region from south-central British Columbia, southwestern Alberta, and western Montana, south (east of the Cascades) to east-central California, southern Nevada, central Arizona, southern Nevada, central Arizona, southern New Mexico, and extreme western Texas. It breeds throughout Idaho (Stephens and Sturts 1998). It winters in southern Arizona, southern Nevada, central Arizona, and central New Mexico, south to northern Mexico (Groves et al. 1997).

Ecology and Habitat Requirements. Red-naped Sapsuckers breed in forest, mostly in live aspen, sometimes in live larches or dead Engelmann spruce (Baicich and Harrison 1997). They will also nest in other coniferous trees (ponderosa pine, lodgepole pine, grand fir) and in cottonwoods, birches, and willows. Nests are usually in trees with decaying heartwood (especially those infected by Fomes fungus). A study in north-central Idaho found no differences in numbers among clearcut, fragmented, and contiguous stands of coniferous forest (Hutto 1993). Tobalske (1992) compared Red-naped Sapsucker reproductive success in logged and unlogged areas of Montana and found that Red-naped Sapsucker used logged areas for nesting provided that hardwoods (birch and aspen) were present. In the Blue Mountains of Oregon, the species is said to be associated with older stands for nesting and feeding (Thomas et al. 1979).

Saab (1999) found that Red-naped Sapsuckers in cottonwood riparian forests were associated with stands that had a natural upland vegetation adjacent to them, tended to be more associated with stands that had other stands nearby, and were associated with an open canopy.

Red-naped Sapsuckers are cavity nesters, usually nesting 10-20 ft (3 -6 m) up, but up to 70 ft (21 m; Baicich and Harrison 1997). They usually nest in live trees, frequently near water (Groves et al. 1997), but will also nest in snags. They often return to the same tree, but not the same cavity, year after year. Minimum dbh of nest trees is estimated to be approximately 10 in (25 cm; Thomas et al. 1979). They also roost in cavities.

Sapsuckers eat insects and drink sap obtained by drilling holes in live trees. They also eat spiders, cambium, fruits, and berries (Ehrlich et al. 1988). Other species, including hummingbirds, chipmunks, and mice use the sapwells for the sap or for the insects attracted to it. Tobalske (1992) found that sapsuckers nesting in retention areas of cuts foraged in uncut forest.

Howell (1952) in northeastern California, found 14 Red-naped Sapsucker nests within an area 1.5 X 0.5 mi (2.4 X 0.8 km); Zeiner et al. (1990) used these data and maps Howell's maps to estimate territory size at 1.5 to 15 ac (0.6 to 6.0 ha). Home ranges may be different. In Montana, territory size was estimated as 5 ac (2 ha; McClelland 1977).

Threats. Any action that removes berry-producing riparian shrubs, willow shrubs, or deciduous trees and snags from riparian areas and aspen stands would be detrimental to the Red-naped Sapsucker. This species depends on mature forests, because those are the ones with decay in live trees that makes them suitable for excavation, and mature forests have snags. Conifer invasion of aspen stands and riparian forests would probably negatively impact sapsucker populations. Loss of mature forests over time due to lack of recruitment is also a concern.

Willow Flycatcher

Distribution. Willow Flycatchers breed from central British Columbia, east to southern Minnesota and Nova Scotia, and south to southern California, western and central Texas, Arizona, and portions of southeastern United States. They breed through Idaho (Stephens and Sturts 1998). They winter from central Mexico to Columbia.

Ecology and Habitat Requirements. Willow Flycatchers breed in riparian habitat that has a midstory of willows or alders and an intact lower layer (ground to 5 or 6 ft; 1.5 or 1.8 m). The shrubs should be 6-7 ft (1.8-2.1 m) tall at a minimum. Shrub thickets interspersed with openings are used more than large continuous stands (Sanders and Flett 1988; Harris et al. 1988). An overstory of large trees such as cottonwood is not necessary and a dense overstory may discourage use by Willow Flycatchers. Open water or saturated soils are found on most Willow Flycatcher territories (Harris et al. 1988; Sanders and Flett 1988).

Willow Flycatchers nest near openings; large continuous patches will be used mostly around the edges. In one study, most nests were found in willow patch size of 20 or more ac (8 or more ha); patches 10 ac (4 ha) or less were seldom used (Serena 1982; Harris et al. 1988).

Willow Flycatchers build cup-shaped nests in forks of shrubs or deciduous trees. Nests generally are in willows at least 6.6 ft (2 m) high, with a foliage density of approximately 50-70%, and with about 3.3 ft (1 m) of cover above them (Sanders and Flett 1988). Reported territory sizes range from 0.25 to 1.75 ac (0.1 to 0.7 ha; Walkinshaw 1966; Kings River Conservation District 1985; Sanders and Flett 1988). A high rate of cowbird parasitism occurs in northern Colorado. They are most common at lower elevations (<5500 ft; < 1700 m)

Willow Flycatchers eat insects, which they catch in the air or take from foliage. They feed over willows and adjacent openings.

Threats. Loss of thick shrub habitat, especially of willows, is detrimental to the Willow Flycatcher. They are found more often in large continuous patches, so fragmentation is a threat, although some small openings within the patches are necessary for foraging.

Dusky Flycatcher

Distribution. The Dusky Flycatcher nests throughout Idaho (Stephens and Sturts 1998). It breeds throughout the western United States from the southern border of Alaska to northern New Mexico and Arizona and in southern California. A neotropical migrant, this species winters from southeastern Arizona to Mexico.

Ecology and Habitat Requirements. Dusky Flycatchers breed in early successional coniferous or deciduous forests with a well-developed shrub understory and uses edge habitat. It breeds in aspen groves, willow thickets, open coniferous forest, and mountain chaparral. The essential cover elements are low-growing thickets for nesting and foraging, and nearby high singing-posts/look-out stations. According to Sallabanks (1996), they are found in shrub/seedling/sapling warm, dry DF and small tree (<6 in or <15 cm dbh) cool, moist grand fir greater than expected. The dominant tree species is apparently not important, but several species have been mentioned as overstory: ponderosa pine, Douglas-fir, grand fir, aspen, and pinyon-juniper. They appear to use managed and unmanaged forests where a shrubby component is present. Canopy cover should be below 40% for nesting (Timossi 1990).

Dusky Flycatchers nest in upright crotches of shrubs and trees from 3 to 20 ft (1 to 6 m) off the ground. Territory size ranges from 4-8 ac (1.6 to 3.2 ha), depending on the habitat quality and insect abundance. An abundant supply of flying insects is an essential habitat element for this species.

Threats. Dusky flycatchers appear to be capable of withstanding some level of timber harvest within their habitat, particularly selective harvest. Retention of a brush understory is important, so activities which remove this understory, such as grazing, mining, recreational developments, agricultural conversions, or road building, will decrease a site's suitability for Dusky Flycatchers.

Veery

Distribution. The Veery breeds from southern British Columbia, east across southern Canada to Newfoundland, and south to Oregon, Colorado, portions of the Midwest, and southern Appalacians. They breed throughout Idaho except for the extreme southwestern latilongs (Stephens and Sturts 1998). They winter in northern South America.

Ecology and Habitat Requirements. Veerys breed in moist, low elevation deciduous forests with a dense understory. They are also found in very thick and wide willow or alder shrub riparian habitat near water. Dominant plant species include willow, alder, water birch, creek dogwood, current, rose, aspen, and cottonwood. Results of an Idaho study indicated that in a cottonwood forest, Veerys showed a preference for dogwood subcanopies (Saab 1996). The probability of finding Veerys present in cottonwood riparian forest increases with patch size (Saab 1996).

The Veery builds a cup-shaped nest, preferably on moist substrate, on the ground or in a shrub (Groves

et al. 1997).

Veerys feed on insects, and some fruit and spiders. They mostly feed on the ground, will swoop from a perch to the ground to capture prey, foliage glean, and occasionally hawk insects from the air.

Threats. The Veery is a fairly common cowbird host. Results of an Idaho study indicated that numbers were significantly reduced in grazed areas and campgrounds compared to relatively undisturbed sites (Saab 1996). However, it may select for disturbed forests where the understory is denser than in nondisturbed forests. Mosconi and Hutto (1982) found a negative response to grazing when comparing heavy vs. light grazing intensity.

Yellow Warbler

Distribution. The Yellow Warbler breeds from the Arctic Circle in Alaska, across Canada, south to Panama and the northern coast of South America. In Idaho, it breeds in suitable habitat throughout the state (Stephens and Sturts 1998). It winters from southern California and Arizona, northern Mexico, and southern Florida, south to central Peru, northern Bolivia, and Amazonian Brazil (Groves et al. 1997).

Ecology and Habitat Requirements. Several Idaho studies have found the Yellow Warbler to be a riparian habitat generalist (Groves et al. 1997). It is found in open scrub, second-growth woodlands, thickets, farmlands, and gardens, especially near water. Saab (1999) found that Yellow Warblers were found more in riparian cottonwood forests with agriculture in the surrounding matrix than within a more natural landscape. However, she also found them to be more common in sites with greater landscape heterogeneity and wetlands present. That study also concluded they were edge associates. Yellow Warblers prefer dense willow subcanopies in cottonwood forests to areas with lower densities of shrubs (Saab 1999). Yellow Warblers also use aspen riparian habitats. Riparian shrub habitats that support Yellow Warblers include willows (especially, Dobkin 1994), and alders.

Hutto (1995) found them to be most common in residential areas, followed by riparian shrub, cottonwood/aspen, and marsh/wetland types. He stated that they are riparian obligates that are most common in riparian areas with well developed shrub layers and large deciduous trees (Hutto 1995). Many authors have documented preference for moist habitats with vertical structure and 60-80% crown cover of mostly deciduous shrubs >6.6 ft (2 m)in height (USFS 1994).

Territories averaging 0.4 ac (0.16 ha) have been reported in situations where they appear to be nesting in colonies (Groves et al. 1997, Harrison 1975). In Manitoba, Goossen and Sealy (1982) reported 20 pairs on 2.5 ac (1 ha), or 1 pair per 0.12 ac (1 pair per 0.05 ha). Feeding may occur outside of the territory.

Yellow Warblers usually nest in a dense deciduous shrub or small deciduous tree (Dobkin 1994), relatively close to the ground. The Yellow Warbler is one of the most frequent cowbird hosts, but also have developed behavioral responses to cowbirds, such as building new nests over cowbird-parasitized clutches.

Yellow Warblers eat insects, especially caterpillars, and spiders. They take most of their food from the vegetation, but also may fly from perch to perch to capture prey.

Threats. Reduced grazing apparently results in increased population size (Groves et al. 1997).

Populations respond well to willow restoration and regeneration that occur when riparian areas are protected from cattle and the elimination of willow cutting and herbicide spraying (Taylor and Littlefield 1986). Other potential threats include any activity that would remove the shrub layer, water, or insects, including channelization for flood control and agriculture, and livestock grazing. Cowbirds are also a threat to this species.

Yellow-breasted Chat

Distribution. The Yellow-breasted Chat breeds east across portions of Canada and the northern U.S.A. to northern New England, and south to the Gulf Coast and portions of Mexico. In Idaho, they nest in appropriate habitat throughout the state (Stephens and Sturts 1998). It winters from portions of southern Texas, southern Florica, and northern Mexico south to portions of Central America (Groves et al. 1997).

Ecology and Habitat Requirements. Yellow-breasted Chats are often found in low, wet places near streams, pond edges, or marshes (Groves et al. 1997). They breed in thick, tangled shrubby growth on woodland edges, old pastures, streams, pond edges, hedgerows, and scrub country (Baicich and Harrison 1997); however, in the West, they are riparian-dependent. Hutto (1995) found them almost exclusively in low-elevation riparian bottomlands and brushy riparian draws in open grasslands and shrubsteppe. Saab (1999) found Yellow-breasted Chats positively associated with increasing amounts of residential areas with high edge contrast, dense herbaceous ground cover, a dense shrub layer, and a dense birch subcanopy. They also preferred cottonwood riparian forest patches close to other patches (Saab 1999).

Yellow-breasted Chats mostly eat insects and spiders gleaned from foliage of shrubs and low trees, but will also eat small fruits (Ehrlich et al. 1988).

Chats build their nests in a dense shrub or tangle from the a few inches to 5 ft up, and sometimes higher (Baicich and Harrison 1997). They sometimes nest on the ground. They may form loose colonies.

Gaines (1974) reported 10 pairs nesting in 100 ac (40 ha) in a Sacramento Valley, California, riparian area. Studies elsewhere found home ranges from 0.14-0.71 ac (0.06 -0.3 ha) in Illinois (Brewer 1955), territories ranging from 2.8 to 3.9 ac (1.1 ha to 1.6 ha) in Indiana (Thompson and Nolan 1973); and territories from 1.25-2.5 ac (0.5-1.0 ha) in Virginia (Dennis 1958).

The Yellow-breasted Chat is a frequent cowbird host (Ehrlich et al. 1988).

Threats. Yellow-breasted Chats are dependent upon dense riparian habitats. Activities such as grazing, water diversion, development, and removal of riparian vegetation can adversely affect this species. It is a frequent cowbird victim.

Lincoln's Sparrow

Distribution. The Lincoln's Sparrow breeds across portions of Alaska and Canada, south to the southwestern U.S.A., central Minnesota, and New England. In Idaho, Lincoln's Sparrows nest in appropriate habitat throughout the state (Stephens and Sturts 1998). It winters from the southern U.S.A., south regularly to Honduras, and casually to central Panama.

Ecology and Habitat Requirements. Lincoln's Sparrows mainly are found in boggy, willow-, sedge-, and moss-dominated habitats, especially where shrub cover is dense (Knopf et al. 1988; Ammon 1995b). They nest in boggy sites within subalpine and montane zones. At lower elevations, they also prefer mesic willow shrub habitat, but can be found in mixed deciduous groves such as aspen and cottonwoods, mixed shrub-willows, and others (Ammon 1995a). The occasionally use clearcuts near boggy areas. Lincoln Sparrows generally avoid openings without shrub cover and avoid densely forested riparian sites.

Lincoln's Sparrows nest on the ground, most often inside a low willow shrub or mountain birch that also contains fairly dense sedge cover. The nest shrub is usually ≤24 in (60 cm) in height. Nest sites are more elevated and have denser ground cover and low-shrub cover compared to random sites within territories (Ammon 1995b).

They use tall trees and exposed willow branches for singing. Males use the edges for singing and sentinel purposes, but territories and nest placement are not significantly associated with edge. Territory diameters range from 38 y (35 m) in an area with high population density to >109 y (100 m) in lower density populations.

Lincoln's Sparrows eat insects and small seeds. They forage on the ground and at the base of the willows.

Threats. There is a trend toward population decreases associated with livestock grazing (Schulz and Leininger 1991). Lincoln's Sparrow were absent in decadent (historically summer-grazed) shrub-willow communities in Colorado, but present in winter-grazed communities (Knopf et al. 1988). There are higher nest desertion rates in sites used by recreationists (picnicking, fishing, hiking; Ammon 1995b). Breeding populations were significantly reduced after glyphosate (an herbicide used against deciduous trees, shrubs, forbs, and grasses) was applied in coniferous forest clearcuts in Maine, most likely a result of decreased ground cover not only reducing foraging substrates, but also nest site availability (Santillo et al. 1989). In another study, application of chemicals that resulted in a vegetation increase increased the number of territories (Vera and Servello 1994).

White-crowned Sparrow

Distribution. The White-crowned Sparrow breeds from northern Alaska, east across portions of Canada, and south to southern California, Nevada, central Arizona, and northern New Mexico. In Idaho, they nest in appropriate habitat throughout the state (Stephens and Sturts 1998). It winters from southern British Columbia, southeastern Washington, southern Idaho, Wyoming, and portions of the Midwest and East, south to southern Baja California, the southern mainland of Mexico, and the Gulf Coast.

Ecology and Habitat Requirements. Populations of the White-crowned Sparrow differ remarkably in habitat features of breeding territories. Breeding territories for all populations have grass (either pure or mixed with other plants), bare ground for foraging, and dense young shrubs or small conifers thick enough to provide a roost and conceal a nest. The population that breeds in Idaho also tends to have tall coniferous trees, generally on the edge of territories (DeWolfe and DeWolfe 1962). King and Mewaldt (1987) described White-crowned Sparrow habitat as willow, sage meadows surrounded on the hillsides by taller stands of conifers. Sites are most suitable for nesting if bare ground/grass and shrubs are distributed patchily (DeWolfe 1968).

The White-crowned Sparrow nests in shrubs or on the ground, the latter being more common at high latitude or altitude. Ground nests are in thick, moist vegetation, usually over hung by a canopy of vegetation (Morton and Carey 1971). There is usually standing or running water within White-crowned Sparrow territories (King and Mewaldt 1987).

Mean territory size for the *nuttalli* population was estimated as 1348 y^2 (1127 m^2); successful pairs (those that produced at least one young) had larger territories (3300 y^2; 2760 $m^{2)}$ than unsuccessful pairs (2117y^2; 1770 m^2; Patterson and Petrinovich 1978).

White-crowned Sparrows mostly eat insects and seeds, which they obtain by foraging on the ground. They also occasionally glean from the foliage or hawk insects from the air.

Threats. White-crowned Sparrows are infrequent hosts to Brown-headed Cowbirds. Individuals breeding in riparian habitat in Colorado appear intolerant of changes in vegetative structure resulting from summer cattle grazing (Knopf et al. 1988).

Song Sparrow

Distribution. It breeds across portions of Alaska and Canada, south to southern Baja California, southern Mexico, northern New Mexico, northern Arizona, and portions of the southeastern United States. The Song Sparrow occurs year-around throughout Idaho (Stephens and Sturts 1998).

Ecology and Habitat Requirements. The Song Sparrow is found in brushy, shrubby, and deep, grass areas along watercourses, in cattail and bulrush marshes, and, mostly in northern and eastern portions of its range, in forest edges, bogs, brushy clearings, thickets, hedgerows, and gardens (Groves et al. 1997). Hutto (1995) reported them occurring mostly in the marsh/wetland, riparian shrub, and cottonwood/aspen types. An Idaho study found Song Sparrows preferred wet, short-willow communities for breeding (Douglas et al. 1992).

In cottonwood forests, Song Sparrows prefer an open tree canopy and moderate to dense shrub cover. They also require a grass understory. They are associated with heterogenous landscapes with wetlands and are found more in cottonwood patches with natural upland vegetation than with agriculture (Saab 1999).

Song Sparrows build their nests mostly on the ground beneath shrubs, occasionally in a shrub. They forage on the ground, or in trees, grasses, and bushes. They eat mostly insects and seeds, but will also eat small fruits.

One study reported that breeding territories are usually smaller than 1.0 ac (0.4 ha; Groves et al. 1997). Saab (1999) found this species to be a small patch associate, using edges.

The Song Sparrow is one of the most frequent hosts for the Brown-headed Cowbird (Ehrlich et al. 1988).

Threats. Grazing or development near Song Sparrow habitat that would encourage cowbirds would be detrimental to this species. The Song Sparrow requires shrub and grass cover or marsh cover for nesting, so any activity that would decrease that vegetation layer would impact this species.

Flammulated Owl

Distribution. The Flammulated Owl has a relatively restricted and disjunct breeding distribution within mid-elevation montane forests in western North America from southern British Columbia to Oaxaca, Mexico. Breeding range includes the eastern slope of the Cascade Mountains, interior mountain ranges of Washington, Oregon, Idaho, western Montana (not in the Black Hills), south through the Sierras and inland coast ranges of California, Nevada, Utah, Colorado, Arizona, New Mexico, and southwestern Texas. Extends through Mexico possibly as far south as Guatemala (McCallum 1994). The Flammulated Owl is migratory, and generally absent north of central Mexico in midwinter.

Ecology and Habitat Requirements. The Flammulated Owl is a secondary cavity nester that is almost exclusively insectivorous. Within its range in the United States, the predominant habitat features include open, dry conifer stands, especially yellow pine (ponderosa and Jeffrey pines; at least some large trees; and sapling or brushy thickets (for roosting). During the breeding season, they are found most frequently on upper slopes and ridges (Reynolds and Linkhart 1987, Bull et al. 1990, McCallum 1994). Most nesting stands contain yellow pine trees, although pure ponderosa pine is not required. Mixed conifer stands of pine, grand fir, larch and Douglas-fir are also used. For example, mixed interior Douglas-fir/ponderosa pine is selected in British Columbia over pure ponderosa pine (McCallum 1994 citing Howie and Ritcey 1987). Mature aspen trees are an important component in Colorado (Reynolds and Linkhart 1987), Nevada, and south-central Idaho (Powers et al. 1996), and oaks are prevalent in northwestern California sites (McCallum 1994).

Old-growth trees are strongly correlated with nesting, singing, and foraging sites (Reynolds et al. 1989, Bull et al. 1990, Linkhart et al. 1998). In Colorado, mean age of song trees was 289 years, and mean age of trees where food captures were obtained was 199 years. Flammulated Owls returning to breeding areas in Colorado settled more often in sites containing more old growth ponderosa pine/Douglas-fir than other forest types (Linkhart et al. 1998). Within this landscape, continuous old growth in the same study area supported territories for more consecutive years than areas <75% old growth. Snags are critical habitat features. In eastern Oregon, over 90% of nests were in dead trees (ponderosa pine, larch, and grand fir), and nest snags were significantly taller than what was available (Bull et al. 1990). Over 80% of nests were in snags (Douglas-fir and aspen) in south-central Idaho (Powers et al. 1996). Roost sites are associated with denser foliage, and include thickets or large Douglas-fir or pine trees.

Flammulated Owls feed nocturnally on moths, beetles, crickets, and grasshoppers. Adults ‘hawk’ from perches; molting adults and fledglings frequently forage on the ground (McCallum 1994). In Oregon and Colorado, Flammulated Owls maintained home ranges of 35-40 ac (14-16 ha), on average, but concentrated their activities to smaller areas when nestlings appeared. Some describe them as loosely colonial.

Threats. The loss of mature and old-growth dry pine forests in Idaho and throughout Rocky Mountain West and the reduced numbers of snags, particularly large snags, are the biggest threats to flammulated owl habitat. Flammulated Owls will occasionally nest in boxes, although the circumstances under which an artificial nest box is suitable are not understood (McCallum 1994). Snag management that promotes the retention of large snags and higher densities of snags during timber harvest is critical, as is incorporating firewood cutting guidelines to management plans. The species can occur in selectively-logged stands with residual trees (Reynolds et al. 1989). However, the number and

distribution of suitable foraging trees relative to the nest site is energetically important, as Flammulated Owls fly to the nest with each single prey item captured. Fire suppression in the dry conifer types contributes to loss of the park-like structure that is conducive to hawk-and-glean foraging. Use of herbicides and pesticides in forests may negatively affect non-target species, such as moths, on which Flammulated Owls depend for food. This needs further investigation. Loss of dry conifer forest habitat on the wintering grounds in Mexico and central America may contribute to population instability or decline.

Lewis' Woodpecker

Distribution. The Lewis' Woodpecker breeds from southwestern Canada, Montana, and southern Great Plains states, south to south-central California, central Arizona, southern New Mexico, and eastern Colorado. It winters mainly from northern Oregon, southern Idaho, central Colorado, and south-central Nebraska, south irregularly to northern Mexico, southern New Mexico, and western Texas. In Idaho, they breed throughout the state (Stephens and Sturts 1998).

Ecology and Habitat Requirements. Lewis' Woodpeckers breed in ponderosa pine forest, open riparian woodland dominated by cottonwood, and logged or burned ponderosa pine forest. Breeding birds also are found in oak woodland (Oregon), nut and fruit orchards, pinyon pine/juniper woodland, and a variety of pine and fir forests and in agricultural areas including farms and ranchlands. They may prefer ponderosa pine forests at medium to high elevations and open riparian forests at low elevations.

This species often is classified as a specialist in burned ponderosa pine forest habitat, although suitability of burned areas as habitat may vary with post-fire age, size, and intensity of burn and with geographic region. Saab and Dudley (unpubl. data) found the species abundant 2-3 years after fire in a very large (247,000 ac; 100,000 ha) high-intensity burn in W. Idaho.

Nesting habitat usually has an open canopy (30% tree canopy closure in HSI model), and a brushy understory offering ground cover, dead or downed woody material, available perches, and abundant insects (Bock 1970, Linder 1994).

Lewis' Woodpeckers are cavity nesters, using large snags (12 in; 30 cm dbh), and selecting trees that generally are well decayed. A Lewis' Woodpecker pair forms a life-long bond.

Lewis' Woodpeckers mainly feed on insects, capturing them in the air or dropping from a perch to capture them on the ground. They also eat fruits and nuts and will store nuts in natural cavities.

Their territory in the summer only includes the area around the nest cavity; home ranges for foraging overlap broadly with other pairs. They may exhibit coloniality or close proximity of nests during the nesting season. Multiple, active nests sometimes are found in a single tree. In burned habitat in British Columbia, 5 nests were within a circle 0.6-1.2 mi (1-2 km) in diameter.

Threats. Decline in ponderosa pine habitat may be due to fire suppression that results in dense young stands and invasion of Douglas-fir, selective timber harvesting with subsequent replanting of closely-spaced seedlings, and intensive grazing that may remove the shrub and grass understory.

Decline in riparian habitat may be due to attrition of dead trees and lack of regeneration because of flood control, low water flow rates, and intense cattle grazing. Increased frequency and intensity of fires has occurred in some areas of the west because of increases in fuel loading due to invading

tamarisk.

Human encroachment on habitat occurs in valley floors and foothills. In the Bitterroot Valley of Montana, driveway and home construction has caused loss of previously used nest sites. They may abandon nests if humans disturb the area in the immediate vicinity. Pairs are tolerant of approaches up to about 50 ft (15 m) of the base of the nest tree.

White-headed Woodpecker

Distribution. The White-headed Woodpecker is resident from south-central British Columbia, north-central Washington, and western Idaho, south through Oregon (east of the Cascades) to southern California and west-central Nevada. Their abundance tends to decrease north of California and the species is uncommon to rare in Washington and Idaho (Garrett et al. 1996). In Idaho, they breed in all but the northernmost and southernmost latilongs along the western edge of the state and in two adjacent latilongs (Stephens and Sturts 1998).

Ecology and Habitat Requirements. The White-headed Woodpecker's primary habitat is low-elevation montane coniferous forest dominated by ponderosa pine in the northern range, with tree species composition variable geographically (Cooper 1969, Bent 1939, Jewett et al. 1953, Ligon 1973, Dixon 1995a,b, Garrett et al. 1996, Marshall 1997). Secondary habitats include mixed ponderosa pine and Douglas-fir (Burleigh 1972, Verner 1974, Frederick and Moore 1991), lodgepole (Dixon 1995a), and mixed-conifer (Raphael and White 1984, Morrison et al. 1987, Morrison and With 1987, Milne and Hejl 1989).

White-headed Woodpeckers need multi-storied stands with canopies of 50-70% (Frederick and Moore 1991, Dixon 1995a,b, Garrett et al. 1996). They nest in cavities in ponderosa pine, Jeffrey pine, sugar pine, and fir snags (Raphael and White 1984, Milne and Hejl 1989, Frederick and Moore 1991, Dixon 1995a,b) and in live and dead quaking aspen (Dixon 1995b). They use large-diameter ($ 21 in or 53 cm dbh) snag classes for nesting and roosting in greater proportion than available (Dixon 1995a,b). Larger-diameter trees were preferred (>24 in or 61 cm dbh; Dixon 1995b). Snag density ranged from 0.7-3.9 snags/ac (1.75 -9.8 snags/ha) across study areas (Dixon 1995a,b). Live tree basal area (trees >21 in or 53 cm dbh) was >5.8 y^2/ac (12 m^2/ha); and shrub cover was >30% (Dixon 1995a). Stem density in one study was 117/ac (289 trees/ha; Frederick and Moore 1991).

White-headed Woodpeckers need large tracts of predominantly mature and old-growth ponderosa pine. Habitat is patchily distributed, which has the potential for limiting population interactions and opportunity for dispersal among patches (Lehmkuhl et al. 1997). Fragmented habitats require larger home range sizes per pair than continuous tracts of old-growth ponderosa pine (Dixon 1995a,b). In central Oregon, median minimum convex polygon home range size (July-December) for individual White-headed Woodpeckers was 257 ac (104 ha) in continuous tracts of old-growth ponderosa pine and 793 ac (321 ha) in fragmented sites (Dixon 1995b).

The White-headed Woodpecker forages on large-dbh (>27 in or 68 cm) live ponderosa pines (Frederick and Moore 1991, Dixon 1995a,b). This species eats insects and pine seeds. They are seasonally dependent on ponderosa pine seeds, which are an important food resource during the late fall and winter (Dixon 1995a,b; Garrett et al. 1996). Because of their use of seeds as a food source, water is more important to this species than other woodpeckers.

Threats. Old-growth ponderosa pine forests in the northern Rocky Mountains, Intermountain West,

and eastside Cascades have become some of the most imperiled major forest types (85-98% decline); selective logging of the best trees and fire suppression have been responsible for most of the degradation (Oliver and Ryker 1990, Noss et al. 1995). Particularly hostile habitats for White-headed Woodpeckers include areas that have been severely fragmented by timber harvest regimes and left with expansive clearcut or seed-tree cuts between remnant late-successional stands. Although these habitats have the potential to provide nest snags and patchy foraging habitat, if habitat is so fragmented that a bird must frequently traverse large open areas, that individual is increasingly more exposed to predation and must expend greater amounts of energy to secure resources than an individual in a less fragmented area. This sort of matrix has the potential to isolate populations.

The White-headed Woodpecker is behaviorally tolerant of human-induced disturbances, but development and urban sprawl reduce essential nesting and foraging habitat. They are tolerant of humans to a point but become highly agitated if an intruder approaches either the nest or roost. There is no evidence of brood parasitism, but some nests are known to be usurped by flying squirrels and European Starlings (Dixon 1995a,b). They competes with other species for pine seeds (e.g., Hairy Woodpecker, Clark's Nutcracker, and pine squirrels (Garrett et al. 1996). They are subject to predation by avian predators such as the Great-horned Owl, Northern Goshawk, and Cooper's Hawk (Dixon 1995a,b).

Pygmy Nuthatch

Distribution. The Pygmy Nuthatch is a resident from southern interior British Columbia, northern Idaho, western Montana, central Wyoming, and southwestern South Dakota, south to northern Baja California, southern Nevada, central and southeastern Arizona, central New Mexico western Texas and Oklahoma, and south in mountains to central Mexico. It is considered an uncommon bird in Idaho; it nests in central Idaho and the Idaho Panhandle (Groves et al. 1997; Stephens and Sturts 1998).

Ecology and habitat requirements. The Pygmy Nuthatch nests in a natural or excavated cavity in a conifer tree or standing snag; it may also nest in a post (Groves et al. 1997). In a ponderosa pine forest near Fort Collins, Colorado. 100% (n=26) of the nests in the study area were in dead trees (McEllin 1979). In that study, the mean height of nest trees was 52 ft (16 m; range of 16 to 82 ft or 5 to 25 m) and the mean nest tree diameter was 23 in (58 cm; range of 9 to 33 in or 23-85 cm). Pygmy Nuthatches appeared most often to occupy a cavity excavated by another bird; only 1 of 26 pairs were seen excavating their own hole in the 2-year study (McEllin 1979). Raphael and White (1984) and Brawn and Balda (1988) also found 100% of nests in snags, not live trees.

During the nesting season, there may be nest helpers, that are usually related to the parents (Ehrlich et al. 1988). Family units with larger ponderosa pine and more snags produced larger broods (Sydeman et al. 1988).

Pygmy Nuthatches are residents in mountain conifer woodlands, often in open woodland with large trees (Baicich and Harrison 1997). In Idaho, they are mainly found in pine forests and woodlands, especially ponderosa pine. They may also occur in pinyon-juniper habitat but although they have been seen in one Idaho latilong that contains juniper, they have not been documented nesting within the range of juniper in the state (Stephens and Sturts 1998). They occur at elevations up to 9,840 ft (3000 m; Groves et al. 1997).

A literature review by Hutto (1989) concluded that Pygmy Nuthatches appear to be restricted primarily to ponderosa pine habitat, especially mature to old-growth stands that are fairly open (<70% canopy

coverage).

Populations are dependent on snag densities and nest cavity availability. In three areas, two thinned and one not, Pygmy Nuthatch populations increased with tree and snag density. In open ponderosa pine stands thinned to 23 trees/ac (57/ha) and 2.8 snags/ac (7/ha), the breeding density was 3 pairs/100 ac (40 ha). In thinned ponderosa pine stands with 85-88 trees/ac (209-217/ha) and 8.5 snags/ac (21/ha), breeding density was 15 pairs/100 ac (40 ha). The addition of nest boxes in both stands increased breeding densities to 10 pairs/ 100 ac (40 ha) and 25 pairs/100 ac (40 ha) respectively, demonstrating that populations were limited by nesting habitat (Brawn and Balda 1988).

In a study in the Sierra Nevada, Pygmy Nuthatches appeared to be specialists of burned Jeffrey pine/white or red fir forests. They used soft snags more than hard snags, and mean nest tree diameter was 18 in (45.8 cm; Raphael and White 1984).

Pygmy Nuthatches feed on insects such as wasps, ants, beetles, moths, and grasshoppers; they also eat spiders and conifer seeds. They mostly forage on live trees on the outer branches, needle clusters, and twigs and less often along large branches, tree trunks, and ground (Manolis 1977).

They travel in small family groups after the nesting season, and form larger, loose flocks in fall and winter. Winter groups average 5-15 individuals, forage as a flock, and roost communally within a group territory (Groves et al. 1997). One-hundred fifty Pygmy Nuthatches were observed entering a single snag to roost at sunset (Knorr 1957). Pygmy Nuthatches often forage in mixed-species flocks and have been observed to be dominant over chickadees and White-breasted Nuthatches at feeders (Bock 1969).

Threats. This species needs large ponderosa pine snags for nesting, indicating a need for mature to over-mature forests. Nest sites appeared in one study to be the limiting factor. The nesting density increased with increased tree and snag density. They forage on live trees (Raphael and White 1984).

APPENDIX 6.

High priority and some moderate priority species use of non-riverine wetland habitats in Idaho. Prioritization scores were developed by the Colorado Bird Observatory with review by Idaho PIF (see Table 1, and Appendices 1, 2, 3, and 4.

Species	PIF Score	Wet Meadow	Shallow Marsh	Deep Marsh	Open Water
Western Grebe	22			Nesting	Foraging Roosting
Clark's Grebe	20			Nesting	Foraging Roosting
Amer. White Pelican (nests on islands)	24				Foraging Roosting
American Bittern	19		Foraging Nesting	Foraging	
White-faced Ibis	20	Foraging		Nesting	
Trumpeter Swan	26		Nesting Foraging	Nesting Foraging	Nesting Roosting Migration
Wood Duck (needs trees for nesting)	19		Foraging	Foraging Roosting	
Cinnamon Teal	21	Nesting	Nesting Foraging	Foraging Roosting	Roosting Migration
Canvasback	20		Nesting	Nesting Foraging	Foraging Roosting Migration
Redhead	20		Nesting	Foraging Nesting	Foraging Roosting Migration
Ring-necked Duck	20	Nesting	Nesting Foraging	Foraging Migration	Foraging Roosting Migration
Bufflehead (needs trees or other cavities for nesting)	18			Foraging	Foraging Roosting Migration

Appendix 6 continued.

Species	PIF Score	Wet Meadow	Shallow Marsh	Deep Marsh	Open Water
Barrow's Goldeneye (needs trees or other cavities for nesting)	24			Foraging	Foraging Roosting Migration
Hooded Merganser (needs trees or other cavities for nesting)	22			Foraging	Foraging Roosting Migration
Ruddy Duck	19			Foraging Nesting	Foraging Roosting Migration
Bald Eagle (needs trees for nesting)	19	Foraging	Foraging	Foraging	Foraging
Peregrine Falcon (needs cliffs for nesting)	19	Foraging	Foraging	Foraging	Foraging
Sandhill Crane	24	Nesting Foraging	Nesting Foraging	Nesting Foraging Molting	
Killdeer (prefers very sparse cover)	19	Foraging	Foraging		
American Avocet	23		Foraging Nesting (Prefers sparse cover)		
Willet	20	Nesting Foraging	Foraging		
Long-billed Curlew	23		Migration		
Wilson's Phalarope	21	Nesting	Nesting Foraging	Nesting Foraging	Foraging Migration
Franklin's Gull (nests on islands)	24				Nesting Foraging
California Gull (nests on islands)	19				Nesting Foraging
Forster's Tern	20		Nesting Foraging	Nesting Foraging	Foraging

Appendix 6 continued.

Species	PIF Score	Wet Meadow	Shallow Marsh	Deep Marsh	Open Water
Black Tern	18		Nesting Foraging	Nesting Foraging	Foraging
Short-eared Owl	23	Nesting Foraging	Nesting		
Marsh Wren	20		Nesting Foraging	Nesting Foraging	
Bobolink	21	Nesting Foraging			
Yellow-headed Blackbird	18		Nesting Foraging	Nesting Foraging	

APPENDIX 7.

List of some sources of funding, matching funds, and other assistance for wildlife conservation projects that affect wetlands in Idaho. In addition, the US Forest Service and Bureau of Land Management can provide technical assistance and cost-share on lands they manage.

Source	Project types & names	Contact
USDA Natural Resource Conservation Service	Wetland & other habitats CRP, WHIP, EQIP, NRCTC, WRP, and others	Local or regional NRCS Office
Idaho Department of Fish and Game	Habitat Improvement Program	Tom Hemker, Boise 208-334-2920
USDI Fish and Wildlife Service	Partners for Wildlife	U. S. Fish and Wildlife Service, Peggy Guillory 208-378-5098 North Idaho Jeff Combs 509-921-0160
Pheasants Forever	Cost shares all or part of habitat restoration projects	David Lockwood Boise 208-378-4371
Ducks Unlimited	Funds or cost shares waterfowl conservation projects	Steve Hall Nampa 208-463-9900
Idaho Soil Conservation Commission	Cost shares range land and riparian projects	David Blew Boise 208-334-1033
The Nature Conservancy	Buys land and easements with high conservation value	Lou Lunte Ketchum 208-726-3007
Intermountain West Joint Venture of the North American Waterfowl Conservation Act	Partners with groups and land owners for waterfowl conservation projects.	Jim Cole, Joint Venture Coordinator U.S. Forest Service 145 East 1300 South Suite 404 Lincoln Plaza Center Salt Lake City, Utah 84115 www.fws.gov.r9nawwo/nawmphp.html
National Fish and Wildlife Foundation	Cost shares a wide variety of conservation projects	National Fish and Wildlife Foundation 1120 Connecticut Avenue, NW Suite 900 Washington, DC 20036 Tel: 202/857-0166 www.nfwf.org

APPENDIX 8.

List of land trusts in Idaho (data from Idaho Conservation Data Center 1998).

Name	Involvement	Address
Beaver Lake Natural Trust	To preserve Beaver Lake, Eaton Lake	Scott Engstrom Beaver Lake Natural Trust 7148 Garfield Bay Cutoff Road Sagle, ID 83860 (208) 263-0155
Boise River Trail Foundation	Trails in Ada County along the Boise River.	Tom Hitchman Boise River Trail Foundation 2010 Hallway Drive Boise, ID 83702 (208) 343-3108
Foundation for Parks and Lands	Focuses on natural diversity, recreation, open space and history in State Parks	Sharon Huber 5657 Warm Springs Avenue Boise, ID 83712 (208) 344-7141(w)
Inland Northwest Land Trust	Kootenai and Bonner Counties, Idaho, and several counties in northeastern Washington.	Chris Deforest Inland Northwest Land Trust 315 W Mission Ave, Suite 5A Spokane, WA 99201 (509) 328-2939
Land Trust Alliance of the Northwest	All northwestern states	Elizabeth Bell Land Trust Alliance--NW 3517 NE 45th St. Seattle, WA 98105 (206) 522-3134
Land Trust of the Treasure Valley	Ada and Canyon Counties and vicinity	Kathy Roos Land Trust of the Treasure Valley 1901 Lake Heron Dr Boise, ID 83706-4052 (208) 343-7456
The Nature Conservancy of Idaho	Preserves plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive	Guy Bonnivier The Nature Conservancy of ID P. O. Box 165 Sun Valley, ID 83353 (208) 726-3007

Name	Involvement	Address
Palouse Land Trust	Farms, open space, and forest in the Palouse prairie area	John Norton Palouse Land Trust 5 Kenworthy Plaza Moscow, ID 83843 (208)882-5248 (w)

Appendix 8 continued.

Panhandle Land Trust		Gerty Hanson Panhandle Land Trust W 2535 Riverview Drive Coeur d'Alene, ID 83814 (208) 667-9389
Sawtooth Society	To protect the Sawtooths	Robert Hayes Sawtooth Society P. O. Box 268 Boise, Idaho 83701 (208) 345-9863
Southern Idaho Land Trust	Middle section of the Snake River from American Falls to Glenns Ferry	Judy Brossy Southern Idaho Land Trust 616 Blue Lakes Blvd. N. Suite 144 Twin Falls, Idaho 83301 (208) 734-9319
Teton Regional Land Trust	Upper Snake River, ID, WY	Michael Whitfield P.O. Box 247 Driggs, ID 83422 (208) 354-8939
Trust for Public Lands	Includes Idaho	Geoff Roach Trust for Public Lands Oregon Field Office 1211 SW Sixth Avenue Portland, OR 97204
Wood River Land Trust	Blaine & Custer Counties	Scott Boettger Wood River Land Trust P.O. Box 6376 Ketchum, ID 83340 (208) 622-9332

APPENDIX 9

Scientific names of plants mentioned in the text

TREES	
Black cottonwood	*Populus balsamifera*
Douglas-fir	*Pseudotsuga menziesii*
Engelmann spruce	*Picea engelmannii*
Grand fir	*Abies grandis*
Limber pine	*Pinus flexilis*
Narrow-leaf cottonwood	*Populus angustifolia*
Ponderosa pine	*Pinus ponderosa*
Quaking aspen	*Populus tremuloides*
Rocky Mountain juniper	*J. scopulorum*
Russian olive	*Elaeagnus angustifolia*
Salt cedar	*Tamarix chinensis*
Singleleaf pinyon	*Pinus monophylla*
Utah juniper	*Juniperus osteosperma*
Western juniper	*Juniperus occidentalis occidentalis*
Western larch	*Larix occidentalis*
Whitebark pine	*Pinus albicaulis*
SHRUBS	
Alder	*Alnus incana*
Alderleaf buckthorn	*Rhamnus alnifolia*
American silverberry	*Elaeagnus commutata*
Antelope bitterbrush	*Purshia tridentata*
Arroyo willow	*Salix lasiolepis*
Bearberry	*Arctostaphylos uva-ursi*
Bebb's willow	*Salix bebbiana* var. *Bebbiana*
Big sagebrush	*Artemesia tridentata*
Basin big sagebrush	ssp. *tridentata*
Wyoming big sagebrush	ssp. *wyomingensis*
Mountain big sagebrush	ssp. *vaseyana*
Xeric sagebrush	ssp. *xericencis*
Subalpine big sagebrush	ssp. *spiciformis*
Black hawthorne	*Crataegus douglasii*
Black sage	*Artemesia nova*
Bog birch	*Betula glandulosa*
Bog cranberry	*Vaccinium oxycoccus*
Booth's willow	*Salix boothii*
Buffaloberry	*Shepherdia* spp.
Bush oceanspray	*Holodiscus dumosus*
Ceanothus	*Ceanothus* spp.
Chokecherry	*Prunus virginiana*
Cinquefoil	*Potentilla* spp.
Curlleaf mountain-mahogany	*Cercocarpus ledifolius*
Currant	*Ribes* spp.
Common snowberry	*Symphoricarpos albus*
Coyote willow	*Salix exigua*

Douglas spiraea	*Spiraea douglasii*
Drummond's willow	*Salix drummondiana*
Dusky willow	*Salix melanopisis*
Elderberry	*Sambucus* spp.
Geyer's willow	*Salix geyeriana*
Greasewood	*Sarcobatus vermiculatus*
Huckleberry	*Vaccinium* spp.
Mountain alder	*Alnus incana*
Mountain maple	*Acer glabrum*
Ninebark	*Pysocarpus malvaceus*
Plane-leaf willow	*Salix planifolia* var. *planifolia* and var. *Monica*
Prince's pine	*Chimaphila* spp.
Pursh's buckthorn	*Rhamnus purshiana*
Rabbitbrush	*Chrysothamnus* spp.
Raspberry	*Rubus* spp.
Red-osier dogwood	*Cornus stolonifera*
Rose	*Rosa* spp.
Serviceberry	*Amelanchier alnifolia*
Shadscale, saltsage, and four-wing saltbush	*Atriplex* spp.
Short-fruit willow	*Salix brachycarpa*
Shrubby cinquefoil	*Potentilla fruticosa*
Smooth sumac	*Rhus trilobata*
Spiny hopsage	*Grayia spinosa (Atriplex spinosa)*
Spirea	*Spirea* spp.
Syringa	*Philadelphus lewisii*
Threetip sagebrush	*Artemesia tripartita*
Water birch	*Betula occidentalis*
Whortleberry	*Vaccinium scoparium*
Winterfat	*Krascheninnikovia lanata*
Wolf's willow	*Salix wolfii*

GRASSES, FORBS, SEDGES, AND SEDGE-LIKE PLANTS

Arnica	*Arnica* spp.
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Baltic rush	*Juncus balticus*
Basin wildrye	*Elymus cinereus*
Bladder sedge	*Carex utriculata*
Bladderworts	*Utricularia* spp.
Bluebunch wheatgrass	*Pseudoroegneria spicata (Agropyron spicatum)*
Bottlebrush squirreltail	*Elymus elymoides (Sitanion hystrix)*
Burreeds	*Sparganium* spp.
Canada thistle	*Cirsium arvense*
Cheatgrass	*Bromus tectorum*
Common cattail	*Typha latifolia*
Common spikerush	*Eleocharis palustris*
Common timothy	*Phleum pratense*

Common yarrow	*Achillea millefolium*
Coontails	*Ceratophyllum* spp.
Creeping bentgrass	*Agrostis stolonifera*
Creeping spikerush	*Eleocharis palustris*
Crested wheatgrass	*Agropyron spicatum*
Dalmatian toadflax	*Linaria dalmatica*
Elk sedge	*Carex geyeri*
Eurasian water milfoil	*Myriophyllum spicatum*
Fireweed	*Epilobium angustifolium*
Fleabane or buckwheat	*Eriogonum* spp.
Floating-leaved pondweed	*Potamogeton natans*
Fowl bluegrass	*Poa palustris*
Foxtail barley	*Hordeum jubatum*
Halogeton	*Halogeton glomeratus*
Hardstem bulrush	*Scirpus acutus*
Henbane	*Hyoscyamus niger*
Hoary cress	*Cardaria draba*
Idaho fescue	*Festuca idahoensis*
Indian paintbrush	*Castilleja* spp.
Indian ricegrass	*Oryzopsis hymenoides*
Inflated sedge	*Carex vesicaria*
Junegrass	*Koeleria nitida*
Kentucky bluegrass	*Poa pratensis*
Ladysthumb	*Polygonum* spp.
Leafy spurge	*Euphorbia esula*
Mat muhly	*Muhlenbergia richardsonis*
Medusahead (wildrye)	*Taeniatherum caput-medusae* ssp. *Asperum*
Milfoils	*Myriophyllum* spp.
Milk-vetch	*Astragalus* spp.
Mud sedge	*Carex limosa*
Muskgrass	*Chara* spp.
Mutton bluegrass	?
Nebraska sedge	*Carex nebraskensis*
Needle-and-thread	*Stipa comata*
Northern mannagrass	*Glyceria borealis*
Pepperweed whitetop	*Cardaria draba*
Phlox	*Phlox* spp.
Pinegrass	*Calamagrostis rubescens*
Poison hemlock	*Conium maculatum*
Pond lily	*Nuphar polysepalum*
Pondweeds	*Potamogeton* spp
Purple loosestrife	*Lythrum salicaria*
Quack grass	*Agropyron repens*
Reed canary grass	*Phalaris arundinacea*
Rushes	*Juncus* spp.
Russian knapweed	*Centaurea repens*
Russian thistle	*Salsola kali*
Russian wildrye	*Psathyrostachys juncea (Elymus junceus)*

Sandberg bluegrass	*Poa secunda (Poa sandbergii)*
Scarlet gilia	*Gilia aggregata*
Siberian wheatgrass	*Agropyron fragile ssp. sibericum (Agropyron sibiricum)*
Slender sedge	*Carex lasiocarpa*
Small beaked sedge	*Carex simulata*
Small-fruit bulrush	*Scirpus microcarpus*
Smooth brome	*Bromus inermis*
Softstem bulrush	*Scirpus validus*
Spatterdock	*Nuphar* spp.
Sphagnum moss	*Sphagnum* spp
Spotted knapweed	*Centaurea maculosa*
Sundews	*Drosera* spp.
Tall wheatgrass	*Elytrigia elongata (Agropyron elongatum)*
Thickspike wheatgrass	*Elymus lanceolatus ssp. Dasystachyum* (*Agropyron dasystachyum)*
Thurber needlegrass	*Stipa thurberiana*
Tufted hairgrass	*Deschampia cespitosa*
Water potato	*Sagittaria latifolia*
Water horsetail	*Equisetum fluviatile*
Water sedge	*Carex aquatilis*
Water shield	*Brasenia schreberi*
Western needlegrass	?
Western wheatgrass	*Pascopyrum smithii (Agropyron smithii)*
Wild rice	*Zizania aquatica*