Appendix E

Terrestrial Wildlife Resources

Table of Contents

Tables

Figures

Changes to Appendix E between the 2003 Forest Plan and the Amended 2012 Forest Plan

Appendix E of the 2003 Forest Plan was modified to summarize the conclusions from the multi-scale assessment and describe how the conclusions should be used to help understand the purpose and interpret the use of proposed management direction during Forest Plan implementation. A Short-Term Wildlife Habitat Restoration Prioritization Process and a Wildlife Habitat Restoration Strategy Map was added to this appendix.

Appendix E provides an overview of the Wildlife Conservation Strategy (WCS), including discussions pertaining to the following elements:

- The assessment supporting WCS development
- The WCS long-term goals and planning period objectives
- The assessment of current baselines, threats, and risks needed to inform WCS development
- The WCS midscale spatial priorities and type of restoration
- The implementation of WCS priorities and strategies at the fine scale, actions to be taken, and measurements of success

Wildlife Conservation Strategy Overview

Ecological sustainability is one of three interdependent components of sustainability that the Forest Plan strives to achieve (along with social and economic sustainability). In 1997, the Secretary of Agriculture convened an interdisciplinary committee of scientists to review and evaluate the Forest Service's planning process for land management planning and identify changes needed to, in part, address sustainability (Committee of Scientists 1999). Consistent with recommendations found in the Committee of Scientists report, this Forest Plan provides a management framework that integrates biological and ecological system management with their social and economic contexts, acknowledging that management should not compromise the basic functioning of these systems.

The primary purpose of the Sawtooth National Forest's (Forest's) WCS is to provide a framework for Forest management that contributes to sustaining native ecological systems that will support diverse terrestrial wildlife species. To achieve this purpose, Appendix E must integrate and work in concert with the Wildlife and Vegetation Strategy (vegetation strategy) described in Appendix A and Aquatic Conservation Strategy (ACS) described in Appendix B.[1] Appendix E and the WCS complement these appendices by describing what, when, and where specific habitat conditions and key habitat elements associated with terrestrial wildlife species of concern should be addressed within the context of the vegetation strategy and ACS.

A complementary and necessary secondary focus of the WCS is to provide a fine-filter conservation approach for those terrestrial wildlife species, or groups of species, whose persistence needs cannot be fully addressed through the broader vegetation strategy alone or through the ACS, which specifically targets fish and other aquatic organisms. This fine-filter approach involves a small subset of the 345 terrestrial vertebrate wildlife species believed to occupy National Forest System lands within the Forest's administrative boundary. Typically, this subset consists of species determined to be of conservation concern, such as Endangered Species Act (ESA) threatened and endangered species, Region 4 sensitive species, local endemics, and species requiring specialized components not adequately addressed through the more general vegetation strategy or the ACS.

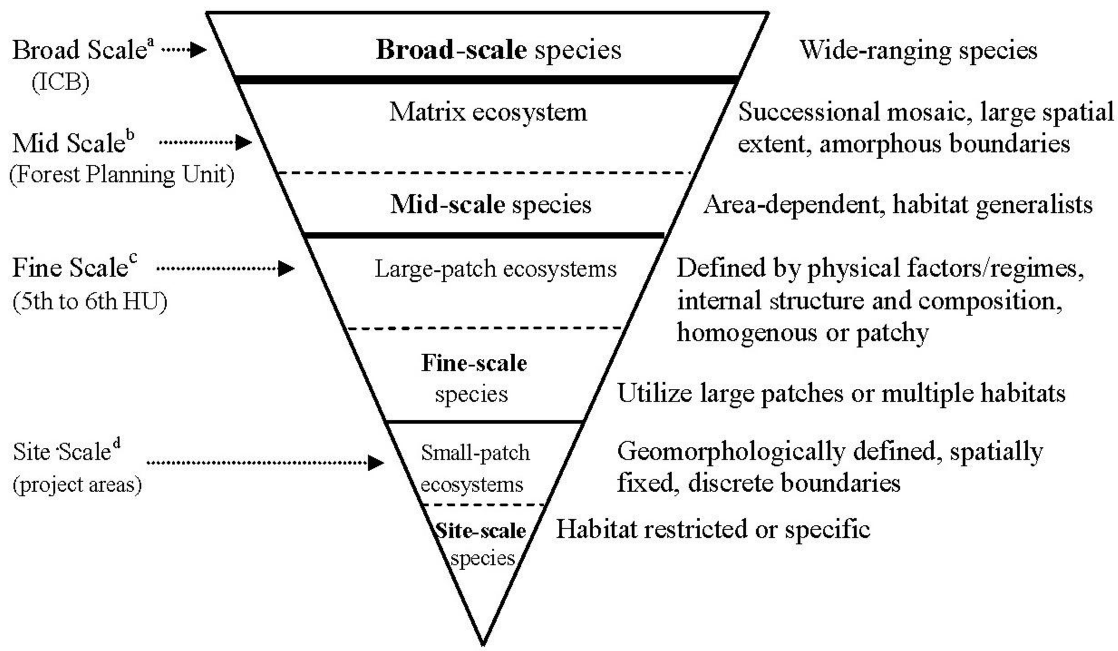
While the long-term goal of the WCS is to maintain or restore environmental conditions needed to support persistence and sustainability of the diversity of terrestrial wildlife species found across the Forest, the short-term (i.e., this planning period) emphasis is on habitats and species believed to be of

[1] Appendices A and B of this Forest Plan provide the foundational information that informs decisions concerning project design and implementation concerning desired *representative, redundant,* and *resilient* vegetative and aquatic resource conditions important to ecological sustainability.

conservation concern. This emphasis results in more specific threat reduction measures and spatial and temporal restoration priorities for these habitats or species, compared to species of lesser concern.

ASSESSMENT SUPPORTING WILDLIFE CONSERVATION STRATEGY DEVELOPMENT

Both the level of biological organization (species, communities, and ecosystems) and spatial scale at which biological diversity occurs (site, fine, mid, and broad scale) are important aspects of wildlife conservation planning (Figure E-1) (Poiani et al. 2000; Groves 2003). Some species occur only at site and fine scales (e.g., pygmy rabbit), while others have much larger spatial requirements (e.g., wolverines and wolves) and are best addressed at mid to broad scales. Similarly, some vegetation communities and ecosystems, such as those occurring in caves or along cliffs, are localized in their distributions, while others, such as mid-elevation Douglas-fir forests of the Intermountain West, occur over vast areas.



[a] Broad scale: A regional land area that may include all or parts of several states; typically millions of acres or greater. An example of a broad-scale assessment is the Interior Columbia Basin (ICB) Ecosystem Management Project.
[b] Mid scale: An area varying in size from a U.S. Geological Survey 4th-field hydrologic unit (HU) to groups of 4th-field HUs, approximately 500,000 to 5,000,000 acres. Subbasin review, EcoGroup, and forest planning unit analyses occur at this scale.
[c] Fine scale: This scale is used to define a landscape area varying in size from a 6th-field HU to a combination of 5th-field HUs, approximately 10,000 to 100,000 acres.
[d] Site scale: Any scale less than a broad, mid, or fine scale.

Figure E-1. Biological organization and spatial scale

Past efforts in conservation planning suggest that the biological diversity needed to support species persistence and sustainability occurs at varying spatial levels (Groves 2003). Changing a condition at one scale, without accounting for its effect at other scales, may inadvertently affect the desired outcomes at various scales. Thus, an effective conservation strategy must account for this hierarchical ordering of nature and the variety of spatial scales at which species and ecosystems occur.

The Wildlife Conservation Strategy and its Relationship to the Interior Columbia Basin Ecosystem Management Project Science Findings

The Forest primarily falls within the Interior Columbia Basin (ICB). The Forest WCS was developed in the context of the Interior Columbia Basin Ecosystem Management Project's (ICBEMP's) broader-scale science findings. These findings are summarized in the *Highlighted Scientific Findings of the Interior Columbia Basin Ecosystem Management Project* (Quigley and Cole 1997). One of these findings identified three common themes that successful land management strategies, including this WCS, must address (Quigley and Cole 1997; Quigley et al. 2001):

1. Multiple risks to ecological integrity and economic well-being must be recognized and managed.
2. Risks and opportunities differ significantly across a project area and management plans must recognize this variation.
3. Individual sites are linked to ecological processes and human activities; these links must be understood and considered.

Habitat Suites, Families, and Associated Species of Mid-scale Focus Used in this Wildlife Conservation Strategy

The ICBEMP science assessment found that source habitats[2], as described by Wisdom et al. (2000) and Raphael et al. (2001), for some wildlife species within the ICB have declined substantially in geographic extent from historical conditions.

In 2003, an inter-Agency memorandum of understanding (MOU)[3], implementing *The Interior Columbia Basin Strategy* was signed and stated the following:

> Management plans shall address ways to maintain and secure terrestrial habitats that are comparable to those classified by the science findings as "source" habitats that have declined substantially in geographic extent from the historical to the current period and habitats that have old-forest characteristics. Direction should address opportunities to re-pattern these habitats when and where necessary, maintain and guide expansion of the geographic extent and connectivity of source habitats that have declined where they can be sustained. Direction needs to address restoration of the important vegetation characteristics of these habitats (such as species composition, vegetation structure, snags or coarse woody debris), which various terrestrial species need to survive and reproduce. (USDA Forest Service et al. 2003a,b)

[2] Source habitats are those characteristics of macrovegetation (cover types and structural stages) that contribute to stationary or positive population growth for a species within its distributional range (Wisdom et al. 2000; Raphael et al. 2001). Further, source habitats contribute to source environments, which represent the composite of all environmental conditions that result in stationary or positive population growth in a specified area and within a specified time range (Wisdom et al. 2000; Raphael et al. 2001).

[3] The purpose of the 2003 inter-Agency MOU was to cooperatively implement *The Interior Columbia Basin Strategy* (USDA Forest Service et al. 2003a, b) to guide the amendment and revision of Forest Service forest plans and Bureau of Land Management (BLM) resource management plans and project implementation on public lands administered by the Forest Service and BLM throughout the ICB.

Consistent with this MOU, one of the foundational elements of the WCS was the concept of source habitat as defined by Wisdom et al. (2000). The Forest Planning Team adopted the hierarchical system described in Wisdom et al. (2000) of grouping source habitats into suites and families (refer to Table E-1). Three of the habitat suites and 12 of the families are consistent with those used in the broad-scale assessment, *Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-scale Trends and Management Implications*, completed by Wisdom et al. (2000). The remaining suite, Suite 4, was developed by the Forest Planning Team and includes riverine and nonriverine riparian and wetland habitat. The importance of Suite 4 habitats was recognized by Wisdom et al. (2000) however, due to the broad-scale nature of the study, their analysis could not "reliably estimate their [Suite 4] habitat abundance." [4] Wisdom et al. (2000) concluded that that these habitats and related species needed to be addressed through mid- to fine-scale assessments, such as those completed as part of forest planning and subsequent plan to project fine-scale planning.

Of the 345 species of birds, mammals, or reptiles believed to occur within the Forest, 207 species are species of conservation concern and/or interest. These species include ESA threatened or endangered species, Region 4 sensitive species, and/or species of conservation concern identified in the *Idaho Comprehensive Wildlife Conservation Strategy* (IDFG 2005).

After reviewing available literature and local information, the Forest Planning Team assigned the selected species of conservation concern to one of the 14 habitat families based on habitat attributes. The number of species of conservation concern tied to each particular habitat family is identified in Table E-1 and described in detail in the *Wildlife Technical Report for the 2011 Sawtooth National Forest Plan Amendment to Implement a Forest Wildlife Conservation Strategy* (Filbert et al. 2011). While Wisdom et al. (2000) used a selected set of species to derive habitat families, the WCS assessment began by using those defined families to derive species of focus for each habitat family assessed. This approach is consistent with direction stated in the 2003 Interagency MOU implementing the *The Interior Columbia Basin Strategy* (USDA Forest Service et al. 2003a, b).

Within each habitat family, a subset of species was selected as "focal species" and used in mid-scale analyses to help identify habitat needs for species associated with each family. These species were selected by evaluating the key ecological functions (KEFs)[5] and key environmental correlates (KECs)[6] associated with species in the family. The Forest Service selected the fewest number of species necessary to represent the full array of KECs and KEFs associated with a family and likely to be affected by management actions implementing the Forest Plan. In addition, all ESA listed species, Region 4 sensitive species, and management indicator species (MIS) were included in the subset

[4] "Additional species (>80), most of which were deemed to be dependent on riparian or water habitats, also met the seven criteria [for selection of species of broad scale focus] (table 1); source habitats for these species, however, were identified by experts as needing mapping units smaller than 100 ha (247 acres) to reliably estimate their habitat abundance." (Wisdom et al. 2000, Volume 1, p. 9)

[5] Key Ecological Functions are the set of ecological roles performed by a species in its ecosystem (Marcot and Vander Heyden 2004). These ecological roles are the main ways organisms use, influence, and alter their biotic and abiotic environments. For example, beavers are primary consumers (herbivores), are prey for secondary and tertiary consumers (predators), create structures that can be used by other organisms (dams), and impound water by creating dams or diversions. This last function is unique to the beaver. The loss of beaver in a system where it is normally present, influences many other species. In Idaho, 33 wildlife species are directly and positively associated with beaver activity (e.g., dams, lodges, ponds).

[6] Key Environmental Correlates are biotic or abiotic habitat elements that species use on the landscape to survive and reproduce. For example, flammulated owls utilize natural or woodpecker-created cavities in standing dead trees in forested habitats. If those habitat elements are not present, this species cannot persist. The function (KEF) that northern flickers and pileated woodpeckers perform (cavity excavation) creates a habitat element (KEC) needed by the flammulated owl.

Table 0-1. Wildlife Conservation Strategy habitat suites and families and number of associated species of conservation concern (SCC), including how many are Endangered Species Act listed, Region 4 Sensitive, and/or State of Idaho species of conservation concern (IDFG 2005). Overlap exists between each of these various SCC categories.

Suites: Source habitats restricted to:	Source habitats dominated by:	Family number	Family name	Total Number of SCC	Number of ESA listed	Number of Region 4 Sensitive	Number of Idaho SCC
Suite 1: Forests only	Old-forest stages, low elevation	1	Low-elevation old forest	2	0	1	2
	Old-forest stages, broad elevation	2	Broad-elevation old forest	6	0	6	4
	Broad range of structural stages	3	Forest mosaic	2	1	1	2
	Forest stand-initiation stage (early seral)	4	Early seral montane and lower montane	0	0	0	0
			Suite 1 totals =	**10**	**1**	**8**	**8**
Suite 2: Combination of forests and rangelands	Broad range of forest and rangeland cover types	5	Forest and range mosaic	6	0	2	6
	Forests, woodlands, and montane shrubs	6	Forests, woodlands, and montane shrubs	1	0	1	0
	Forests, woodlands, and sagebrush	7	Forests, woodlands, and sagebrush	6	0	2	6
	Unique combinations of rangeland cover types and early and late seral forests	8	Rangeland and early and late seral forests	0	0	0	0
	Woodlands	9	Woodlands	4	0	0	4
			Suite 2 totals =	**17**	**0**	**5**	**16**
Suite 3: Rangelands only	Broad range of grassland, shrublands, and other cover types	10	Range mosaic	5	0	1	5
	Sagebrush	11	Sagebrush	7	1	1	7
	Grassland and open-canopy sagebrush	12	Grassland and open-canopy sagebrush	3	0	1	3
			Suite 3 totals =	**15**	**1**	**3**	**15**
Suite 4: Riverine and nonriverine wetland/riparian	Riverine riparian and wetland streams	13	Riverine riparian and wetland	5	1	2	5
	Open water, ponds, lakes, nonriverine riparian, and wetland	14	Nonriverine riparian and wetland	13	0	1	12
			Suite 4 totals =	**18**	**1**	**3**	**17**
			Total ALL Suites =	**60**	**3**	**19**	**56**

selected. ESA listed and Region 4 sensitive species were included in part because the Forest Service must assess these species in project planning where project activities may affect habitat associated with them. MIS were included due to their role in Forest Plan monitoring. Mid-scale assessments provide the context needed to inform more refined priorities established during plan-to-project fine-scale planning and site-specific conclusions about the magnitude of effects to habitat associated with species of concern.

Detailed documentation of habitat family descriptions, source habitat definitions for species associated with each family, KECs and KEFs associated with mid-scale focal species, and assessments completed for habitat families and each focal species are in the planning record.

WILDLIFE CONSERVATION STRATEGY LONG-TERM GOAL

The long-term goal of the WCS is to maintain or effectively restore representative, resilient, and redundant networks of habitats across the planning unit:

- **Representative—**Landscapes within the planning unit should contain the full array of potential "states" (i.e., diverse conditions) of an ecosystem characteristic on the landscape (Harris 1984; Hunter 1990). The assumption of a representative approach is that providing a wide range of habitat conditions will sustain the greatest percentage of terrestrial wildlife species that utilize those characteristics. For example, the intent of the WCS is to provide a range of forest structural stages and canopy closures characteristic of the historical landscapes. How and where this is done is informed by the knowledge that source habitats for some species are tied to specific size classes, canopy covers, and tree species (e.g., species associated with Family 1), while species in other families use a broader variation of conditions (e.g., species associated with Families 2 and 3).
- **Redundant—**To avoid extinction or endangerment caused by naturally occurring stochastic events (e.g., disease, predation, floods, and fires) and human-related disturbance, representative source habitat conditions should occur multiple places within the planning unit (Forman 1995). The WCS addresses redundancy by conserving or restoring representative source habitat conditions across the planning unit where the habitat historically occurred.
- **Resilient—**Landscapes within the planning unit identified as priority areas for a particular habitat family should be resilient to natural and human-caused disturbances. This criterion means that the representation and redundancy of source habitats and their associated species populations should be of sufficient quality to persist over long periods of time. For communities, ecosystems, and other surrogate measures, this criterion implies that natural ecological processes and disturbance regimes, such as fires and floods, are operating within their historical range of variability (Hunter 1990; Landres et al.1999) and the sizes of the areas are sufficient to allow source habitat features and related species populations to recover from natural disturbances. In terms of human disturbance, resilience implies that anthropogenic disturbance levels are within limits that will retain habitat features necessary to support species populations and source habitats.

The WCS addresses resilience by emphasizing the importance of restoring ecological processes and disturbance regimes, such as fires and floods, and by addressing potential effects of human disturbance on the quality of source habitats using an assessment based on conservation principles found in this appendix. The WCS used information such as published literature, regional and local expert input, and local field data regarding species habitat requirements to determine the representation and redundancy of ecosystem characteristics or specific habitat features needed to sustain a species. This range of specific habitat features becomes the context in which the current and projected status of an ecosystem characteristic can be evaluated. This is similar to the representative and redundant approach identified in Appendix A of the Forest Plan for vegetation conditions across the planning unit. However, the WCS goes a step further: the proportional amount of the vegetative characteristic to be maintained or restored has been further refined, and where it was identified as a priority to address during this planning period, specific planning period management direction has been defined to address the issue associated with the priority (e.g., restoration of dry forest communities, retention of old-forest habitat).

ASSESSING CURRENT BASELINES, THREATS, AND RISKS NEEDED TO DEVELOP THE WILDLIFE CONSERVATION STRATEGY

Nine conservation principles form the basis for assessing current baselines, threats, and risks and assigning appropriate WCS mid-scale strategies (i.e., active, passive, or conservation) and priorities (i.e., low, moderate, or high) for restoration. These principles are described below. The first six principles (1–6) relate to Suites 1, 2, and 3; the remaining three (7–9) apply to Suite 4. By using these principles to assist in project design and implementation, the desired representative, resilient, and redundant network of habitats should be realized in the long term.

Conservation Principles for Suites 1, 2, and 3

1. *Species well distributed across their range (redundant) are less susceptible to extinction (resilient) than species confined to small portions of their range.*

   This principle builds upon the belief that a widely distributed population will likely persist through major disturbance perturbations or other impacts that occur throughout its entire range at once. Local population extirpation and habitat recolonization following disturbance events are natural phenomena. Well-distributed populations allow the recolonization of extirpated habitats following these events. For instance, a severe drought may dry up the breeding ponds used by a species of salamander for several years in a row across two or three habitat patches. If that salamander does not occur elsewhere, it would be extirpated. However, if that salamander is widely distributed, at least some breeding ponds within its range would not completely dry out and would still contain salamanders. From these refugia, the species can recolonize areas where it had been extirpated. As an extreme example, a plant species that has become confined to the riparian zone of a single stream could become extirpated by a single extreme flood event. Keeping species well distributed is therefore a logical conservation goal and corresponds to the well-accepted "multiplicity" principle, which states it is preferable to have many patches rather than few (Soule and Simberloff 1986; Noss 1994). The provision of the ESA that allows for listing of local populations, even when the species as a whole is not threatened, is consistent with this principle.

   Maintaining occupied source habitats for multiple populations of species ensures a natural range of genetic variability and reduces the likelihood that environmental variability will result in species extirpation. As such, habitat management must consider redundancy. Focal species associated with a particular habitat must be represented in many places across the landscape so that extirpation at one location does not eliminate the species entirely from the planning area.

2. *Habitat in contiguous blocks is better than fragmented habitat (i.e., representative, resilient).* (Refer to Figure E-2.)

   Fragmentation reduces patch size of habitat remaining in the planning area, increases edge effects, and isolates patches by removing connecting habitat corridors (Forman 1995; Botequilha Leitao and Ahern 2002). Although species differ in their sensitivity to these changes (Crooks 2002), the theory of island biogeography suggests that fragmentation will decrease species richness due to reduced immigration and emigration potential (in the case of isolation) and increased extinction rates (in the case of small populations size) (MacArthur and Wilson 1967). Although fragmentation can result from natural disturbance, in many landscapes, fragmentation can also result from anthropogenic activities. Small and isolated habitat patches are expected to have smaller populations and less opportunity for demographic or genetic "rescue" from surrounding populations (Brown and Kodric-Brown 1977). In metapopulation theory, an unoccupied patch of suitable habitat isolated by fragmentation is less likely to be colonized or recolonized by a species (Gilpin and Hanski 1991). If enough connections between suitable habitat patches are severed and the habitat becomes fragmented, the metapopulation is destabilized and less likely to persist.

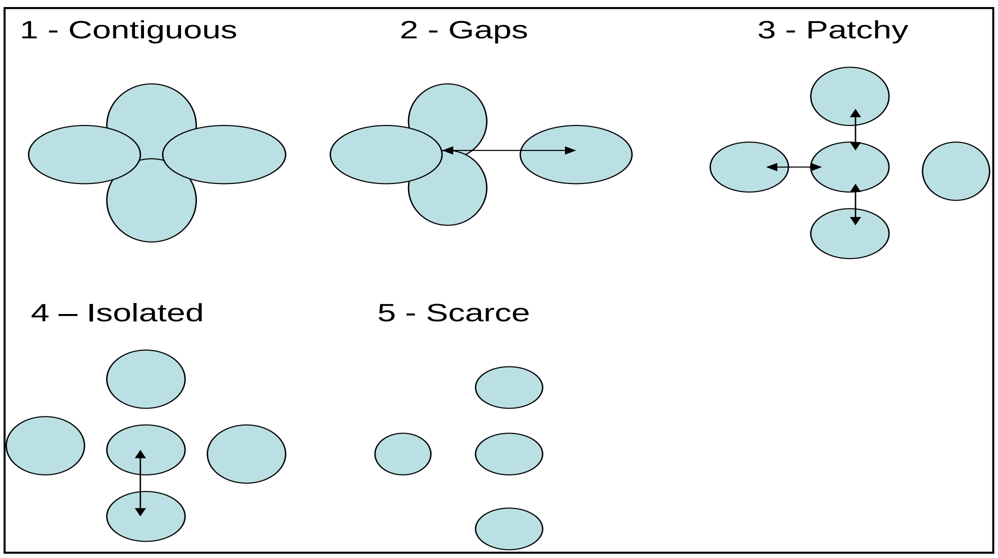


Figure E-2. Conceptual diagram of the five habitat outcome classes developed by Lehmkuhl et al. (1997) to assess effects of planning alternatives on selected plants and animals within the Interior Columbia Basin. Classes were defined as follows: outcome 1 indicated habitat was broadly distributed with the opportunity for nearly continuous distribution of the species; outcome 2 indicated habitat was broadly distributed but with gaps but patches were large and close enough to permit dispersal (indicated by arrows between patches); outcome 3 indicated habitat occurred primarily in patches, some of which are small or isolated, causing limitations in species dispersal; outcome 4 indicated habitat occurred in isolated patches with strong limitations on dispersal among patches and some likelihood of local extirpation; and outcome 5 indicated habitat was scarce with little or no opportunity for dispersal among patches and strong likelihood of extirpation.

When large habitat blocks are broken into smaller ones, not all species will be detected in the remaining patches because of sampling effects (Arrhenius 1921, 1922; Wilcox 1980). This effect is especially true for rare species and nonmobile organisms—such as small mammals, amphibians, and many invertebrates—that may already be sparsely or patchily distributed within the planning area. Additionally, connecting populations of these nonmobile populations may require multiple generations, and the persistence of these species is further dependent on suitable corridor habitat (Beier et al. 2008).

Large animals and top carnivores require large areas of habitat. These species are especially vulnerable to reduced habitat area caused by landscape fragmentation, and they may disappear entirely from forest patches because food or other resources are inadequate to support them (Newmark 1987; Carroll et al. 2001). Even smaller species are affected by the size of habitat patches; decreases in landscape connectivity via fragmentation and habitat loss can affect amphibian assemblages (Lehtinen et al. 1999). The disappearance of some species from forest fragments can profoundly affect the forest itself. For example, depletion of mammal or bird communities due to habitat fragmentation reduces seed survival or seedling establishment for certain plants (Santos and Tellería 1994; Asquith et al. 1997, 1999; Cordeiro and Howe 2001, 2003). Other species may persist, but in smaller populations with lower genetic diversity, which will increase the vulnerability of those species to other ecological changes such as disease. Rare species and those that normally occur at low population densities are especially vulnerable to these effects (Golden and Crist 1999). Smaller forest patches may also include less environmental variability and therefore fewer microhabitats than more extensive forest areas. The presence of fewer microhabitats can result in the loss of individual species and may reduce total species richness per area of forest (Collinge 1995, Laurance and Bierregaard 1996).

Fragmentation involves more than population effects for a single species. Effects at the community, ecosystem (Saunders et al. 1991), and landscape levels are also well documented (Noss and Csuti 1994). Problems at these higher levels include abiotic and biotic edge effects that reduce the area of secure interior habitat to smaller habitat patches and the proliferation of invasive species; increase disturbance of rare habitats and species; and disrupt natural disturbance regimes, hydrologic functions, and other natural processes. The end result of fragmentation is often a landscape that has lost native species and is dominated by exotics and other invasive species. Although species richness at the local or landscape scale is often higher after fragmentation than in more natural conditions, this richness is misleading because it is accompanied by a homogenization of flora and fauna at a broader scale and net loss of rare species.

3. *Large blocks of habitat containing large populations of species (representative and resilient) are superior to small blocks of habitat containing few individuals.* (Refer to Figure E-2.)

The principle of "largeness" is another universally accepted generalization of conservation biology (Soule and Simberloff 1986). A larger block of suitable habitat will usually contain a larger population of a species; large populations are less vulnerable to extirpation than small populations. Large blocks of habitat are also less likely to experience a disturbance that affects the entire area. Furthermore, refugia and recolonization sources are more likely to be present in large blocks of habitat than in small blocks, thus enhancing population persistence. Also, some species are present only in large blocks of habitat. This correlation is recognized as a species-area relationship: species richness increases as habitat area increases.

Larger patches of habitat generally contain more species, more individuals of a given species, more species with large home ranges, more species sensitive to human activity, and more intact ecosystem processes than do small areas (Robbins et al. 1989; Turner et al. 1993; Newmark 1995;

Schafer 1995). Larger patches will also usually contribute to greater resilience of populations and may also increase the utility of patches that act as "stepping stones" or connectors across a landscape (Buechner 1989; Lamberson et al. 1992). However, smaller reserve patches may also supplement larger reserves by protecting rare species that occur only in certain areas. Hence, greater variability in patch sizes may increase niche diversity and, consequently, regional biodiversity (Franklin and Forman 1987; Hansen et al. 1991).

4. *Blocks of habitat close together are better than blocks far apart (i.e., representative, redundant).* (Refer to Figure E-2.)

Across a landscape, habitat patches range from being evenly distributed to "clumped." Aggregation of habitat patches helps explain how species may be found in patches that are close together but not in more isolated patches (Ritters et al. 1996; He et al. 2000). This concept generally follows the island biogeography (MacArthur and Wilson 1967) and metapopulation theories (Levins 1969, 1970) and helps explain the function of patches within a landscape.

Many species are capable of crossing narrow patches of unsuitable habitat, such as a recreation trail or a narrow secondary road; far fewer are able to successfully move across a multilane highway or large clear-cut. Without intervening barriers, close habitat patches will experience more interchange of individuals than patches that are far apart. If enough interchange occurs between habitat patches, they are functionally united into a larger population that is less vulnerable to extirpation (Soule and Simberloff 1986).

Habitat patches that are close together may function as one larger, contiguous habitat patch for those species that are able to move among areas. However, what constitutes "close together" depends on the species of concern. Habitats close together for birds might be inaccessible for animals incapable of crossing barriers. For example, many small mammals, salamanders, and flightless invertebrates seldom or never cross roads (Mader 1984; Merriam et al. 1989; Fahrig et al. 1995; Forman and Alexander 1998).

5. *Interconnected blocks of fragmented habitat are better than isolated blocks, and dispersing individuals travel more readily through habitat resembling that preferred by the species in question (representative, redundant, and resilient).* (Refer to Figure E-2.)

Connectivity— which is the opposite of fragmentation but not synonymous with contiguousness— has become one of the most widely accepted conservation planning principles (Margules and Pressey 2000). Despite continuing arguments over benefits versus costs of particular corridor designs (Simberloff et al. 1992), conservation biologists generally agree that habitats functionally connected by natural movements of species are less subject to extirpation than habitats artificially isolated as a result of human activities. It is also probable that corridors or linkages will likely function better when habitat within them resembles that preferred by the species (Haddad 1999a,b; Ricketts 2001). For example, although we may not know exactly what habitats species associated with old-forest habitat will travel through, older forests are likely to provide better linkages than early seral forests.

Connectivity allows organisms to move between patches that contain suitable habitats. A collection of small areas individually may be too small to maintain populations of some species, if connected, these small areas may provide sufficient habitat for a species to maintain sustainable populations. In essence, connectivity refers to the pattern of interconnectedness or "networking" in a landscape. It helps determine how individuals of a species and natural processes, such as fire, move or function within a landscape (Wiens et al. 1985; Noss and Cooperrider 1994; Bascompte and Solé 1996; With 1999). A well-connected area can sustain important elements of ecosystem integrity—namely the ability of species to move and natural processes to function—and is more likely to maintain its overall integrity than a highly fragmented area.

The isolation of patches, or distance between patches, plays an important role in many ecological processes. Several studies have shown that patch isolation is the reason that fragmented habitat patches often contain fewer bird and mammal species than contiguous habitat patches (Murphy and Noon 1992; Reed et al. 1996; Beauvais 2000; Hansen and Rotella 2000). As habitat is lost or fragmented, residual habitat patches become smaller and more isolated from each other (Shinneman and Baker 2000); species movement is disrupted; and individual species and local populations become isolated and at greater risk of extinction from synchronous disturbance events. Connectivity is especially critical to the persistence of low-vagility species. Suitable habitats for these species that are connected for long periods allow multiple generations of these species to move (Beier et al. 2008). Isolated habitats can put species at higher risk for extirpation.

6. *Blocks of habitat that are in areas where direct and indirect effects of human disturbance are low are more likely to provide all elements of a species' source environment than areas where it is not (representative, resilient and redundant).*

Species disturbance caused by human activities may elicit behavioral responses and/or physiological responses that are detrimental to the species (Gabrielsen and Smith 1995; Gill et al. 2001). Behavioral responses are influenced by characteristics of the disturbance (e.g., type of activity, distance away, direction of movement, speed, predictability, frequency, and magnitude) and its location (e.g., above versus below, in open areas versus areas screened by topography or vegetation) (Knight and Cole 1995). Disturbances at critical life-history periods, such as during the winter, are those that are unanticipated (MacArthur et al. 1982; Parker et al. 1984). In circumstances where motorized use is predictable and localized (confined to routes), wildlife responses to unanticipated disturbances by people afoot, skiing, or using off-road vehicles may be even more pronounced than responses to vehicles on roads, to which species have adapted.

A continual threat to many species is increased access to habitats, primarily through roads. Increasing road density is the common thread in habitat-altering activities such as timber harvest, resource extraction, and conversion of wildlands for residential and commercial purposes. A wealth of scientific literature describes the effects that roads have on habitat and various wildlife species (Trombulak and Frissell 2000). Included among these effects are direct wildlife disturbance, increased erosion, increased air and water pollution, the spread of invasive species, and wildlife mortality.

Livestock grazing is also grouped under this principle as a human disturbance. Livestock grazing can affect the composition, function, and structure of ecosystems (Wagner 1978; Crumpacker 1984; Fleischner 1994) in the following ways: (1) altering species composition of communities, including decreasing density and biomass of individual species, reducing species richness, and changing community organization; (2) disrupting ecosystem functioning, including interfering in nutrient cycling and ecological succession; and (3) altering ecosystem structure, including changing vegetation stratification, contributing to soil erosion, and decreasing water availability to biotic communities; and (4) spreading infectious diseases between domestic and wild species.

Suite 4 Conservation Principles

To effectively address the long-term goal for habitat families in Suite 4 (riparian and wetland habitats), the Forest Planning team developed three specific principles unique to this suite. These principles were developed using the overall concepts behind the six principles above for Suites 1–3 and the ACS (Appendix B). Conservation principles for Suite 4 include the following:

1. *Representative species well-distributed across their range (redundant) are less susceptible to extinction (resilient) than species confined to small portions of their range.*

Similar to species in Suites 1, 2 and 3, Suite 4 species that are distributed in multiple populations across the variety of environmental regimes and habitats they naturally occupy will be less susceptible to the stochastic processes that can lead to extinction. In any given year, some populations may be subject to natural disturbances such as floods or fire, abnormally high levels of predation, or human-related threats such as habitat loss or degradation. However, if a sufficient number of populations exist appropriately distributed across their range, the species will be less susceptible to extinction.

2. *Continuous, nonfragmented riparian and wetland systems are better than fragmented habitat (i.e., representative, redundant and resilient).*

Many aquatic resources in need of restoration have problems that originated with harmful alteration of channel form or other physical characteristics, which in turn may have led to problems such as habitat degradation, changes in flow regimes, and siltation. Stream channelization, ditching in wetlands, disconnection from adjacent ecosystems, and shoreline modifications are examples of structural alterations that may need to be addressed in a restoration project. In such projects, restoring the original site morphology and other physical attributes is essential to the success of other aspects of the project, such as improving water quality and restoring native biota.

Perhaps the greatest impact of roads concerns alterations and fragmentation of stream and riparian habitats. Studies show that road networks constructed in forests appear to have increased the magnitude and frequency of peak flows and debris slides, thus altering the natural dynamics of stream and riparian areas (Jones et al. 2000).

3. *Riparian and wetland systems **representative** of the full array of historical natural functions are more resilient and more likely to provide the source environments needed to support species persistence in the short and long term.*

Structure and function are closely linked in river corridors, lakes, wetlands, estuaries, and other aquatic habitat. Reestablishing the appropriate natural structure can restore beneficial eco functions. For example, restoring the bottom elevation in a wetland can be critical for reestablishing the hydrological regime, natural disturbance cycles, and nutrient fluxes. To maximize the societal and ecological benefits of the restoration project, it is essential to identify what functions should be present and make missing or impaired functions priorities in the restoration.

Using the Conservation Principles to Conduct Analysis

Wildlife guideline WIGU15 states that these conservation principles should be used to assist in identification of treatment priorities within watersheds, in design treatments for wildlife habitat restoration, and to help understand the effects of proposed activities on wildlife habitat. Evaluating these principles provides a consistent and logical line of reasoning to document progression toward Forest Plan restoration goals and objectives, as well as recognize when, where and why effects may occur to source habitats and the species associated with them. Since the principles are interdependent, when Forest managers evaluate the principles, they should consider the entire set of principles likely to be affected by proposed management actions, rather than just one principle absent the context of others.

For example, natural resource use and development in the western United States over the past 200 years has resulted in extensively fragmented systems in some areas, leaving only small, isolated remnants of native vegetation (conservation principles 2–5). Forestry practices and domestic livestock grazing have affected both the remaining patch fragments and the surrounding matrix, and nonnative plant and animal species have affected the native biota (Hobbs 2001). Invasive plant species have the potential to significantly alter ecosystem composition and functioning. *These different influences often interact.* For instance, smaller fragments are often more prone to plant invasion and more likely to have been grazed in the past. Invasions by plant species is often linked with livestock grazing or road development. Classical fragmentation studies that concentrate on parameters such as habitat area and isolation but ignore changes in habitat condition brought about by livestock grazing, road development, and invasive species are unlikely to yield meaningful results. Similarly, management of fragmented ecosystems must account for not only the spatial characteristics of the remaining habitat but also the importance of other influences, particularly those that impinge on fragments from the surrounding matrix.

Mid-scale conservation principle indicators (CPI) were developed for each conservation principle to assist in developing the WCS. For each CPI, three relative risk ratings (high, moderate, and low) were developed to help inform mid-scale conclusions concerning how well a principle is currently met and what, if any, action may be needed to restore conditions related to a conservation principle. The *Wildlife Technical Report for the 2011 Sawtooth National Forest Plan Amendment to Implement a Forest Wildlife Conservation Strategy* (Filbert et al. 2011) provides the detailed documentation of these assessments and associated findings.

The evaluation of mid-scale CPIs provided a consistent and logical line of reasoning to inform development of the Forest Plan WCS and subsequent Forest Plan management direction. Likewise, evaluations of principles and appropriate CPIs for fine- to site-scale planning will provide a consistent and logical line of reasoning for documenting progress toward WCS restoration goals and objectives reflected in the Forest Plan; inform conclusions as to when, where, and why project effects may occur to conditions addressed by the indicator; and provide a framework for developing project-specific mitigation responding to effects. In some cases, the CPIs developed for mid-scale assessments will be appropriate in these finer scale assessments; however, in some cases more specific CPIs may be developed to take advantage of better data sources. When new CPIs are developed through fine- to project-scale planning, documentation to demonstrate the value and use of an indicator should be completed as at the mid-scale (*2009 Science Findings Contract* [Suring 2009a]).

A final caveat to consider is that in some cases, negative effects (i.e., increases in relative risk) to one principle in the temporary (≤3 years) or short (≤15 years) term may be acceptable to improve (i.e., reduce relative risk) another principle in the long term (>15 years). A decision whether to allow a negative impact within temporary or short-term time frames to provide for long-term risk reductions and/or promote restoration goals will depend on the duration of the impact, site-specific conditions, the status of species of concern in that location, and other resources of concern.

WILDLIFE CONSERVATION STRATEGY MID-SCALE SPATIAL PRIORITIES AND TYPE OF RESTORATION

Restorative actions taken almost anywhere would provide some benefit to vegetation and wildlife habitat. However, due to limited resources and funds, not all needs can be addressed in the foreseeable future. Spatially prioritizing restoration areas will help ensure source environments are expanded and functional source habitat areas are reconnected in a manner and time frame that provides the greatest benefit to species of conservation concern.

Forest managers and scientists believe the likelihood of restoration success increases as a landscape prioritization strategy is developed and implemented. A landscape prioritization strategy helps managers better understand how restoration in a given area contributes to the greatest conservation benefits for species of conservation concern and the spatial integration of restoration efforts relative to multiple habitat areas; how benefits can be maximized for a given cost; and how, through integration with other resources within and among agencies, managers can capitalize on common objectives and minimize unintended effects to accomplish various restoration objectives (USDA Forest Service and USDI BLM 2000; Rieman et al. 2000; Mehl and Haufler 2001; Brown 2002; Crist et al. 2009).

Two types of landscape prioritization strategies were developed to address source habitat and the more inclusive source environment needs for habitat families and species of conservation concern. The first strategy addresses conservation and restoration needs for habitat families where vegetation conditions are most departed from those believed to have occurred historically (e.g., Habitat Family 1 and associated species, and some Family 2 associated species). The second strategy addresses potential human conflicts associated with source environments linked to species of concern such as wolverine (e.g., Habitat Family 3).

The spatial priorities for these strategies are displayed on the Wildlife and Vegetation Habitat Restoration Strategy Map (2011) and the Source Environment Restoration Strategy Map (2011), respectively (Appendix 3). Both Forest-wide and Management Area direction are directly linked to these spatial strategies. While the long-term goal of these spatial priorities and associated plan direction is to maintain or restore environmental conditions needed to support persistence of terrestrial wildlife species found across the Forest, a short-term emphasis (i.e., this planning period) is provided for habitats or species of greatest conservation concern. This approach to short-term restoration will not equally address all habitats needing restoration. However, with the long-term component of the strategy in place, opportunities for restoring departed habitats of lesser concern will still be available. A brief synopsis of the long- versus short-term priorities follows.

Long-term (>15 years) Priorities: In order to provide habitat well distributed across the planning unit to support sustainability of native species, Forest vegetation communities should contain the array of desired habitat conditions described in Appendices A (i.e., macrovegetation features) and E (e.g., fine-scale elements such as old-forest habitat, snags and logs). The vegetative desired conditions described in Appendix A fall within the historic range of variability (HRV). Similarly, the desired conditions for wildlife habitat in the Forest Plan are to remain within, or move towards, conditions that fall within the HRV. The underlying assumption of the WCS is that the risk of losing species, processes, or genetic diversity within populations is thought to increase as departure from the HRV increases (Figure E-3) (McComb and Duncan 2007). While the level of risk likely becomes increasingly uncertain as the distance from HRV increases, the shape of the relationship and the confidence intervals depicted are not well understood (McComb and Duncan 2007) and likely vary among specific taxa.

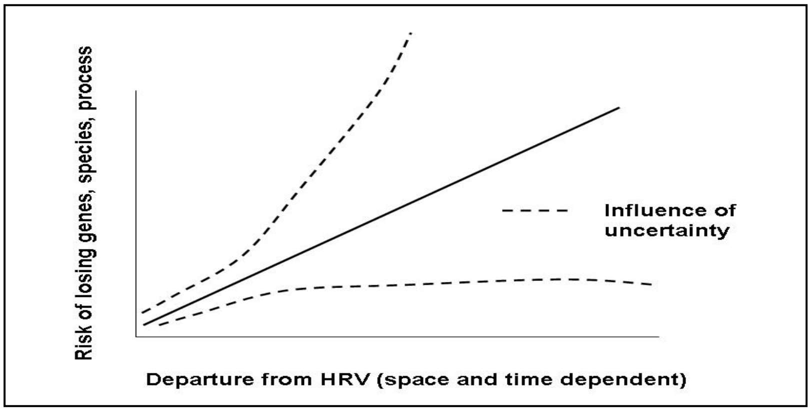


Figure E-3. Risk of species loss relative to departure from historic range of variability (HRV) (McComb and Duncan 2007)

While every acre across the Forest does not need to contribute to a desired network of source habitat and related environmental conditions, Forest managers should recognize that the greater the departure of source environments from HRV—largely depicted by the aforementioned conservation principles—the greater the risk to species sustainability.

Short-term (≤15 years) Habitat Maintenance and Restoration Priorities: Not all habitat families have experienced habitat change equally from historic to current conditions. While changes in habitat have occurred in each family, Families 1, 2 and 3 in the forests only habitat suite have a greater need for short-term conservation and restorative action compared to Family 4 in this suite (Table E-1). Since the Forest has limited funding to support restoration, short-term restoration priorities are designed to focus efforts and funding during the next 10–15-year planning window on those habitats and species with the greatest departure from historical conditions in habitat quantity, quality, and/or distribution. Restoring short-term priority areas will provide the building blocks for locating and designing restorative management actions over the long term.

IMPLEMENTING WILDLIFE CONSERVATION STRATEGY PRIORITIES AND STRATEGIES AT THE FINE SCALE, TAKING ACTION, AND MEASURING SUCCESS

Mid-scale decisions about priority 5th Code HUs (i.e., watersheds) are supplemented at the fine and site scales with information about specific threats at these smaller scales and site-specific actions needed to reduce or eliminate these threats. Generally, the more detailed datasets typically available at fine-to-site scales should be used to assess those habitat elements (e.g., snag conditions and distribution, verification of old-forest habitat) that could not be assessed fully in mid-scale analyses due to the limitations of common, planning unit–wide datasets. Understanding threat distribution and severity within fine-scale landscapes is vital to identifying and designing specific actions to effectively eliminate or mitigate the threats.

Relationship of the Wildlife Conservation Strategy to Forest Plan Appendices A and B and the Aquatic Conservation Strategy

Forest Plan vegetative management direction and Appendix A provide the operational framework for achieving desired vegetative conditions envisioned in the Forest Plan. Appendix A contains the mapping criteria, classification descriptions, and desired condition tables for vegetation. Separate tables and/or narratives within Appendix A disclose (1) desired conditions for separate components of forested vegetation, including snags and coarse woody debris; (2) desired conditions for woodland, shrubland, and grassland; and (3) desired conditions for riparian vegetation, including vegetation in riparian conservation areas (RCAs). Appendix A also describes how to plan for and undertake management actions that result in vegetative patches and patterns typical of those believed to have existed historically.

Forest Plan soil, water, riparian, and aquatic (SWRA) resource management direction; Appendix B; and the ACS provide the operational framework for achieving the desired SWRA resource conditions envisioned in the Forest Plan. Appendix B contains (1) the Southwest Idaho Ecogroup Aquatics Matrix, which describes properly functioning conditions for SWRA resources by pathways and watershed condition indicators; (2) Guidance for Delineation and Management of RCA; (3) the Implementation Guide for Identifying and Managing Landslide and Landslide Prone Areas; and (4) an Overview of the Southwest Idaho Ecogroup ACS, including determinations of the appropriate type of subwatershed restoration and the priority for short- and long-term progression toward achieving SWRA resource desired conditions.

Wildlife resource assessments supporting the Forest Plan indicated that these vegetative and SWRA resource strategies would maintain or contribute to the long-term maintenance and restoration of landscapes to a condition similar in *representation*, *resiliency*, and *redundancy* as that believed to have occurred historically (i.e., HRV). As such, management actions that strive toward achieving the appropriately functioning or desired conditions described in Appendices A and B will result in achieving long-term landscape source habitat conditions needed to support terrestrial wildlife species.

However, while Appendices A and B provide consistent definitions of the desired macrovegetative and SWRA resource conditions that encompass source habitat definitions, in many cases these definitions need to be refined during fine- and site-scale assessments to more accurately depict the range of conditions that represent source habitat needed to support ESA listed species, Region 4 sensitive species, and other species of conservation concern in the short versus long term.

For mid-scale assessments, species source habitat was assessed using Appendix A macrovegetation elements that best aligned with definitions from Wisdom et al. (2000), as well as other locally relevant literature. This more generalized approach was sufficient to assess factors needed to develop a mid-scale WCS that (1) conserves or restores habitat representation, resiliency, and redundancy across the planning unit; (2) identifies potential threats to current habitats and options to address them; and (3) identifies principles that should be used to help assess the relative risk these threats present to maintaining or restoring desired source environments. However, in future fine- and site-scale assessments, it will be important to recognize that the vegetative communities associated with Appendix A macrovegetation elements and their successional stages have unique environmental conditions that are ecologically important as niches for wildlife species (Thomas et al. 1979). Combinations of these successional stages may be necessary for some species for foraging, reproduction, or both, while other species are associated with one stage for all their needs.

To address this variation, the WCS developed habitat definitions and modeling parameters for habitat families, ESA listed species, and Region 4 sensitive species that linked to Appendix A macrovegetation elements but also described the other habitat features that could not be captured by the macrovegetation elements alone. Description of habitat definitions and modeling parameters was also done for other species of mid-scale analysis focus (i.e., focal species), including MIS. Documents providing this information have been combined into the *Wildlife Technical Report for the 2011 Sawtooth National Forest Plan Amendment to Implement a Forest Wildlife Conservation Strategy* (Filbert et al. 2011). Biologists should refer to this report to find more specific definitions and habitat parameters for habitat families and their associated species.

As fine- to site-scale assessments are completed in support of plan implementation, it will be important to understand that as vegetation moves from one successional stage to the next, both the vertical and horizontal structure of the vegetation changes (i.e., size and arrangement). Understanding how Appendix A macrovegetation elements relate to a successional stage is important to assessing the quality of habitat on a landscape.

The structural stages displayed in Figure E-4 were used by Wisdom et al. (2000) and Hann et al. (1997) in their analyses for the Interior Columbia Basin project and provide an illustration of the important structural stages. These structural stages do not necessarily move sequentially from one stage to the next but instead follow paths influenced by climatic factors, site and landscape characteristics, disturbance type, disturbance severity, disturbance periodicity, and anthropogenic influences. Structural stages can be altered by management practices that either advance or impede movement into another stage; these stages could fall within various Appendix A structural size classes (i.e., large, medium, small, sapling, or grass/forb/shrub/seedling [GFSS]). Understanding the pathways between stages can help identify opportunities for restoring, as well as maintaining, desired structural stages over time. By associating the tree size class and canopy cover variables described in Appendix A with these structural stages, wildlife biologists can more finely characterize source habitat needs for individual species or habitat families. A description of each structural stage follows Figure E-4.

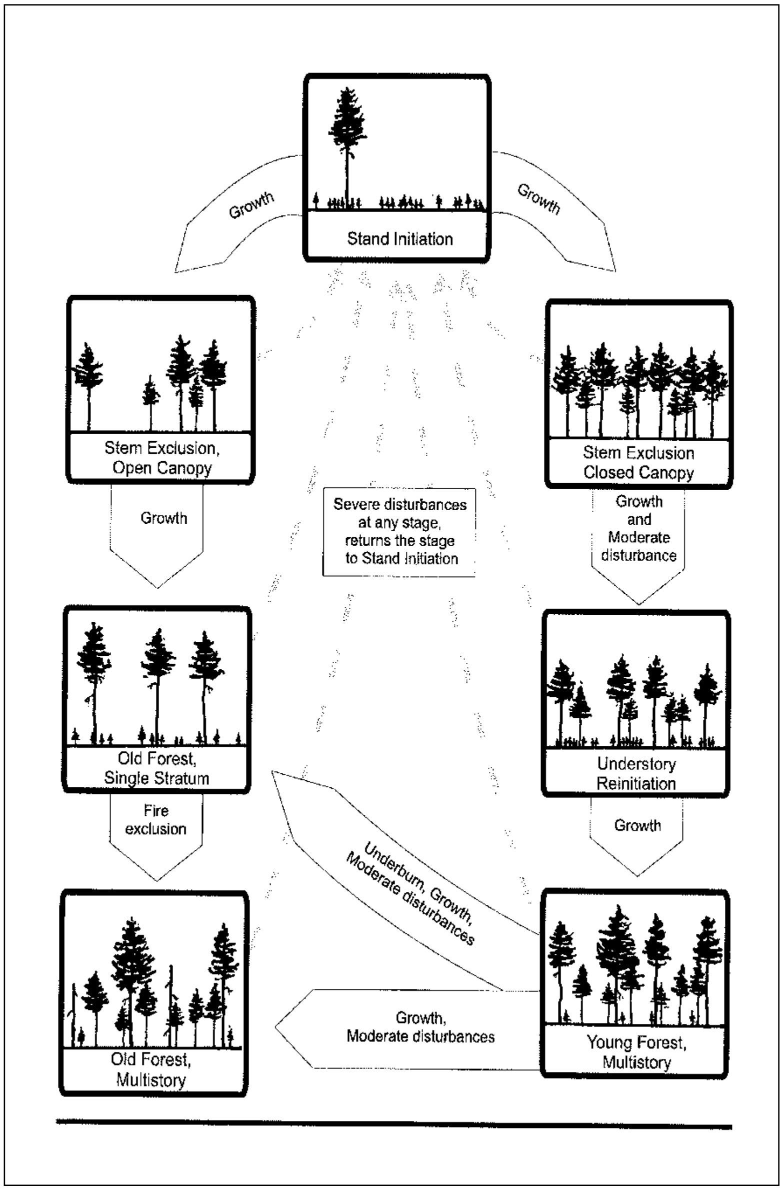


Figure E-4. Illustration of forest structural stages (Hann et al. 1997; Wisdom et al. 2000)

Stand Initiation - This stage refers to land that is reoccupied following a stand-replacing disturbance (Hann et al. 1997). Sites are occupied by GFSS in a broken or continuous layer (O'Hara et al. 1996). Legacy trees could be present but would make up <10 percent of the canopy cover. Typically this stand condition would be classified as either a GFSS or sapling tree size class per Appendix A definitions.

Stem Exclusion, Open Canopy - This stage refers to forested areas where the occurrence of new tree stems is limited by moisture (Hann et al. 1997). Sites are occupied by one broken-canopy cohort, usually of small- or medium-sized trees (O'Hara et al. 1996). Some large live legacy trees, up to 29 percent of the canopy cover, may also be present. When large trees account for 10–29 percent of the canopy cover, this stand condition would be classified as a large tree size class per Appendix A definitions. When large trees make up <10 percent of the canopy cover, this stand condition would typically be classified as a small or medium size tree stand per Appendix A definitions.

Stem Exclusion, Closed Canopy - This stage refers to forested areas where the occurrence of new tree stems is predominately limited by light (Hann et al. 1997). Sites are generally occupied by one cohort of small- or medium-sized trees in a continuous closed canopy (O'Hara et al. 1996). Some large live legacy trees, up to 29 percent of the canopy cover, may also be present. When large trees account for 10–29 percent of the canopy cover, this stand condition would be classified as a large tree size class per Appendix A definitions. When large trees make up <10 percent of the canopy cover, this stand condition would typically be classified as a medium size tree stand per Appendix A definitions.

Understory Reinitiation - This stage occurs when a second generation of trees is established under an older, typically mid-seral, overstory (Hann et al. 1997). Sites are occupied by at least two, sometimes more, cohorts of younger trees under older small- or medium-sized trees (O'Hara et al. 1996). Some large live legacy trees, up to 29 percent of the canopy cover, may also be present. When large trees account for 10–29 percent of the canopy cover, this stand condition would be classified as a large tree size class per Appendix A definitions. When large trees make up <10 percent of the canopy cover, this condition could be classified as a small or medium size tree stand per Appendix A definitions.

Young Forest Multistory - This stand development stage results from frequent harvest or lethal disturbance to the overstory (Hann et al. 1997). Sites are occupied by multiple cohorts, ranging from seedlings to medium sized trees (O'Hara et al. 1996). Managed young, multistory stands have undergone some form of silvicultural treatment, salvage, or roading and contain relatively few large snags or trees (Wisdom et al. 2000). Unmanaged young, multistory stands have not undergone disturbances described for managed stands and contain higher densities of large snags and large trees. When large trees account for 10–29 percent of the canopy cover in a young multistory stand, this stand would be classified as a large tree size class per Appendix A definitions. When large trees make up <10 percent of the canopy cover, this stand condition would be classified as a medium size tree stand per Appendix A definitions.

Old Forest, Single Stratum - This stage refers to forested areas resulting from frequent nonlethal fire or other management activities (Hann et al. 1997). Sites are occupied by broken-to-continuous cover of large, single or multi-aged cohorts in the same stratum (O'Hara et al. 1996). The understory is absent or consists of some inclusions of seedlings or saplings. Wisdom et al. (2000) defined old forest, single story as stands with >30 percent canopy cover in the large tree size class and <20 percent canopy cover in smaller size classes. Old-forest habitat is defined for potential vegetation groups (PVGs) in Table E-2. Forested stands within the planning unit that meet these conditions are identified as old-forest habitat. Per Appendix A definitions, these stand conditions would always be classified as a large tree size class.

Old Forest, Multistory - This stage refers to forested areas resulting from a lack of understory disturbance (Hann et al. 1997). Sites are occupied by multi-aged trees in an assortment of size classes and stratums (O'Hara et al. 1996). Wisdom et al. (2000) defined old forest multistory as stands with >30 percent canopy cover in the large tree size class and at least 20 percent canopy cover in smaller size classes. Old-forest habitat is defined for PVGs in Table E-2. Forested stands within the planning unit that meet these conditions are identified as old-forest habitat. Per Appendix A definitions, these stand conditions would always be classified as a large tree size class.

Understanding Context is Key to Successful Strategy Implementation

As stated in Appendix A, and supported by findings in Appendix B, *"In many areas, current conditions deviate strongly from desired conditions…even under careful management it may take several decades for these areas to approach desired conditions. During that time, managers will have to choose among several approaches to maintain progress toward desired conditions. There may be many different paths to a common endpoint that meet different management objectives, but each path has its own trade-offs. Navigating these paths and trade-offs will be the challenge of ecosystem management in trying to achieve desired vegetative conditions"* (Appendix A, page A-1). For managers to effectively understand trade-offs between resources, priority activities identified for vegetative and SWRA resources need to be evaluated alongside those priorities identified for wildlife source habitat or species of conservation concern (Table E-1). Although in many cases these priorities are consistent, situations exist where they are not. In these situations, trade-offs will need to be balanced consistent with the multiple-use objectives associated with the applicable Forest Plan management prescription category (MPC) allocation.

In most cases, Forest managers must use broad- and mid-scale assessment findings to establish a broader context for identifying fine-scale issues/priorities. The absence of context is like having a word with no sentence; there is nothing to help explain the meaning of the word or what message is being conveyed. Information or attributes visible at one scale may disappear at another scale. Influences at broader scales generally operate over a longer time frame than at finer scales; setting limits on ecosystems, analogous to machinery operating at finer scales. Fine-scale machinery is the gears, rods, and pistons, more or less invisible at broader scales, that make the ecosystem tick. The machinery at one scale is the context or constraint at the next scale down.

As discussed in Chapter III of the Forest Plan (p. III-1), three analysis scales should be considered during plan implementation to fully understand the context of and effects (negative or beneficial) to ecosystem and species diversity likely to result from implemented actions. At each scale, consistent with WIGU15, the conservation principles discussed above should be used to assist in evaluations.

From larger to smaller, the following three scales should be addressed and/or assessed:

1. Mid scale: This scale of analysis was completed by the Forest interdisciplinary team (IDT) within the context of broader-scale findings, such as those identified in the ICBEMP and *Idaho Comprehensive Wildlife Conservation Strategy* (IDFG 2005). This analysis is maintained in the planning record and will be updated periodically as part of Forest Plan monitoring and evaluation consistent with timelines established in Chapter IV of the Forest Plan. This analysis provides conservation and restoration priorities ***among*** 5th HU watersheds.
2. Fine scale: This scale of assessment results in a better understanding of spatial and temporal relationships of threats, risks, and priority actions ***within*** a 5th HUC watershed. Typically, outcomes from this scale of assessment support what is referred to as "tactical planning" and would be reflected by the Forest Leadership Team in updates to the Forest's 5-year integrated plan for forest plan implementation (i.e., projects to be implemented to address Forest multiple-use priorities over the next 5 years). This 5-year plan integrates the various resource priorities for action along with other social and economic priorities, such as hazardous fuel reduction activities within the wildland-urban interface (WUI).
3. Site scale: Analysis at this scale supports site-specific planning and design of projects that implement priority actions identified in the Forest's 5-year integrated plan.

Evaluations across these scales lead to the following:

- An understanding of the importance of each watershed within a planning unit in providing source environments, including source habitat, for species associated with habitat families in the short and long term.
- An understanding of what threats represent the greatest risk to species and their source environments and where action is needed in the short and long term.
- The ability to trace the logic of management priorities to address the threats that represent the greatest risks in the short term (i.e. this planning period); and ultimately the long term.
- The ability to provide the context needed to support the probable effect of a specific project activity and its likelihood of changing an identified threat to habitat, and what that change means in terms of decreasing or increasing short-term risks to habitats and associated species of conservation concern across their respective ranges within the planning unit.

This hierarchical and iterative approach to evaluating ecosystem and species diversity will likely be more rigorous where risks to ecosystems and species are high or where potential management is complex. To improve planning efficiencies, the rigor of analysis should be commensurate with the degree of risk a project represents to habitats and their associated species of concern. Additional information concerning fine- and site-scale assessments is provided below.

Fine-Scale Assessments (Short-Range Tactical or Plan-to-Project Planning)

Similar to how plan-level mid-scale analyses provide context to fine-scale analyses, fine-scale analyses provide context to conclusions reached in site-specific analyses. Fine-scale assessments provide the more finite information needed to support scheduling of actions that will help achieve Forest Plan goals and objectives, as well as Forest program goals and emphasis items. These assessments rely on existing datasets unless the Responsible Official determines that additional data collection is warranted in light of the potential risk and threats to be addressed. In most cases, existing data can be used directly or as surrogate indicators of a potential threat needed to assess risk to habitat or associated species.

Results from fine-scale assessments are not only used to identify and prioritize opportunities for restoration within watersheds, but also to inform the Responsible Official of the likely magnitude (spatially and temporally) of potential project effects. Fine-scale information—in combination with the forest planning mid-scale assessment—can help inform priorities for project planning and design, resolve potential issues about the magnitude of effects to wildlife species in one area over another, and assist in understanding the effects of an action within the broader planning-unit framework. In other words, what may appear to be a concern or not a concern when looking at the project area alone may take on a different light when viewed from a higher scale. Fine-scale assessments should help answer questions such as the following:

- For proposed projects with a purpose to maintain or restore habitat related to one or more habitat families:
  - Why is a particular threat to habitat, or its associated species, the right one to address?
  - Why is it a priority to address this threat or need for restoration in this location at this time?

- For proposed projects whose purpose is to achieve other multiple-use goals and objectives in the Forest Plan (e.g., recreation facility development, mining, domestic livestock grazing, and forest products for socio-economic support):
  - Will implementing this action measurably increase the magnitude of a threat that has been identified as potentially contributing to declines in habitats associated with species of conservation concern within this watershed and/or planning unit?
  - If implementing this action is likely to measurably increase the magnitude of a threat, what project design or mitigation is needed to avoid or minimize the magnitude of the threat to the level where it will no longer result in unacceptable consequences to an ESA listed species, Region 4 sensitive species, or other species of concern?
  - If no project design or mitigation measures are available to avoid or minimize the magnitude of the effect in that location, can the effect be compensated for elsewhere within the watershed and/or planning unit in a manner that does not increase the overall risk or uncertainty concerning persistence of species within the planning unit?
  - Do opportunities for wildlife source environment restoration exist in this location, regardless of the WCS priority, that can be capitalized on through this action?

Setting priorities and scheduling work are key considerations in fine-scale assessments. Actions designed to address opportunities generated through fine-scale, plan-to-project planning will typically be included in the Forest's 5-year integrated plan when the Forest Service is reasonably confident the funding is or will be available to implement the project.

Site-Scale Assessments (Project or Site-specific Planning)

While fine-scale analyses provide context as to the importance of the beneficial or negative effects of a proposed project, they do not include the necessary detail concerning baseline conditions within a project area needed to assess and disclose site-specific direct, indirect, and cumulative effects of an action. Project design, planning, and related assessments provide this necessary detail.

In addition, the WCS identifies three important fine- to site-scale habitat elements that need greater emphasis for conservation and restoration during project design and planning this planning period: old-forest habitat, legacy trees, and large snags. These elements are discussed in detail below.

Old-Forest Habitat

Old-forest habitat is an important source habitat condition that provides essential denning, nesting, foraging, and cover habitat for many wildlife species. Old-forest habitats are distinguished by old trees and related structural attributes, which include tree size, signs of decadence, large snags and logs, canopy gaps, and understory patchiness (USDA Forest Service 2003a; Van Pelt 2007, 2008). Old-forest habitat develops when structural elements (e.g., large snags, logs, understory structure) are found in proximity to old, large trees, typically those defined as legacy trees (see Appendix A). Due to differences in forest/habitat types, site quality, climate, and disturbance patterns, old forests may vary extensively in tree sizes, age classes, and presence and abundance of structural elements (Helms 1998). Desired conditions for old-forest habitat are identified in Table E-2.

The ICBEMP assessment provides an estimate of historical ranges for old forest structural stages using a process similar to that which generated the HRV for Appendix A (Hann et al. 1997).

Table 0-2. Desired conditions for old-forest habitat within potential vegetation groups (PVGs) (arranged by fire regime). Components are measured at the stand level.

Fire Regime	PVG	Tree Size Class	Canopy Cover of Live Trees ≥20 inches d.b.h.[a] (Large Tree Canopy Cover)	Canopy Cover of Live Trees ≥0.1 inches d.b.h. (Stand Canopy Cover)	Species Composition of Live Trees ≥20 inches d.b.h.[e]	Number of Snags of a Particular Size in Each Acre[b]		Course Woody Debris Tons/Acre[c]	
						>10 to ≤20 inch	>20 inch	≥3 inch	>15 inch
Nonlethal	1	Large	≥30%	≥30% and ≤70%	PP ≥60%	≥1	≥1	>6	>75%
	2	Large	≥30%	≥30% and ≤70%	PP ≥60%	≥2	≥2	>9	>75%
Mixed 1	3	Large	≥30%	≥50% and <70%	PP and/or DF ≥60%	≥2	≥1	>9	>65%
	4	Large	≥30%	≥50% and <70%	DF ≥60%	≥2	≥1	>9	>65%
Mixed 2	7	Large	≥30%	≥50% and <70%	DF ≥60%	≥3	≥2	>12	>50%
	11	Large	≥30%	≥50% and <70%	WB and/or ES ≥60%	≥2	≥1	>9	>25%

[a.] d.b.h.=diameter at breast height
[b] Regardless of d.b.h., the height of all snags should be ≥30 feet in all PVGs except PVGs 1 and 11 where the minimum height is ≥15 feet. Note, while snags shorter than these heights do not contribute to determining whether a forest stand meets the old forest habitat definition, they do contribute to ecological functions and should be retained.
[c] Regardless of diameter, the length of all course woody debris should be ≥6 feet.
[d] PVG 10 is not included because persistent lodgepole pine does not develop old-forest conditions that are considered source habitat for WCS focal species or species of concern.
[e] PP = ponderosa pine; DF =Douglas-fir; WL = western larch; ES = Engelmann spruce; WB = whitebark pine

Estimates were generated for Ecological Reporting Units (ERU) including the Central Idaho ERU, which covers most of the Sawtooth National Forest *(although none of the Minidoka Ranger District on the south end of the Forest lies within this ERU)*. This information was used to develop the ranges displayed in Table E-3.

Table 0-3. Historical Estimates of Old Forest Habitat by PVG for the Sawtooth National Forest

Old Forest Habitat	Percentage Within Each PVG (%)					
	Nonlethal		Mixed1		Mixed2	
	PVG 1	PVG2	PVG 3	PVG 4	PVG 7	PVG 11
Historical Range	17-49		20-35	23-34		

Mid-scale assessments supporting the WCS concluded that far fewer acres of large tree size class forests exist compared to what was believed to exist historically. While mid-scale data are not detailed enough to fully assess all elements of old-forest habitat (Table E-2 and E-3), it was assumed that the greater the departure of large tree size class stands from historical conditions, the greater the departure in old-forest habitat conditions. Thus, compared to historical conditions, source habitats—including old-forest habitats—in the low- and mid-elevation dry conifer forests, *and especially in ponderosa pine forest*, have experienced the most change and have become smaller in patch size, more simplified in structure, homogenized within patches, and more fragmented. These changes, or declines, in source habitat are the result of several factors, including historic forest management, disruptions in historical fire processes (i.e., long-term fire exclusion), and uncharacteristic fire events.

In response to these findings and assumptions, the Forest Plan strategy includes standards that require retention of existing old-forest habitat (WIST08) and restoration of old-forest habitat conditions (WIST09). Management actions are permitted within forested stands defined as old-forest habitat as long as the stands will continue to meet the definition of old-forest habitat when the action is completed. To design projects that comply with these standards, the definitions in Table E-2, Figures E-5 and E-6 and the discussion on legacy trees should be used as guides.

Old forest is described using two distinct structural stages: old forest single-story and old forest habitat multistory (refer to Description of Forest Structural Stages above). Structural conditions for old-forest habitat vary depending on forested vegetation type (PVG) and the associated fire regime. The historical fire regime heavily influenced the patch size, spatial distribution, and vertical/horizontal diversity of structural elements of old-forest habitat for the associated PVG. Forested stands that experience frequent low- or mixed-severity fire disturbances (e.g., dry and moist ponderosa pine [PVGs 1 and 2] and warm, dry Douglas-fir [PVG 4]) develop old-forest single-story structure, which has been described as uneven-aged stands composed of relatively small, even-aged groups or patches interspersed with herbaceous openings and canopy gaps (Figure E-5; Kaufman et al. 2007). These stands primarily occur in the lower to mid-elevations; are typically less dense, consisting of fairly open clumps of large trees; and have small to moderate accumulations of understory conifers and large coarse woody debris/logs.

Figure E-5. Graphic of ponderosa pine old-forest habitat, single-story condition (Van Pelt 2008)

Forested stands that developed from less frequent high- or mixed-severity fire disturbances (e.g., warm, dry subalpine fir [PVG 7]) tend to develop multistory old-forest structure, which includes a variety of sizes and conditions of live trees, snags, and logs and some large, old trees (Figure E-6). In these stands, spatial heterogeneity is present vertically, in the form of a vertically continuous but variably dense total stand canopy, and horizontally, apparent in patchiness in stand density (WSDNR 2005). Structural attributes of multistory old forest typically include a developed understory, multi-aged trees, and large volumes of large coarse woody debris/logs. These stands are more typical of the upper montane and subalpine forests.

Figure E-6. Graphic of Douglas-fir in an Old-Forest Habitat, Multistory Condition (Van Pelt 2007)

The minimum criteria for defining old-forest habitat are described using a subset of the large tree structural class and associated canopy cover, species composition, snags, and coarse woody debris described in Appendix A; refer to Table E-2 for definitions by PVG. Criteria found in Table E-2 should be used to determine compliance with Forest Plan standards concerning old-forest habitat—WIST08 and WIST09. To comply with these old-forest habitat standards, management actions are permitted within these stands as long as (1) the stands continue to meet the definition of old-forest habitat (WIST08) after the action is completed or (2) if the stand is currently not in an old-forest habitat condition but has the species composition needed to restore this condition, management actions do not preclude development of old-forest habitat (WIST09).

The portion of large tree size class described in Appendix A where the large tree, non-overlapping canopy cover ranges from 10 to 29 percent canopy is not defined as old-forest habitat (refer to Figure E-4). However, the large trees in these stands do provide important habitat for a variety of species and, where the tree species composition is consistent with that desired in old-forest habitat, can provide a starting point for restoring old-forest habitat conditions. This is particularly true for single-story or multistory large tree stands that have experienced little to no forest management in the past; these stands would likely include large snags and logs, making them desirable for focused old forest restoration efforts.

Legacy Trees

Legacy trees are important attributes of old-forest habitat because they are often the largest and oldest specimen present. As discussed in Appendix A, legacy trees can be defined as anything handed down from a predisturbance ecosystem (Perry and Amaranthus 1997). These old, large trees can also be a remnant of a prior old-forest condition that exists in stands of other forest structural stages due to a previous disturbance event. In forests characterized by low- or mixed-severity fire regimes, aging stands become more diverse and complex due to low-severity disturbances that result in the establishment of multiple cohorts (Van Pelt 2008). In these forests, it is often the presence of clumps or individual legacy trees that determine opportunities for restoration of old-forest habitat and ultimately become the foundation for a restoration plan (Van Pelt 2008).

Characteristics of legacy trees include deep bark fissures, wide bark plates, altered bark color, flattened crowns, different branch characteristics, dead tops, and diversity in crown form (Kaufman et al. 2007; Van Pelt 2008). These old, large trees are often selected as nesting sites due to their larger branches that are capable of supporting large stick nests, and these trees often have dead tops or internal decay that provide nesting or denning habitat for cavity-dependent species. Older, larger trees have deep, full canopies that provide more foraging area for bark and foliage gleaners and typically produce greater quantities of seed important to a number of species. When these legacy trees die they continue to provide important habitat as a large snags or eventually as a large logs within old-forest habitat. Legacy trees also provide genetic material important for future stand establishment because it reflects local site conditions.

Ponderosa pine and Douglas-fir legacy trees are important to wildlife species on the Forest, and the Forest Plan includes specific direction (VEGU08) emphasizing the need to retain these important trees. These trees are long-lived seral species that contribute to old-forest habitat conditions important for wildlife species persistence and are typically subject to management activity due to their presence in lower and mid-elevations where forest management is most likely to occur. Refer to the Appendix A discussion and description of legacy trees.

Snag Retention

Snags, live trees with decay, hollow trees, logs, and other woody debris provide an important ecological component in ecosystems. Two thirds of all wildlife species use deadwood structures or woody debris for some portion of their life cycles (Brown 2002). They are used by wildlife for foraging, nesting, denning, roosting, and resting (Bull et al. 1997). Historically, the presence of snags, hollow and dead portions of live trees, and woody debris depended on a variety of factors including vegetative patterns and distribution, site potential, and disturbance regimes.

Due to the territorial nature of numerous wildlife species (e.g. woodpeckers), snags and snag patches must be well distributed across the landscape (Bull et al. 1997). Marcot et al. (2002) suggest that managers not average snags and coarse woody debris across too broad an area, which could potentially leave large areas within a watershed with elements that are too scarce or small to be used by wildlife. Therefore it is most desirable to provide snags and coarse woody debris, within the ranges identifies in tables A-5 and A-6, at the stand or project level scale.

Forest Plan direction results in different levels of snag retention within the various MPCs across the planning unit, consistent with the multiple-use objectives associated with individual MPCs. This direction includes retention requirements during general vegetation management treatments and in some cases, specific retention requirements during any salvage operation. Table E-4 provides a summary of snag retention requirements by MPC.

When planning salvage logging, Forest managers should recognize that considerable scientific debate still exists regarding what, if any, level of salvage logging is compatible with maintaining biodiversity within severely burned forests, particularly in the mixed- and high-severity fire regimes (Hutto 2006; Lindenmayer et al. 2008). Studies conducted in burned forests have shown that several species respond positively to postfire conditions (Hutto 1995; Saab and Dudley 1998; Smith and Hoffman 2000). Kotliar et al. (2002) identified at least nine species of birds that are consistently more abundant in burned forests, indicating that these are important wildlife habitat areas. In addition, different postfire burn severities offer unique conditions or combinations of resources for species and, in order to meet habitat needs of all species, a range of fire severities need to be provided for across the landscape (Smucker et al. 2005). Some species (e.g., black-backed woodpecker, American three-toed woodpecker) are considered burn specialists and heavily rely on high-severity, postfire forests. These species nest in snags and rely on snags for feeding sources. Wood-boring beetle larvae are known to dramatically increase following severe fires and their short life cycle (2–3 years) results in a very narrow window of opportunity for bird species to utilize this food source. Postfire salvaging decreases the suitability of postfire forests for most cavity-nesting species (McIver and Starr 2001, Kotliar et al 2002) and typically result in negative effects to these species that are most reliant on burned forests (Saab and Dudley 1998, Haggard and Gaines 2001, Kotliar et al. 2002).

Early postfire conditions in communities represented by mixed and high severity fire regimes offer unique habitat components that are highly valuable to wildlife species. It is important to note that the ranges described in Tables A-5 and A-6 are representative of green stands, not post disturbance (e.g. high severity fire) stands. To provide habitat important for species diversity, snag and coarse woody debris retained after moderate and high severity fires need to be evaluated at the project level. Recommendations include leaving large patches of burned forest or generously increasing the number of snags per acre retained on the landscape.

Table 0-4. Snag retention requirements by management prescription category (MPC)

MPC	MPC Acres in Planning Unit	Vegetation Treatments, Including Salvage Logging	Snag Retention Requirement per MPC Standards
1.1 and 1.2	482,000	Prohibited	All snags retained
2.2	3,000	Allowed	As allowed in the RNA or Experimental Forest Management Plan
3.1, 3.2, and 4.1c	969,000	Allowed	Retain all snags >20 inches d.b.h. during all vegetation management operations. In addition, retain the upper end of Appendix A desired range for total snags and snags <20 inches d.b.h.
4.3	1,800	Allowed	No specific direction. Refer to specific ski area Vegetation Management Plan.
4.2, 5.1, and 6.1	657,000	Allowed	Retain the upper end of Appendix A desired range of snags >20 inches d.b.h. during salvage operations. All other vegetation management treatments manage consistent with Appendix A

Measuring Success, Monitoring and Evaluation, and Adaptive Management

Adaptive management incorporates new information and findings into conservation actions. Specifically, it is integrating the scientific method into the design, management, and monitoring of decisions. Adaptive management is used to systematically test assumptions and measure success in order to *adapt* and *learn* from decisions.

In light of the uncertainties associated with some of the assumptions used in developing the WCS, testing and documenting the outcome of actions during Forest Plan implementation is key to adjusting the "path" that ensures the realization of the WCS. Chapter 4 of this Forest Plan provides the monitoring questions, indicators, and measuring frequencies for mid-scale elements. Results from monitoring will be comprehensively evaluated every 5 years. Results from these 5-year evaluations will be used to adapt our current mid- to fine-scale assumptions, Forest Plan management direction, and WCS priorities.

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