The Use of Avian Focal Species for Conservation Planning in California[1]

Mary K. Chase[2] and Geoffrey R. Geupel[2, 3]

Abstract

Conservationists often try to facilitate the complex task of protecting biological diversity by choosing a subset of species from a larger community to help them plan their conservation objectives. Biological knowledge about these species then is used to plan reserve systems or to guide habitat restoration and management efforts, with the assumption that the implementation of these recommendations will maintain overall biodiversity. Partners in Flight (PIF) is developing Bird Conservation Plans to set conservation priorities and specific objectives for bird populations and habitats throughout the United States. Many of these plans use focal species in some way. Here we briefly review the issues surrounding the use of focal species in conservation planning, and present the focal species strategies being developed and implemented by Partners in Flight in California. California PIF created focal species lists by identifying focal habitats, and then selecting those species associated with important habitat elements or ecosystem attributes, as well as those species with special conservation needs. Thus, a suite of species was chosen whose requirements define different spatial attributes, habitat characteristics, and management regimes representative of a healthy system. This process resulted in a diverse list of focal species for each habitat that includes both common and uncommon or rare species. Because focal species lists are based on numerous hypotheses and assumptions, these should be made as explicitly as possible and tested in ongoing monitoring studies as part of an adaptive management program.

Key words: adaptive management, bird conservation plans, monitoring, surrogate species, umbrella species.

Introduction

Protecting biological diversity is an extremely complex process, and conservationists often lack even the most basic data on which to base management and planning decisions. Conservation planners often try to facilitate this process by choosing a subset of species from a larger community to help them formulate their conservation objectives. Biological knowledge about these species then is used to plan reserve systems or to guide habitat restoration and management efforts, with the assumption that the implementation of these recommendations will maintain overall biodiversity. Here, we use the general term "focal species" to describe any species chosen for special attention in a multi-species planning effort. Although the use of focal species has been criticized on both theoretical and empirical grounds, many conservation biologists believe that their use can be valuable if the assumptions underlying their choice are stated explicitly and subjected to scientific testing (Caro and O'Doherty 1999, Lindenmayer et al. 2002, Poiani et al. 2001, Soulé 1995).

In the past, focal species often have been selected on the basis of their threatened or endangered status, largely because these species are given the strongest legal protection. However, the species that are at the greatest risk are not necessarily the most effective focal species (Franklin 1994). Partners in Flight (PIF) is developing Bird Conservation Plans (BCPs) to set conservation priorities and specific objectives for bird populations and habitats throughout the United States. Many of these plans use focal species in some way. Here we briefly review the issues surrounding the use of focal species in conservation planning, and present the focal species strategies being developed and implemented by Partners in Flight in California, as well as in Oregon and Washington.

The Uses of Focal Species in Conservation Planning

Focal species may be used to guide several components of conservation planning: (1) the selection and design of habitat reserves, (2) habitat restoration and management, and (3) population monitoring, both of population trends over time and effects of management actions. Planning a reserve system involves selecting which sites should be preserved and determining what their configuration

[1] A version of this paper was presented at the **Third International Partners in Flight Conference, March 20-24, 2002, Asilomar Conference Grounds, California.**

[2] Point Reyes Bird Observatory Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94970-9701.
[3] Corresponding author, e-mail: ggeupel@prbo.org.

should be, for example, for size, shape, and connectivity. Thus, the distribution and ecological needs of one or more focal species may be useful in site selection and reserve configuration, both of which are major foci of conservation planning (Margules and Pressey 2000). However, to ensure the persistence of biodiversity, conservation planners must also identify effective forms of habitat restoration and active habitat management to maintain desired conditions, both in habitat reserves and in working landscapes. One way to accomplish this is to design restoration and management to benefit one or more focal species. Monitoring is an essential companion to the other components of conservation planning, especially when management takes place in an adaptive manner. Adaptive management involves treating management as a continual experiment in which the results of previous actions are monitored and used to modify future management (Holling 1978, Ringold et al. 1996). Thus, focal species also can be monitored to test the effectiveness of management activities (Gibbs et al. 1999).

Clearly, a number of different classes of focal species are needed to address such a variety of conservation goals. In *table 1* we define several classes of focal species that are used or have been proposed for use in conservation planning. Caro and O'Doherty (1999) provide a more in-depth review of focal species types and their characteristics.

Table 1— *Classes of focal species[1] that are used or have been proposed for use in conservation planning.*

Focal species class	Definition
Flagship	Species that attract the attention of the public and generate popular support for the conservation of their ecosystems (Caro and O'Doherty 1999).
Keystone	Species whose presence is especially crucial in maintaining the organization and diversity of their ecological communities (Mills et al. 1993).
Special status	Species that have been given special status as endangered, threatened, or "of special concern" by local or national governments.
Indicator	Organisms whose characteristics are used as an index of attributes too difficult, inconvenient, or expensive to measure for other species or environmental conditions of interest (Landres et al. 1988)[2].
Umbrella	Species requiring large areas of habitat, which if given sufficient protection, will provide for the needs of a larger suite of species occupying the same habitat (Noss 1990)[3].

[1]Here we use focal species as a general term to describe individual species chosen for special attention in a multi-species conservation effort. The term surrogate species also has been used for this purpose (but see Armstrong 2002).
[2]Indicator species can be further divided into health indicators, population indicators, and biodiversity indicators (Caro and O'Doherty 1999).
[3]Some authors use umbrella species in a more general manner to include any species whose protection provides for the needs of a larger suite of co-occurring species (e.g., Launer and Murphy 1994).

The Pros and Cons of Focal Species

The use of focal species has a number of advantages. First, planning and managing for the habitat requirements of every species present in a planning unit is often impractical, if not impossible. Second, knowledge of the needs of individual species can help direct ecosystem or landscape level planning (Simberloff 1998, Wilcove 1994). Third, the legal protection assigned to species in the United States (rather than to higher levels of biodiversity, such as habitats, ecosystems, or landscapes) sets up a funding and incentive structure that is species-specific (Noss 1990). Fourth, some species are simply much more amenable to monitoring and research than others, a consideration that is crucial given real-life time, logistical, and funding constraints.

However, there are a number of problems associated with some uses of focal species (Landres et al. 1988, Lindenmayer et al. 2002). Here we discuss three problematic uses of focal species. First, the use of indicator species (as defined in *table 1*) to assess population trends of other species has been criticized on the grounds that individual species have unique ecological requirements (Taper et al. 1995). Indeed, empirical studies have shown that population responses to habitat change often cannot be extrapolated from one species to another, even within the same guild (Landres et al. 1988), or from one population to another of the same species (O'Conner 1991).

Second, the use of focal species to delineate habitat reserves also may be questionable if focal species do not reliably co-occur with a large proportion of other species in the area of interest (Andelman and Fagan 2000). This assumption is often difficult to test rigorously given our incomplete knowledge of species distributions. For example, Andelman and Fagan (2000) tested the effectiveness of several focal species approaches using species distribution databases from three geographical areas, and found that most approaches performed poorly. However, these databases contained incidence records only for species with special legal status. Therefore, the authors were unable to test the effectiveness of schemes that include "non-listed" as well as "listed" focal species and could not evaluate the effect that protecting focal species would have on other "non-listed" species.

Third, using species as indicators of habitat quality is only valid if research shows that the density or demographic parameters of focal species are reliably linked to specific habitat, population, or community attributes. Population density alone is known to be an unreliable indicator of habitat quality, even for a single species (Van Horne 1983). Clearly, focal species should be chosen based on explicitly defined criteria, and empirical research and monitoring are needed to validate the assumption that other species are receiving protection as a result of the protection of a focal species (Landres et al. 1988, Noss 1990). As this has become more widely recognized, more empirical tests of focal species approaches have appeared in the literature, with mixed results (e.g., Andelman and Fagan 2000, Chase et al. 2000, Kremen 1992, Poiani et al. 2001). Therefore, we agree with Lindenmayer et al. (2002) that a focal species approach should not be the only conservation strategy adopted in a given region and that the effectiveness of all restoration programs should be rigorously tested.

It is especially tempting to suggest that threatened and endangered species are good focal species. These species may be especially sensitive to changes in habitat attributes of concern, but they may not meet the other criteria for effective focal species. For example, the presence of a threatened species, such as the California Gnatcatcher (*Polioptila californica*), often does not indicate the presence of a more diverse or distinctive ecological community (Chase et al. 2000) or the presence of other sensitive taxa (Rubinoff 2001). Managing for the habitat requirements of an endangered species may not benefit other species present, and may even be detrimental to some species or habitats of conservation concern (Launer and Murphy 1994). Also, endangered species that occur at low densities or have regulatory status pose more sampling problems, which render monitoring less reliable and more expensive (Landres et al. 1988, O'Conner 1992, Strong 1990). Even when an endangered species appears to be a good umbrella for co-occurring species, it can be risky to focus conservation emphasis on a single species. If the species can be shown to be more flexible in its breeding requirements that was thought (Abate 1992), or to be genetically indistinguishable from other, less-threatened populations (Zink et al. 2000), the justification for protection of its habitat may be undermined.

Focal Species in PIF Conservation Planning

The national PIF Bird Conservation Strategy consists of four steps that result in the development and implementation of Bird Conservation Plans (Pashley et al. 2000). These are: (1) identify species and habitats most in need of conservation; (2) establish population and habitat conservation objectives; (3) identify actions to meet objectives and implement plans; and (4) monitor progress and refine the plans. Within this general framework, planners in different geographic regions have used different approaches to accomplish these goals. California PIF has stressed the management and restoration aspect of conservation planning in its Bird Conservation Plans, because public and private land managers are eager for more information to support their decision-making. California PIF uses a habitat-based adaptive management approach (*fig. 1*), acknowledging the gaps in our current knowledge, and emphasizing the need to test the hypotheses and assumptions involved in conservation planning and to revise the Conservation Plans regularly. In this way, California PIF provides decision-makers and conservation initiatives with biological assumptions (models) in a timely manner, and these can be tested with effective monitoring (Gibbs et al. 1999). Therefore, California's Bird Conservation Plans acknowledge the uncertainties involved in selecting focal species, and focal species lists are expected to be revised as the assumptions and hypotheses inherent in such lists are tested.

The identification of species and habitats most in need of conservation (Step 1) can be accomplished in a number of different ways. Many plan writers have chosen focal species by using the national Partners in Flight assessment score database to identify species most in need of conservation (Carter et al. 2000). California PIF and Oregon-Washington PIF created focal species lists by identifying those species associated with important habitat elements or ecosystem attributes, as well as those species with special conservation needs. This approach explicitly places greater emphasis on ecosystems in the planning

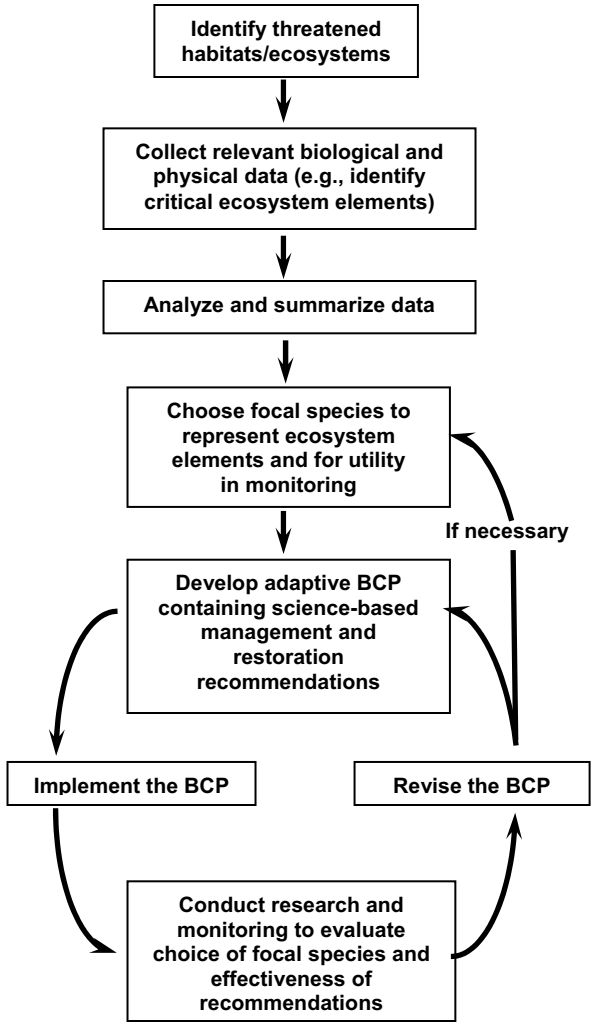

Figure 1— Adaptive conservation planning approach used by California Partners in Flight to develop Bird Conservation Plans (BCP) for five major habitats.

process, and is related to the "coarse-filter" approach of Wilcove (1993) and the multiple umbrella-species concept elaborated by Lambeck (1997). In general, this type of focal species approach attempts to meet the needs of as many species as possible by identifying those species in a region that are most demanding of resources and then targeting them for management. The specific method proposed by Lambeck (1997) focuses on landscape characteristics, and involves choosing a suite of focal species whose spatial, compositional, and functional requirements encompass those of all other species in a given landscape. For example, the bird that requires the largest area to survive in a certain habitat would determine the minimum suitable area for that habitat type. Likewise, the requirements of non-migratory birds that disperse short distances to establish new territories would define the attributes of connecting habitat. This approach was broadened by California PIF to include focal species that represent habitat characteristics across multiple scales (e.g., microhabitat requirements as well as landscape-scale habitat requirements). Thus, a suite of species can be chosen whose requirements define different spatial attributes, habitat characteristics, and management regimes representative of a healthy system. This process often results in a diverse list of focal species that may include both common and uncommon or rare species. It is important to note that the best indicators often may be common species.

Once an initial list of focal species is compiled, the current state of knowledge of their ecological requirements can be used to guide the establishment of conservation objectives (Step 2) and the identification and implementation of conservation actions (Step 3). Because the success of implementation must be evaluated (Step 4), the focal species list should be directly linked to the defined conservation objectives and should include species that make good indicators for monitoring the results of management actions. Good indicator species are those that are more sensitive to environmental change than others, and respond quickly and consistently to environmental stresses or enhancements (Landres et al. 1988, Caro and O'Doherty 1999). The most useful indicators are those which also have populations large enough to be easily monitored and to provide sufficient samples sizes for statistical analysis across sites and/or regions.

Another pragmatic reason for including relatively common, "unlisted" focal species in conservation planning is that some landowners and managers may be more interested in undertaking restoration or management activities for these species. Many private landowners are reluctant to take conservation actions that may attract an endangered or threatened species—and associated regulatory attention—to their property. In contrast, landowners often are enthusiastic about voluntarily creating habitat on their land for 'unlisted birds'. Both private and public land managers also are attracted to projects that will show results in the short-term. For example, managers who design riparian restoration projects to include the diversity of shrub and tree species needed by both common and threatened bird species can expect to attract multiple species of riparian birds within a few years. In contrast, managers planting only the vegetation needed by the state-endangered Western Yellow-billed Cuckoo (*Coccyzus americanus*) may need to wait decades to see results.

California's Choice of Focal Species

California's focal species strategy incorporates the use of focal species into an adaptive management feedback loop (*fig. 1*). Seven major habitat types in California were identified for conservation planning (riparian, grasslands, coastal shrublands, oak woodlands, coniferous forests, desert, and shrub steppe) based on results of a species and habitat prioritization scheme developed by the USFS (Davidson 1995, Manley and Davidson 1993). The initial focal species lists were compiled based on expert consensus at California PIF meetings focusing on each habitat type. Focal species were chosen so that, as a group, their breeding (and in some cases, wintering) requirements represented the full range of critical ecosystem/habitat elements. Individual species were chosen so that they also met as many as possible of the following criteria:

- Use the focal habitat as a primary breeding (and in a few cases, wintering) habitat in most bioregions of California.
- Warrant special management status or have experienced reduction in breeding range or population declines.
- Are invasive or may have negative impacts on native species.
- Represent a taxonomic group other than land birds (passerines and near-passerines). e.g. Wood Duck (*Aix sponsa*)', Spotted Sandpiper (*Actitis macularia*).
- Are useful for monitoring effects of management actions:
    - Abundant breeders in focal habitat throughout CA (i.e., provide adequate sample sizes for analysis).
    - Amenable to monitoring (e.g., nests can be easily monitored, high detection rates).
    - Thought to demonstrate quick, strong or consistent responses to habitat attributes, management, or restoration.

Thus, the number of focal species chosen depended on the characteristics of the focal habitat as well as the availability of biological information. While no single number can be put forward as ideal, we advocate a larger, more inclusive list rather than a restrictive list. Due to limitations of time, resources, and available information, it was not possible to immediately write detailed species accounts for every proposed focal species in some of California's Bird Conservation Plans. For these plans (Oak Woodland, Grassland, Coastal Scrub and Chaparral, and Coniferous Forest), species accounts were written for a subset of the focal species (sometimes referred to as "primary focal species"). However, this terminology is somewhat misleading because it was not necessarily intended that the "primary" focal species should be given higher conservation priority than the "secondary" species.

Bird Conservation Plans for the five focal habitats in California, including their associated focal species lists and conservation-oriented species accounts, are available at: http://www.prbo.org/calpif/plans.html. Two others (shrub steppe and desert) are currently being drafted. Oregon and Washington's habitat-based Bird Conservation Plans are available at http://community.gorge.net/natres/pif/cons_page1_.html. Below we provide examples from several of these plans to illustrate how focal species were chosen.

Examples from Bird Conservation Plans

Riparian Bird Conservation Plan (BCP)

The Riparian BCP (RHJV 2000) provides a good example of how focal species can be used in adaptive conservation planning and management (Geupel and Elliott 2001). A consensus emerged within California PIF that the first planning efforts should focus on riparian habitat, due to its high bird diversity, major historical loss of area, and serious ongoing conservation threats (Davidson 1995, Gaines 1977, Katibah 1984, RHJV 2000). A review of existing scientific information on riparian ecosystems in California was conducted and newly collected data were analyzed. These findings demonstrated that both habitat structure and seral stage were critical ecosystem elements for riparian birds. Therefore, a suite of focal species was chosen that together represented a range of riparian habitat components and also met many of the criteria for focal species listed above (*table 2*).

Species accounts were written containing detailed information about each species, along with a summary of key information. Account authors and other conservation and land management experts collaborated to synthesize these results into a summary of concerns, habitat requirements, conservation objectives, and recommended actions for riparian habitats. For example, available data indicated that seven of the ten focal species that have suffered the greatest range reductions and/or population declines tend to depend upon early successional riparian habitats with dense understory cover. Therefore, restoration recommendations were

developed that emphasized the need to restore and manage riparian forests to promote structural diversity and volume of understory (RHJV 2000). Monitoring methods also were recommended to guide the assessment of avian responses to riparian restoration projects. Thus, as the conservation plan is implemented, the effectiveness of the plan's recommendations and choice of focal species are being evaluated and this new information is being used to revise the plan. As part of this process, additional focal species candidates have been identified (see below).

Table 2-- *California Partners in Flight riparian focal species and the criteria used in their selection (reproduced from RHJV 2000).*

Focal species	Primary riparian breeder	Special status	Reduction in breeding range	Abundant breeder in CA	Nest site location
Swainson's Hawk (*Buteo Swainsoni)*	X	X	X		Canopy
Yellow-billed Cuckoo *(Coccyzus americanus)*	X	X	X		Midstory to canopy
Willow Flycatcher (*Empidonax traillii)*	X	X	X		Understory
Bell's Vireo *(Vireo bellii)*	X	X	X		Understory
Warbling Vireo *(Vireo gilvus)*	X		X	X	Canopy
Bank Swallow (*Riparia riparia)*	X	X	X		Sandy banks
Swainson's Thrush *(Catharus ustulatus)*	X		X	X	Understory
Yellow Warbler *(Dendroica petechia)*	X	X	X	X	Midstory
Common Yellowthroat *(Geothlypis trichas)*	X	X[1]	X	X	Understory
Wilson's Warbler *(Wilsonia pusilla)*	X			X	Understory
Yellow-breasted Chat *(Icteria virens)*	X	X	X		Understory
Song Sparrow *Melospiza melodia*	X		X	X	Understory
Black-headed Grosbeak *(Pheucticus melanocephalus)*	X			X	Midstory
Blue Grosbeak *(Guiraca caerulea)*	X		X		Understory

[1]Only the subspecies endemic to San Francisco Bay area *(G. t. sinuosa)* has special status.

Oak Woodland Bird Conservation Plan

Although California's oak woodlands are threatened by accelerating loss to urbanization and intensive agriculture, lack of regeneration of young trees, and the sudden oak death epidemic, they have not experienced nearly as drastic a reduction in area as riparian habitats (CPIF 2000). Thus, the focal species list for the Oak Woodland BCP differs from that of the riparian plan in that none of the species have special status designations. A suite of species was chosen that have a range of life history characteristics (*table 3*) and require a variety of habitat elements in oak woodlands (*table 4*). This list illustrates that the full range of species found in oak woodland includes not only those that consume acorns and nest in oak cavities, but also those that depend on understory components such as shrubs, grasses, and brush piles. Including the latter species in the list emphasizes the need to manage for the more subtle ecological characteristics of oak woodlands that might otherwise be overlooked. The Oak Woodland BCP also demonstrates the importance of including focal species from a variety of taxonomic groups as needed to represent the full range of important components of a habitat.

Coastal Scrub and Chaparral Bird Conservation Plan

Shrubland habitats in California tend to occur in coastal areas where habitat loss and fragmentation due to human development are major threats to bird communities. Together with fire, these are the most important processes affecting California's shrublands. Therefore, birds believed to be most sensitive to these processes were chosen as focal species for these habitats. For example, several species on the list, such as Sage Sparrow (*Amphispiza belli*) and Rufous-crowned Sparrow (*Aimophila ruficeps*), have been shown to be negatively affected by habitat fragmentation (Bolger et al. 1997). The list also includes species, such as California Gnatcatcher (*Polioptila californica*) and Gray Vireo (*Vireo vicinior*), that are influenced in different ways by fire frequency (CPIF 2000).

Because this plan covers a wide range of coastal, shrub-dominated habitats, the focal species list represents the full geographic and ecological spectrum of coastal scrub and chaparral communities. For example, the list includes Nuttall's White-crowned Sparrows (*Zonotrichia leucophrys nuttalli*), which are characteristic of northern coastal scrub; Greater Roadrunners (*Geococcyx californianus*), which represent drier, more open shrubland habitats; Wrentits (*Chamaea fasciata*), which are characteristic of denser, moister shrublands; and Cactus Wrens (*Campylorhynchus brunneicapillus*),

Table 3— *Oak woodland focal species in California, with information on their use of acorns, nesting substrate, general foraging habitat in oak woodlands, and whether the species is endemic to California (reproduced from CPIF 2000).*

Species	Consumes acorns?	Caches acorns?	Nest[1]	Foraging habitat in oak woodlands	California endemic?
Wood Duck *(Aix sponsa)*	Yes		2° Cavity	Wooded Streams	
Red-shouldered Hawk *(Buteo lineatus)*			Platform	Woodlands	
Wild Turkey *(Meleagris gallopavo)* (I[2])	Yes		Ground	Woodlands	
Band-tailed Pigeon *(Columba fasciata)*	Yes		Platform	Woodlands	
California Quail *(Callipepla californica)*	Yes		Ground	Woodland-shrub	
Northern Pygmy Owl *(Glaucidium gnoma)*			2° Cavity	Woodlands	
Acorn Woodpecker *(Melanerpes formicivorus)*	Yes	Tree, many	1° Cavity	Woodlands	
Lewis Woodpecker *(Melanerpes lewis)*	Yes		1° Cavity	Woodlands	
Nuttall's Woodpecker *(Picoides nuttallii)*	Yes		1° Cavity	Woodlands	Yes[3]
Ash-throated Flycatcher *(Myiarchus cinerascens)*			2° Cavity	Open Woodlands	
Western Scrub-Jay *(Aphelocoma californica)*	Yes	Ground, many	Cup	Woodland-Scrub	
Yellow-billed Magpie *(Pica nuttalli)*	Yes	Ground, few	Cup	Woodlands	Yes
Oak Titmouse *(Baeolophus inornatus)*	Yes	Tree, few	2° Cavity	Woodlands	Yes[3]
White-breasted Nuthatch *(Sitta carolinensis)*	Yes	Tree, few	2° Cavity	Woodlands	
Bewick's Wren *(Thryomanes bewickii)*			2° Cavity	Woodland-Scrub	
Blue-gray Gnatcatcher *(Polioptila caerulea)*			Cup	Woodlands	
Western Bluebird *(Sialia mexicana)*			2° Cavity	Open Woodlands	
California Thrasher *(Toxostoma redivivum)*			Cup	Woodland-Scrub	Yes[3]
European Starling *(Sturnus vulgaris)* (I)			2° Cavity	Agriculture edge	
Hutton's Vireo *(Vireo huttoni)*			Cup	Woodlands	
California Towhee *(Pipilo crissalis)*			Cup	Woodland-Scrub	Yes[4]
Lark Sparrow *(Chondestes grammacus)*			Ground	Grass - Woodland	

[1]Cavity-nesting species differ as to whether they excavate their own cavities (1° cavity nester) or they take over disused nests or naturally occurring cavities (2° cavity nester).
[2](I) denotes an introduced, nonnative species.
[3]Also occurs in Baja California, Mexico.
[4]Also occurs in Baja California, Mexico, and extreme southern Oregon.

Table 4— *Essential habitat elements for focal species, based on California Wildlife Habitat Relationships System V. 7.0 (reproduced from CPIF 2000)1.*

Focal species	Acorns	Cavities	Trees	Shrub	Grass/ herb	Snags	Brush piles	Water/ riparian
Wood Duck *(Aix sponsa)*		X						X
California Quail *(Callipepla californica)*			X	X	X		X	X
Red-shouldered Hawk *(Buteo lineatus)*			X	X				X
Northern Pygmy Owl *(Glaucidium gnoma)*		X	X			X		
Band-tailed Pigeon *(Columba fasciata)*	X		X					
Acorn Woodpecker *(Melanerpes formicivorus)*	X	X	X			X		X
Lewis's Woodpecker *(Melanerpes lewis)*	X	X	X					
Nuttall's Woodpecker *(Picoides nuttallii)*		X	X			X		
Ash-throated Flycatcher *(Myiarchus cinerascens)*		X	X	X				
Western Scrub-jay *(Aphelocoma californica)*	X		X	X				
Yellow-billed Magpie *(Pica nuttalli*	X		X					X
Oak Titmouse *(Baeolophus inornatus)*		X	X			X		
White-breasted Nuthatch *(Sitta carolinensis)*	X		X			X		
Bewick's Wren *(Thryomanes bewickii)*		X	X	X				
Blue-gray Gnatcatcher *(Polioptila caerulea)*			X	X				
California Thrasher *(Toxostoma redivivum)*				X				
Western Bluebird *(Sialia mexicana)*		X	X		X	X		X
Hutton's Vireo *(Vireo huttoni)*			X	X				X
Lark Sparrow *(Chondestes grammacus)*					X			
California Towhee *(Pipilo crissalis)*				X				X

[1] Includes selected elements classified by CWHR as "essential" or "secondarily essential".

which are found in coastal scrub habitats with a cactus component. Even within southern California coastal sage scrub, plant, bird, and small mammal species composition shows a clear gradient from coastal (mesic) to inland (xeric) communities (Chase et al. 2000). Chase et al. (2000) found that Cactus Wrens and Wrentits are significantly associated with the coastal-type species assemblage while Sage Sparrows and Greater Roadrunners are associated with the inland-type species assemblage. Thus, the focal species list for coastal scrub habitats includes representatives from both ends of this spectrum of species composition.

WA/OR Bird Conservation Plans

Oregon-Washington PIF used a similar approach to develop Bird Conservation Plans for five habitats /ecoregions (westside coniferous forest, westside lowlands and valleys, Columbia Plateau, northern Rocky Mountains, and east-slope Cascades). In each plan, habitat conditions and habitat attributes of importance to birds were defined and focal species were chosen to represent each attribute. For example, habitat conditions for westside coniferous forests were chosen based on successional stages. For each habitat condition, attributes such as forest type, structural components, landscape parameters, and microhabitat features were identified, and focal species associated with each attribute were chosen (*table 5*). Finally, biological objectives and conservation options were described for each focal species and associated habitat attribute (http://community.gorge.net/natres/pif/westside_plan.html).

Evaluation and Revision of Focal Species Lists

After Bird Conservation Plans have been developed, their recommendations typically are implemented by a wide range of partner organizations. To further the adaptive conservation planning process, California PIF encourages all partners to monitor population parameters of focal species in order to evaluate the response of birds to the conservation actions recommended in the plans. Both intensive demographic monitoring and population trend monitoring programs should be put in place to evaluate whether focal species and other species within the habitat are benefiting from the prescribed conservation actions. California PIF encourages all partners to contribute information that can guide ongoing revisions of the BCPs. For example, California PIF maintains a statewide geographic database of landbird species distributions, breeding status, and monitoring sites (to view and submit data, visit http://www.prbo.org/calpif/maps.html). In the future it may be possible to use this information to evaluate and revise conservation plans, and to test the effectiveness of focal species approaches.

In addition, the assumptions and hypotheses used to choose focal species should be evaluated through monitoring and research (Lindenmayer et al. 2002). New studies may change our understanding of the important processes influencing birds in each habitat, or how species respond to those processes. To evaluate the focal species lists, it also will be important to verify whether the observed responses of species to habitat change in one area or habitat are similar to those in other areas (Landres et al. 1988). Finally, focal species lists may change as conservation strategies are evaluated and revised through time. For example, the "all bird" approach to bird conservation in North America has broadened the scope of many conservation efforts that once were divided among taxonomic groups.

California's choice of riparian focal species currently is being evaluated as part of the process of revising the Riparian BCP. The focal species list is being reexamined to evaluate whether it actually represents all the important habitat elements in California's riparian ecosystems. It has been recognized that the original landbird focus of the plan resulted in no species being chosen that is dependent on gravel bar habitat, an important early-successional element of riparian ecosystems. Therefore, the addition of the Spotted Sandpiper (*Actitis macularia*) has been proposed to represent this habitat attribute.

Additional riparian focal species candidates also may be identified by analyses of monitoring data. For example, recent analyses of the life history and habitat associations of Spotted Towhees (*Pipilo maculates*) suggest that they may be valuable as indicators for monitoring the effectiveness of habitat restoration and management in the Central Valley. Spotted Towhees, like many other open-cup nesting species in riparian habitats, experience high nest predation rates (mean nest survivorship = 0.23, range 0.20 – 0.50, n = 309 nests; Point Reyes Bird Observatory unpublished data). However, because they are common in Central Valley riparian habitats (present at 56 percent of point-count stations, n = 1005 stations, 3 surveys per year, 1995-1998; Point Reyes Bird Observatory unpublished data) it is possible to monitor a larger sample of nests than is practical for other riparian birds. Also, their abundance was found to be positively correlated with bird species richness in riparian habitats, which suggests that they are responding to habitat conditions that also influence many other riparian species. Finally, Spotted Towhees also appear to show relatively strong relationships between abundance and habitat attributes (e.g., shrub cover and species richness, tree cover and species richness) that may be affected by management and restoration activities.

Table 5— *Forest conditions and associated habitat attributes and focal species for landbird conservation in coniferous forests of western Oregon and Washington (reproduced from the Westside Coniferous Forest Landbird Conservation Plan, Oregon-Washington Partners In Flight,* http://community.gorge.net/natres/pif */westside_page1.html).*

Forest condition	Habitat attribute	Focal species
Old-growth forest	Large snags	Vaux's Swift *(Chaetura vauxi)*
	Large trees	Brown Creeper *(Certhia Americana)*
	Conifer cones	Red Crossbill (*Loxia curvirostra)*
Mature forest: multi-layered	Large snags	Pileated Woodpecker (*Dryocopus pileatus)*
	Large trees	Brown Creeper *(Certhia Americana)*
	Conifer cones	Red Crossbill (*Loxia curvirostra)*
	Closed canopy	Hermit Warbler (*Dendroica occidentalis)*
	Deciduous canopy trees	Pacific-slope Flycatcher (*Empidonax difficilis)*
	Mid-story tree layers	Varied Thrush *(Ixoreus naevius*)
	Open mid-story	Hammond's Flycatcher (*Empidonax hammondii)*
	Deciduous understory	Wilson's Warbler (*Wilsonia pusilla)*
	Forest floor complexity	Winter Wren (*Troglodytes troglodytes)*
Young forest: understory reinitiating	Closed canopy	Hermit Warbler (*Dendroica occidentalis)*
	Deciduous canopy trees	Pacific-slope Flycatcher (*Empidonax difficilis)*
	Open mid-story	Hammond's Flycatcher (*Empidonax hammondii)*
	Deciduous canopy trees	Black-throated Gray Warbler (*Dendroica nigrescens)*
	Deciduous understory	Wilson's Warbler (*Wilsonia pusilla)*
	Forest floor complexity	Winter Wren (*Troglodytes troglodytes*
Pole forest: stem exclusion	Deciduous canopy trees	Black-throated Gray Warbler (*Dendroica nigrescens)*
	Deciduous subcanopy/understory	Hutton's Vireo *(Vireo huttoni)*
Early-seral forest: stand initiation	Residual canopy trees	Olive-sided Flycatcher (*Contopus borealis)*
	Snags	Western Bluebird *(Sialia mexicana)*
	Deciduous vegetation	Orange-crowned Warbler *(Vermivora celata)*
	Nectar-producing plants	Rufous Hummingbird *(Selasphorus rufus*)
Forest inclusions/	Mineral springs	Band-tailed Pigeon *(Columba fasciata)*
unique habitats	Alpine	American Pipit (*Anthus rubescens)*
	Waterfalls	Black Swift (*Cypseloides niger)*
	High elevation wet meadows	Lincoln's Sparrow (*Melospiza lincolnii)*

In some cases, new research may support the original focal species choices. In one example, recent research has shown that the abundance of two Oak Woodland focal species is associated with the density of human development in oak woodlands. Stralberg and Williams (2002) found that Lark Sparrows (*Chondestes grammacus*) were less abundant and Western Scrub-jays (*Aphelocoma californica*) more abundant where levels of human development in the oak woodland landscape are high.

Indeed, one purpose of choosing focal species and developing management recommendations, even when available information is limited, is to encourage and focus the development of new research and monitoring projects and thus obtain information needed for better conservation planning. Only through ongoing monitoring of restoration and management projects will we be able to test the basic assumption of the focal species approach taken by California, Oregon and Washington: that managing for the needs of a suite of carefully chosen focal species will ultimately improve conditions for the larger community of species that shares the same habitat.

Conclusion

In conclusion, we suggest that focal species lists used in Partners in Flight and other conservation planning exercises should include species that represent various habitat elements and processes in the ecosystem and species that are easily and efficiently monitored. It is crucial to note that the focal species that are the best indicators may well be common species that have not been identified as a 'priority' by ranking schemes or 'in decline' by monitoring programs. Ideally, the avian focal species identified by Partners in Flight would be considered alongside focal species from broader bird taxa (e.g. waterfowl and shorebirds) as well as other wildlife (fish, mammals and invertebrates) as conservation actions are weighed and evaluated. Although the focal species approach described here may provide a good starting point for conservation planning, we should not complacently assume that all other species in the habitat consequently will be conserved. Because focal species lists are based on numerous hypotheses and assumptions, these should be made as explicitly as possible and tested in ongoing monitoring studies as part of an adaptive management program.

Acknowledgments

Many California Partners in Flight collaborators have contributed to the development and implementation of the focal species approach described here. We thank especially B. Allen, B. Altman, B. Barnes, G. Ballard, C. Beardmore, J. Buchanan, L. Comrack, D. Craig, G. Elliot, T. Gardali, S. Heath, A. Holmes, D. Humple, C. McCreedy, N. Nur, D. Pashley, J. Robinson, S. Small, and S. Zack. Partner and collaborating organizations include the American Bird Conservancy, Bureau of Land Management, California Department of Fish and Game, California Oak Foundation, Central Valley Habitat Joint Venture, The Nature Conservancy, Natural Resource Conservation Service, Riparian Habitat Joint Venture, US Fish and Wildlife Service, and Wildlife Conservation Society. Generous financial support to PRBO for adaptive conservation planning in California has been provided by the National Fish and Wildlife Foundation, David and Lucile Packard Foundation, Resources Law Group, USDA Forest Service, and Bureau of Reclamation. This is PRBO contribution number 1045.

Literature Cited

Abate, T. 1992. **Which bird is the better indicator species for old-growth forest?** BioScience 42: 8-9.

Andelman, S., and W. Fagan. 2000. **Umbrellas and flagships: Efficient conservation surrogates or expensive mistakes?** Proceedings of the National Academy of Sciences 97: 5954-5959.

Bolger, D. T., T. A. Scott, and J. T. Rotenberry. 1997. **Breeding bird abundance in an urbanizing landscape in coastal southern California.** Conservation Biology 11: 406-421.

Caro, T. M., and G. O'Doherty. 1999. **On the use of surrogate species in conservation biology.** Conservation Biology 13: 805-814.

Carter, M. F., Hunter, W. C., Pashley, D. N., and Rosenberg, K. V. 2000. **Setting conservation priorities for landbirds in the United States: The Partners in Flight approach.** Auk 117: 541-548.

Chase, M. K., W. B. Kristan III, A. J. Lynam, M. V. Price, and J. T. Rotenberry. 2000. **Single species as indicators of species richness and composition in California coastal sage scrub birds and small mammals.** Conservation Biology 14: 474-487.

CPIF (California Partners in Flight). 2000. Version 1.0. **The draft coastal scrub and chaparral bird conservation plan: A strategy for protecting and managing coastal scrub and chaparral habitats and associated birds in California** (J. Lovio, lead author). Point Reyes Bird Observatory. http://www.prbo.org/calpif/plans.html.

Davidson, C. 1995. **Determining habitat conservation priorities for Neotropical migrant birds in California.** Draft report. San Francisco, CA: Pacific Southwest Research Station and Pacific Southwest Region, Forest Service, U.S. Department of Agriculture.

Franklin, J. F. 1993. **Preserving biodiversity: Species, ecosystems, or landscapes?** Ecological Applications 3: 202-205.

Gaines, D. F. 1977. **The valley riparian forests of California: Their importance to bird populations.** In: A. Sands, editor. Riparian forests in California: Their ecology and conservation. Institute of Ecology Publication 15. Davis, CA: University of California.

Geupel G.R. and G. Elliott. 2001. **Wet and Wild. Using birds to conserve western riparian habitat.** Bird Conservation 14: 12-13

Gibbs, J., H. Snell, and C. Causton. 1999. **Effective monitoring for adaptive wildlife management: lessons form the Galapagos Islands.** Journal of Wildlife Management 63: 1055-1065.

Holling, C., editor. 1978. **Adaptive environmental assessment and management.** New York: John Wiley & Sons.

Katibah, E. F. 1984. **A brief history of riparian forests in the Central Valley of California.** In: R. E. Warner and K. M. Hendrix, editors. California riparian systems: ecology, conservation, and productive management. Berkeley, CA: University of California Press Ltd.

Kremen, C. 1992. **Assessing the indicator properties of species assemblages for natural areas monitoring.** Ecological Applications 2: 203-217.

Lambeck, R. J. 1997. **Focal species: A multi-species umbrella for nature conservation.** Conservation Biology 11: 849-856.

Landres, P. B., J. Verner, and J. W. Thomas. 1988. **Ecological uses of vertebrate indicator species: A critique.** Conservation Biology 2: 316-328.

Launer, A., and D. Murphy. 1994. **Umbrella species and the conservation of habitat fragments: a case of a threatened butterfly and a vanishing grassland ecosystem.** Biological Conservation 69: 145-153.

Lindenmayer, D. B., A. D. Manning, P. L. Smith, H. P. Possingham, J. Fischer, I. Oliver, and M. A. McCarthy. 2002. **The focal-species approach and landscape restoration: A critique.** Conservation Biology 16: 338-345.

Manley, P. and C. Davidson 1993. **Determining habitat conservation priorities for Neotropical migrant birds in California.** Draft report. San Francisco, CA: Pacific Southwest Research Station and Pacific Southwest Region, Forest Service, U.S. Department of Agriculture.

Margules, C. R., and R. L. Pressey. 2000. **Systematic conservation planning.** Nature 405: 243-253.

Noss, R. F. 1990. **Indicators for monitoring biodiversity: A hierarchical approach.** Conservation Biology 4: 355-364.

O'Conner R. J. 1991. **Long-term bird population studies in the United States.** Ibis 133 (suppl. I): 36-48.

O'Conner, R. J. 1992. **Trends in Population: Introduction**. In: J. M. Hagen and D. W. Johnston, editors. Ecology and Conservation of Neotropical Birds. Washington DC: Smithsonian Institution Press; 23-25.

Pashley, D. N., C. J. Beardmore, J. A. Fitzgerald, R. P. Ford, W. C. Hunter, M. S. Morrison, and K. V. Rosenberg. 2000. **Partners in Flight: Conservation of the Land Birds of the United States.** The Plains, VA: American Bird Conservatory.

Poiani, K. A., M. D. Merrill, and K. A. Chapman. 2001. **Identifying conservation-priority areas in a fragmented Minnesota landscape based on the umbrella species concept and selection of large patches of natural vegetation.** Conservation Biology 15: 513-522.

RHJV (Riparian Habitat Joint Venture). 2000. Version 1.0. **The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California.** California Partners in Flight. http://www.prbo.org/calpif/plans.html.

Ringold, P. L., J. Alegria, R. L. Czaplewski, B. S. Mulder, T. Tolle, and K. Burnett. 1996. **Adaptive monitoring design for ecosystem management.** Ecological Applications 6: 745-747.

Rubinoff, D. 2001. **Evaluating the California Gnatcatcher as an umbrella species for conservation of southern California coastal sage scrub.** Conservation Biology 15: 1374-1383.

Simberloff, D. 1998. **Flagships, umbrellas, and keystones: Is single species management passé in the landscape era?** Biological Conservation 83: 247-257.

Soulé, M. E. 1995. **Biodiversity indicators in California: Taking nature's temperature.** California Agriculture 49: 40-44.

Stralberg, Diana and Brian Williams. 2002. **Effects of residential development and landscape composition on the breeding birds of Placer County's foothill oak woodlands.** In: Richard B. Standiford, Douglas McCreary, Kathryn L. Purcell, technical coordinators. Proceedings of the fifth symposium on oak woodlands: Oaks in California's changing landscape; 2001 October 22-25; San Diego, CA. Gen. Tech. Rep. PSW-GTR-184. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 341-366.

Strong, P. I. V. 1990. **The suitability of the common loon as an indicator species.** Wildlife Society Bulletin 18: 257-261.

Taper, M. L., K. Bohning-Gaese, and J. H. Brown. 1995. **Individualistic responses of bird species to environmental change.** Oecologia 101: 478-486.

Van Horne, B. 1983. **Density as a misleading indicator of habitat quality.** Journal of Wildlife Management 47: 893-901.

Wilcove, D. 1993. **Getting ahead of the extinction curve.** Ecological Applications 3: 218-220.

Wilcove, D. 1994. **Letter to editor.** Ecological Applications 4: 208-209.

Zink, R. M., G. F. Barrowclough, J. L. Atwood, and R. C. Blackwell-Rago. 2000. **Genetics, taxonomy, and conservation of the threatened California Gnatcatcher.** Conservation Biology 14: 1394-1405.