Conceptual Approach

Numerous conceptual approaches for wildlife conservation have been proposed and implemented in recent decades. These approaches have focused on various elements such as single species, management indicator species, ecological guilds, management assemblages, and ecosystems (reviewed by Block et al. 1995). All the approaches by themselves have inherent practical or biological limitations. For example, the single-species approach is usually not cost effective or practical for many species, and a broad-based biodiversity approach can have conflicting objectives among the myriad of species involved—and can be ambiguous in terms of design and evaluation without reference to specific habitat requirements for individual species (Lambeck 1997). Salwasser (2001) suggests that a coarse filter (i.e., multiple species, landscapes, ecosystems) and fine-filter (i.e., species and their habitat needs) approach that is nested and overlapping is the most likely to provide effective wildlife conservation.

> *"…our conservation emphasis is on habitat and habitat attributes, and we use a suite of bird species and their relationships to those habitats and habitat attributes as the mechanism for achieving bird conservation."*

Within PIF, species prioritization for conservation is driven by the quantitative scoring system of the Species Assessment Database (www.rmbo.org/pif/pifdb.html; [Panjabi et al. 2005]), which has been externally reviewed by Beissinger et al. (2000). Although the emphasis is on single-species conservation, there is an underlying assumption that conservation of priority species supports ecosystem management because other species will likely benefit from actions implemented to conserve priority species. However, it is unlikely that a suite of PIF priority species can represent the array of habitat features or conditions important for landbirds in a functioning ecosystem, in part because priority species often are a priority because they are "habitat specialists." Thus, conservation of an ecosystem or habitat type for birds is likely to be compromised because desired conditions for some/many habitat features or functional relationships would not be addressed if just focusing on priority species. Furthermore, the broader goals for conservation of biodiversity, increasingly desired as societal and ecological goals, cannot be achieved on a species by species basis (Franklin 1993).

Given the limitations of the priority species approach for ecosystem or habitat-level conservation and the recommendations of Salwasser (2001), we developed ***a multiple-scale approach for landbird conservation that emphasizes conservation of the coniferous forest ecosystem through appropriate representation of the habitat types and conditions important to birds as described through the habitat requirements of a suite of individual bird species most representative of those desired habitat types and conditions.*** Thus our conservation emphasis is on habitat and habitat attributes, and we use a suite of bird species and their relationships to those habitats and habitat attributes as the mechanism for achieving bird conservation. Two key components of this approach are:

- Adequate representation of the primary bird-habitat relationship categories within the coniferous forest ecosystem (e.g., forest type, successional stage)
- Adequate representation of the key desired habitat elements or attributes within the coniferous forest ecosystem (e.g., snags, canopy cover, shrub cover, tree size)

> *"Our use of a suite of focal species provides an efficient and comprehensive way to address ecosystem conservation because it ensures that conservation is directed at the range of important habitat conditions within the ecosystem."*

At the core of this approach is the use of focal species (Lambeck 1997). Our rationale for using focal species is to draw immediate attention to habitat features and conditions most in need of conservation or most important in a functioning ecosystem for landbirds. Although conservation is directed towards focal species, establishment of conditions favorable to focal species also will likely benefit a wider group of species with similar habitat requirements (Lambeck 1997).

Our use of a suite of focal species provides an efficient and comprehensive way to address ecosystem conservation because it ensures that conservation is directed at the range of important habitat conditions within the ecosystem. Implementation of this multi-focal species approach should result in a high likelihood of maintaining key habitat attributes and providing functioning ecosystems for landbirds because the most important habitat attributes for landbirds are targeted for conservation. This approach also provides a comprehensive framework for dealing with priority species (current and future) because the component(s) of the habitat needed by those species are likely already addressed through our suite of focal species. It also provides the opportunity to include priority species either as focal species or as independently unique species, and include species-level recommendations for their conservation.

Organizational Framework

Forest successional stage is used as the primary category to organize the document because it provides the most distinct separation of bird-habitat relationships in coniferous forests of western Oregon and Washington (Meslow and Wight 1975). However, it is widely recognized that successional stage alone can be an insufficient measure of wildlife habitat quality (Bunnell et al. 1997), because many wildlife species respond to specific habitat attributes that can occur in multiple successional stages such as canopy closure, presence of large trees and snags, understory development, structural heterogeneity, and a deciduous tree component. Additionally, intensively managed forests and efforts to implement multi-aged management complicates use of successional stage because the various structural features characteristic of "natural habitats" are managed for or against under different management objectives. Thus, we use successional stage as our coarse-filter organizational category, and use habitat attributes (See *Habitat Attributes*) within successional stages as our fine-filter organizational category. Finally, as described below, we use a suite of bird species to address conservation of the habitat attributes within successional stages, and also use populations of those bird species as one of the performance metrics for tracking progress towards objectives.

Habitat Attributes

We use the term habitat attribute to describe those habitat features, conditions, or elements that function as important life requisites for the focal species representing them. Our presentation of quantitative objectives for habitat attributes within the context of the appropriate successional stage provides land managers with descriptive and measurable targets to strive to achieve through management or natural succession.

Further, for some bird species, habitat relationships are not best described by successional stage and/or habitat attributes but by the composition and pattern of structural attributes or successional stages across the landscape. Since this strategy is designed to be an ecosystem planning tool, it also will be necessary to design and implement management at the landscape-level to support these species and ensure adequate representation of all the other species. Landscape planning will require addressing regional populations or sub-populations of birds that occur both within and across large landscapes. However, most of what we know about landbird ecology in coniferous forests exists at the scale of individual birds/pairs or small populations at the site-level (often referred to as stand-level in coniferous forests), and less is known about the relationships between landbird populations and habitat at the landscape scale (Marzluff et al. 2000). However, recognition of the importance of landscape-level considerations for forest bird conservation is receiving more recent attention (Aubry 2007), and herein we include some landscape-level objectives, based on emerging biological knowledge (e.g., Nott et al. 2005) and some professional judgment, to be tested in an effort to expand our knowledge of landbird biology and management toward the landscape scale.

"…we use successional stage as our coarse-filter organizational category, and use habitat attributes within successional stages as our fine-filter organizational category."

Components of the Process

The conservation planning process to support the conceptual approach described above includes the following components which are summarized in the following sections and presented in detail in subsequent chapters:

- identify habitats that are conservation priorities for landbirds
- identify the desired habitat attributes for landbirds
- identify species representative of the desired habitats and habitat attributes (i.e., focal species)
- supplement the focal species list with priority species that have been identified by primary bird conservation partners and would benefit from conservation of focal species
- establish measurable habitat objectives to achieve the desired habitat conditions based on the habitat requirements of the focal species
- supplement the habitat objectives with focal species population objectives to be used as the metric for tracking bird conservation
- recommend conservation strategies that can be implemented to achieve the habitat objectives,
- conduct monitoring to assess the habitat and focal species response to the implemented conservation strategies and progress towards the habitat and population objectives
- implement adaptive management as appropriate to adjust habitat management towards the trajectory of the biological objectives

Desired Habitat Attributes

We reviewed the scientific literature on bird-habitat relationships in westside coniferous forests to determine the range of important habitat attributes most associated with bird species habitat selection or use within the context of the ecologically desired conditions for these forests. We did not emphasize habitat attributes which may be ecologically important to the forest community or other taxa, but are not a primary habitat feature for landbirds (e.g., seeps for amphibians and downed logs for mammals).

Because there is considerable latitudinal and elevational variability in the geographic scope of this document, there also is variability in the habitat types and conditions and the bird species relationships with those habitat conditions. Thus, it is important to recognize that although bird species are generally responsive to the same habitat conditions throughout coniferous forests of western Oregon and Washington, there often is variation in response to the specific parameters of the habitat condition. Our characterization

of bird-habitat relationships reflects primary tendencies that can be targeted for the greatest conservation value for those species and habitats. However, there are no absolutes in bird-habitat relationships and our characterizations should not replace local knowledge or data applicable for the conservation of our focal species and their associated habitats and habitat attributes.

Focal Species

The two primary goals for bird conservation under the PIF Initiative are 1) helping species at risk, and 2) keeping common birds common (Rich et al. 2004). Planning to meet these goals can be problematic because of the large number of landbird species and the need for conservation actions for both rare and common species. It is unrealistic in terms of cost and time to plan or implement species-specific conservation for so many species. Thus, the use of focal species (See*: Focal Species*) is an alternative approach widely used for conservation of biodiversity (Rempel 2007).

Focal Species

Although each bird species has evolved to occupy a unique ecological niche, there is significant overlap among many species in their basic habitat requirements. These areas of overlap provide an opportunity to efficiently capture the habitat needs of many bird species by directing conservation towards a few key species (i.e., focal species) associated with a suite of shared habitat requirements. The assumption is that **conservation directed towards the collective needs of a suite of focal species that represent the range of desired habitat conditions for birds in the habitat should also address the habitat needs of most if not all of the other bird species occurring in that habitat type**. Thus, our use of focal species is a "coarse filter" attempt to conserve biodiversity, a firmly entrenched objective of conservation.

After determining the important habitat attributes for landbirds as described above, we reviewed the scientific literature to determine the coniferous forest bird species that best met the following criteria as focal species for those attributes:

- regularly occurring breeding species throughout our geographic scope
- strongly associated with conifer forests such that it is the primary habitat for the species and they reach their highest breeding densities there
- strongly associated with an important habitat attribute within conifer forests such that they would demonstrate significant responses to management or restoration targeted at the habitat attribute
- readily monitored using standard techniques to be able to track progress towards objectives at multiple scales

When considering bird species suitable to meet these criteria, we first evaluated the appropriateness of any priority species identified by primary bird conservation partners. They were used as a focal species if we were confident they were a good representative relative to other potential focal species for a particular habitat attribute.

"Our premise throughout this document is that measurable, prescriptive targets for birds and associated habitat attributes are what is most needed by those working on-the-ground for landbird conservation."

Photo by Erik Ackerson

When more than one species would seemingly make a good focal species for a particular habitat attribute, we usually deferred to the species for which more knowledge exists about its life history and ecology to provide the source for setting biological objectives, or species that we had more national "responsibility" for based on their restricted distribution to the Pacific Northwest.

Although we tried to ensure the completeness of the geographic representation of each focal species, there is coniferous forest habitat in western Oregon and Washington where some focal species may not occur as breeding species. In these cases, we suggest using the habitat objectives presented for the focal species and using one of the species listed under "species to benefit" (Appendix A) for tracking population response or progress towards any population objective for the focal species.

We also identified some additional habitat attributes and focal species for the Klamath Mountains ecoregion of southwestern Oregon because of their uniqueness to that area. We suggest using these focal species to supplement the regional focal species and associated forest conditions and habitat elements as appropriate when planning or implementing conservation in southwestern Oregon.

Integration of Priority Species

Many PIF partner agencies and organizations have prioritized bird species for conservation based on factors such as small populations, limited distribution, declining population trends, threats to habitat, or dependence on the geographic area being considered. When using these lists of "priority" species to direct conservation, the emphasis is on single-species conservation with an underlying assumption that actions to conserve priority species supports some degree of habitat or ecosystem conservation because other species will likely benefit. However, the conservation of any particular feature or condition within the habitat or ecosystem is dependent on the chance that a priority species is associated with it. Thus, conservation using priority species is an opportunistic and often unbalanced approach for the conservation of habitats or ecosystems.

An assumption of our focal species approach is that the suite of focal species will cover the habitat requirements of priority bird species. However, some priority species are such unique ecological specialists that this is not always true. Some examples include Black Swift and waterfalls and Vaux's Swift and large hollow snags. Additionally, most agencies and organizations have historically used priority species; thus, there is established interest in tracking conservation of these species. In order to ensure our approach addressed these priority species, we included a priority species as a focal species with biological objectives if they met the focal species criteria described above. If not, we integrated them into the strategy where appropriate as species to benefit from conservation actions directed towards focal species.

Biological Objectives

Quantitative habitat and population objectives (collectively referred to as biological objectives) are the cornerstone of this document. Stated simply, they are "***what we think the birds need based on current knowledge.***" They are **not regulatory, nor do they represent the policies or recommendations of any agency or organization** (See*: Using our Quantitative Biological Objectives*). Our premise throughout this document is that measurable, prescriptive targets for birds and associated habitat attributes are what is most needed by those working on-the-ground for landbird conservation. Establishing quantitative biological objectives serves several purposes:

- They provide targets for designing management plans and benchmarks for measuring success of management actions
- They provide hypotheses for research, particularly when objectives are based on assumptions and/or expert opinion due to lack of data
- They are probably our best form of outreach to communicate to others what is needed to conserve landbirds
- They function as a starting point for discussion of integration with broader ecosystem-based objectives

"It is important to recognize that our biological objectives have been established solely for the promotion of landbird conservation. They are not tempered by societal or economic concerns or by the conservation concerns of other wildlife or natural resource values. Integration of those factors is important, but outside the scope of this document."

Using our Quantitative Biological Objectives

It is important to recognize that our biological objectives have been established solely for the promotion of landbird conservation. They are not tempered by societal or economic concerns or by the conservation concerns of other wildlife or natural resource values. Integration of those factors is important, but outside the scope of this document. It will be important for people historically steeped in regulatory enactments such as the Endangered Species Act or National Environmental Policy Act, to think outside the regulatory paradigm that associates quantitative objectives with compliance and consequences of non-compliance, and recognize the different purpose and value of the biological objectives presented herein. **Our quantitative biological objectives are what we think the birds need based on current knowledge and are intended to stimulate conservation action in the trajectory of an objective, not provide the expectation of a rigid threshold or benchmark with accompanying consequences. Furthermore, our biological objectives are based on the premise that a quantitative target is more likely to stimulate conservation action than a descriptive, qualitative target that does not provide any numerical context for the desired outcome or means of tracking progress towards it.** Simply stated, most land managers want to know the measurable parameters—how much, where, and by when—in order to plan and implement bird conservation actions in an effective and integrated manner with other objectives, and perhaps just as importantly to have a context within which to track their progress towards goals and objectives.

Because of variability in the type, quality, and amount of data on focal species, some biological objectives are based on empirical data and others are based on expert opinion. To indicate this degree of variability, we provide the rationale and/or assumptions for the biological objectives as part of the process. We always strived to use the "best science available," and in many cases, the biological objectives have been taken directly from the recommendations of others based on empirical data from studies. Where specific data are limited for a focal species, and the biological objectives are based more on expert opinion, these objectives become testable

> *"All the biological objectives presented in this document should be viewed as dynamic with an emphasis on the need for research, refinement, and improvement of the numerical objectives over time."*

hypotheses for research. All the biological objectives presented in this document should be viewed as dynamic with an emphasis on the need for research, refinement, and improvement of the numerical objectives over time.

Habitat Objectives

Several types of habitat objectives at several different scales are presented in the document. At the scale of large landscapes such as ecoregions, quantitative habitat objectives are presented for representation of different amounts of habitat types or successional stages across the landscape. These are derived from expert opinion on adequate representation of successional stages relative to historic amounts and current and projected future land uses. We also present some smaller landscape-level habitat objectives based on the demographic monitoring of the Monitoring Avian Productivity and Survivorship (MAPS) program and species-specific ecological modeling for Pacific Northwest forests (Nott et al. 2005, Nott 2009).

At smaller scales (e.g., sites), prescriptive habitat objectives are presented as measurable targets for specific habitat attributes such as canopy cover, tree or snag size, and understory cover. These are derived from an evaluation of bird-habitat relationship data in the scientific literature and determination of the most appropriate targets. Three factors were paramount in setting these quantitative objectives for habitat conditions or attributes:

- means (rather than minimums) of available data were used because they more likely provide adequate conditions for maintaining populations
- a range of values were often used to represent the plasticity of a species' relationship with a habitat attribute and to acknowledge the historical range of variation that likely occurred for many habitat attributes
- optimal or high quality habitat was emphasized (to the degree of our knowledge) for self-sustaining populations in geographic areas most suitable for maintaining or providing that habitat

Unless otherwise indicated, data on population abundance or density are used to indicate habitat suitability. This assumes healthy, viable populations where species are most abundant, despite recognition that population density and associated habitat quality can in some cases be a misleading or inaccurate measure of population viability (Van Horne 1983). From a practical standpoint, this approach has been widely used because of the ease and cost effectiveness of collecting abundance or density data relative to demographic data, which is often unavailable. However, a consistent theme throughout this document is that use of habitat quality to represent population health is an assumption that will ultimately need to be validated with demographic data to determine relationships between habitat characteristics and population viability.

We emphasize setting habitat objectives for the most desirable habitat conditions for focal species in areas where those conditions are ecologically appropriate. Thus, throughout the habitat objectives we use the phrase "where ecologically appropriate" as a reminder that it is essential to consider the ecological appropriateness of the site to support the habitat attribute before initiating the management.

Finally, in the habitat objectives section, we provide quantitative targets not only for the habitat attribute the focal species is representing, but often for other habitat features the species is highly associated with. These additional habitat objectives are provided to recognize that the species conservation may include features beyond the habitat attribute they represent.

> *"We emphasize setting habitat objectives for the most desirable habitat conditions for focal species in areas where those conditions are ecologically appropriate."*

Population Objectives

The PIF Continental Plan used range-wide Breeding Bird Survey (BBS) trend data to establish *ideal* (i.e., not based on potential or capacity to achieve it) population abundance objectives (i.e., maintain, increase by 50%, increase by 100%) for the highest continental priority bird species (i.e., Watch List species; Rich et al. 2004). The establishment of continental population objectives was based on the model of the North American Waterfowl Management Plan in which population objectives have proven to be a valuable tool for stimulating conservation actions and for measuring the success of those actions. The population objectives established in the PIF Continental Plan were viewed as a starting point to initiate dialogue on the value of population objectives, and to stimulate action towards conservation of priority bird species at the continental scale by setting measurable targets. The expectation was that regional and local assessments would be conducted to establish habitat-based population objectives at those scales that reflect the practical realities of the capacity of those areas to contribute towards the continental population objective.

There is inherent value in having quantitative objectives for bird populations as part of bird conservation. Some of these include:

- a marketing tool to emphasize the magnitude of the conservation needed
- a communication tool that is compelling and understandable for public outreach
- a management tool with measurable targets for planning and implementation
- a performance metric to track bird populations relative to habitat management actions conducted on their behalf

- an adaptive management tool for monitoring ecological response and assessing where changes need to occur
- the "bottom line" metric for the ultimate assessment of bird conservation
- support of the continental population objectives presented in the PIF Continental Plan (Rich et al. 2004)

Population objectives were set in two ways. Most were set as a direct translation of habitat objectives based on abundance indices or density estimates. A few were set based on some desired density of breeding pairs within a landscape.

Conservation Strategies

Conservation strategies as defined herein are examples of management actions that may be used to support the biological objectives or enhance conservation relative to a habitat attribute or focal species. They are recommendations that can be institutionalized into management practices or implemented on an opportunistic basis within the broader context of ecosystem management. Management actions recommended include only a few of the wide variety of options available. Land managers and biologists should consult with ecologists and scientists from other disciplines to ascertain appropriate conservation actions to prescribe for specific areas. These individuals also can be a valuable source of information for additional management actions to achieve the biological objectives.

"…most land managers want to know the measurable parameters—how much, where, and by when—in order to plan and implement bird conservation actions in an effective and integrated manner with other objectives, and perhaps just as importantly to have a context within which to track their progress towards goals and objectives."

"The population objectives established in the PIF Continental Plan were viewed as a starting point to initiate dialogue on the value of population objectives, and to stimulate action towards conservation of priority bird species at the continental scale by setting measurable targets. The expectation was that regional and local assessments would be conducted to establish habitat-based population objectives at those scales that reflect the practical realities of the capacity of those areas to contribute towards the continental population objective."

Monitoring and Adaptive Management

Finally, monitoring of habitat attributes and focal species will provide a means of assessing bird and habitat response to the implemented conservation strategies and tracking progress towards our biological objectives. Monitoring provides essential feedback for demonstrating adequacy of conservation efforts on the ground, and guides the adaptive management component (Irwin and Wigley 1993) that is inherent in this approach. Because bird monitoring is a cost-effective tool for measuring the ecological effects of habitat management (Alexander et al. 2007), it serves as a link between bird conservation and habitat management within the adaptive management framework. Standard bird monitoring methods are readily available (e.g., Ralph et al. 1993) for gathering the types of habitat and population data necessary to evaluate progress towards the biological objectives found in this document.

Photo by Erik Ackerson