

Wapiti and Warblers: Integrating Game and Nongame Management in Idaho

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Abstract — The primary concern of wildlife managers in the USDA Forest Service (USFS) and Idaho Department of Fish and Game (IDFG) is maintaining elk herds and quality elk hunting. As a result, nongame species like neotropical migratory landbirds do not receive much management attention. Cause for concern over this neglect are twofold: 1) forest fragmentation may be having detrimental effects on neotropical migrants in Idaho and 2) an emphasis on elk habitat management may not be in the best interests of achieving the broader goal of maintaining biological diversity on National Forest lands. We discuss biological, policy, economic, and political implications for neotropical migrants on USFS lands managed primarily for elk. Our analysis proceeds from a review of forest plans, a review of IDFG comments on these plans, interviews with USFS and IDFG biologists, and a synthesis of literature on the ecology of elk and neotropical migrants. Elk are inappropriately used as an ecological management indicator species because they are habitat generalists. The use of MIS and models to manage habitat for elk (habitat effectiveness models) are reviewed and critiqued. The extent to which forest fragmentation, to which elk appear well-adapted, may be negatively impacting neotropical migrants is discussed. A landscape-level approach for managing habitats for neotropical migrants is broadly outlined. We give recommendations for improving management of elk and neotropical migrants, and for improving individual and collective abilities of USFS and IDFG wildlife personnel for management of all wildlife species on USFS lands in Idaho.

INTRODUCTION

There is considerable evidence that many species of neotropical migratory landbirds are declining (Terborgh 1989, Robbins et al., these proceedings). Most evidence comes from monitoring and research efforts in deciduous forests of the eastern United States. Forest fragmentation is cited as one primary reason for declines (Faaborg et al., these proceedings). In the western U.S., where many habitats are naturally fragmented, only a few studies have examined effects of forest

fragmentation on avian communities (Freemark et al., Hejl et al. 1993, these proceedings), and long-term monitoring data on bird populations are limited.

In most western states, fish and game agencies are primarily interested in welfare of game species. For example, the greatest concern of state wildlife managers in Idaho is maintenance of the state's elk (*Cervus elaphus*) herds and quality elk hunting. Idaho has the second largest elk population in the U.S., and Idaho hunters harvest more elk than any state except Colorado (1990 Western States Elk Workshop, unpublished data). Income to IDFG derived from elk hunting is substantial. National Forest lands provide the majority of habitat for elk. In fact, 90% of all elk in the U.S. spend some part of the year on public land (Thomas 1991). Elk populations, elk habitat effectiveness models and guidelines (Lyon 1983), and elk vulnerability (Christensen et al. 1991) during the hunting season are foremost among joint concerns of USFS and IDFG personnel.

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Idaho's Terrestrial Biodiversity

Because IDFG and USFS emphasize elk management, many other species, including neotropical migrants, have not received management attention they warrant. Ongoing timber harvest and resulting habitat fragmentation could have detrimental effects on forest breeding birds, including neotropical migrants. Furthermore, implications for other species of managing habitat based upon guidelines from elk habitat effectiveness models is largely unknown, but it is possible that managing habitat primarily for elk is not beneficial to other wildlife species such as forest-dwelling neotropical migrants. This is particularly important because USFS manages most habitat where neotropical and resident forest birds occur. In addition, there is increasing evidence that tree cover is not critical to elk survival (Peek et al. 1982) and that hunter access and intensity, not cover or forage areas, are most important in controlling managed elk herds (Unsworth et al. 1993). This suggests that emphasis placed on elk habitat management may not be in the best of interests of maintaining overall biological diversity as mandated by the National Forest Management Act (NFMA).

The purpose of this paper is to examine implications for forest-dwelling neotropical migrant birds of managing wildlife habitat on National Forest lands in Idaho primarily for elk. The complexity of this situation will be analyzed primarily from a biological management perspective, and secondarily from policy (differing agency mandates), economic (funding for game/nongame), and political (distribution of power) standpoints (Dery 1984). We focus on: 1) interactions between wildlife biologists in USFS and IDFG, 2) the use of management indicator species (MIS) and elk habitat effectiveness models in USFS, and 3) the potential biological effects of forest fragmentation and elk habitat management on neotropical migrants. Finally, we make recommendations on how both IDFG and USFS can individually and collectively improve management of both game and nongame species in Idaho.

BACKGROUND

Biological Diversity

Approximately 506 species of terrestrial vertebrates inhabit Idaho (Groves and Melquist 1991). These include 15 amphibian, 23 reptile, 360 bird, and 108 mammalian species. Of the 360 species of birds, 241 are thought to breed in the state, and about half of these (119 species) are classified as neotropical migrants (Saab and Groves 1992). As such, neotropical migrants constitute about 31% of the state's terrestrial vertebrate biological diversity (Fig. 1), exclusive of non-breeding birds.

Game species account for 73 of 506 terrestrial vertebrate species (14%), whereas nongame species make up about 86% (433/506). Of nongame species, neotropical migratory landbirds account for about 27% (119/433). Migratory landbirds have been further classified into two categories: obligate migrants (78

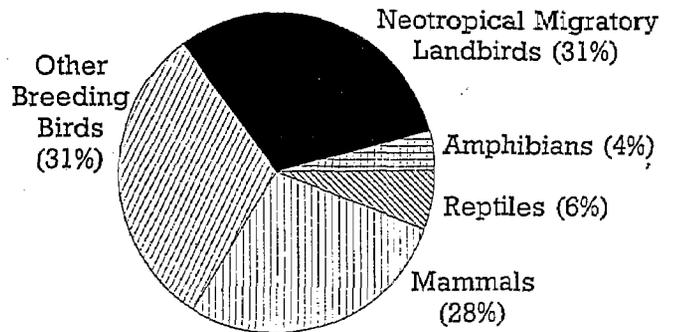


Figure 1. — Percentages of vertebrate classes accounting for the terrestrial biological diversity of Idaho. The total of 506 terrestrial vertebrates includes breeding and non-breeding birds, and introduced species.

species), those species in which nearly all individuals migrate to the tropics, and facultative migrants (41 species), species in which only some individuals migrate long distances (Saab and Groves 1992).

Landscape Setting

Idaho encompasses nearly 22 million ha, extending about 925 km from its northern to southern border (Tisdale 1986). Seventy-five percent of the state is mountainous with the level terrain being concentrated on the Snake River Plain in the south. Approximately 42% of the state is forested, primarily in central and northern portions; 26% is shrub steppe, mostly in the southern third; 23% is in agriculture, urban or exotic annual grasslands; and the remainder is a small percentage of wetland and alpine cover types (Caicco et al., in review). Idaho contains the largest amount of designated wilderness area in the contiguous 48 states. These 1.5 million ha of national forest wilderness are concentrated in five areas in central and west-central Idaho and consist primarily of montane forest, subalpine forest, and unvegetated terrain types.

About two-thirds of Idaho is under federal ownership with the USFS managing 9.3 million ha (38%), the Bureau of Land Management managing 4.9 million ha (23%), and other federal agencies managing about 0.6 million ha (Sharp and Sanders 1978). In addition, the state owns about 0.8 million ha. There are 10 national forests in Idaho, three in the Northern Region of USFS or those lands north of the Salmon River, and seven in the Intermountain Region south of the Salmon River.

Funding and Staff for Game and Nongame Management

In FY-92, IDFG's total budget was \$38.5 million (IDFG, unpublished data). This budget is funded by revenue from the sale of hunting/fishing licenses and tags, and Federal Aid funds such as Pittman-Robertson and Dingell-Johnson. Twenty-two

million dollars of this budget was funded by license revenues. Just over \$5 million of license revenue was from sale of non-resident and resident elk tags and hunting licenses. Revenue from elk hunting represents the single largest portion of income to IDFG, constituting nearly one-fourth of the license budget and 13% of the entire IDFG budget.

Funding for the Nongame Program in FY-92 was about \$600,000 or 1.5% of IDFG's total budget. This funding accounted for about 9% of the wildlife budget within IDFG. Funding for the Nongame Program has come from voluntary state income tax return contributions, which have declined from a high of \$90,000 in 1982 at the program's inception to \$55,000-\$65,000/yr the last three years (Fig. 2). Additional funding for nongame comes from Federal Aid, Section 6 of the Endangered Species Act, contracts with other federal natural resource agencies, other direct donations, and sale of goods.

Idaho Income Tax Checkoff Contributions Nongame/Endangered Species Fund

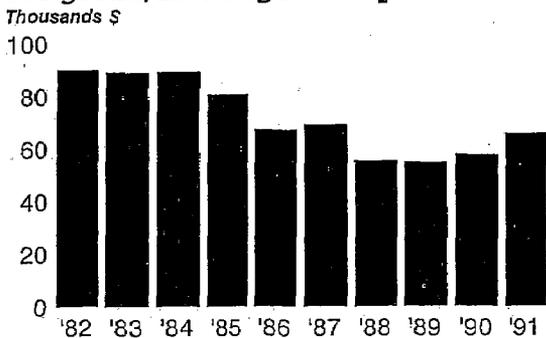


Figure 2. — Summary of voluntary contributions on the state income tax return for the Idaho Department of Fish and Game's Nongame and Endangered Wildlife Program, 1982-1991.

The Nongame Program, which includes the state's natural heritage program, employs two full-time nongame biologists and a plant ecologist. Although there are no regional nongame biologists, there are four wildlife research biologists who work on specific threatened, endangered, and sensitive species projects. In contrast, each of seven regional offices employs a minimum of two full-time wildlife biologists who concern themselves primarily with populations of game species. In addition, there is a whole cadre of wildlife habitat biologists whose primary concern is the management of game species on IDFG-owned lands, and a staff-person in each region who deals solely with wildlife (game) depredations. In total, over 60 permanent wildlife staff in IDFG have major responsibilities for management of game species' populations and habitat, compared to three permanent staff in the Nongame Program.

Management of Neotropical Migrants in Idaho

As detailed in the first "Partners in Flight" newsletter, IDFG's involvement with neotropical migrants has focused on several efforts. In 1992 IDFG, in collaboration with USFS

Intermountain Research Station, published a 16-page color leaflet that provides technical information on descriptions, habitats, population trends, ecology, and conservation of neotropical migrants in Idaho (Saab and Groves 1992). IDFG also coordinated the U. S. Fish and Wildlife Service's (USFWS) breeding bird survey routes (BBS) in Idaho from 1985-1990 (Groves and Melquist 1991). During this period, the number of survey routes increased from about 15 to 50, and consistency in observers and annual surveys of routes improved substantially. IDFG published a new latilong booklet on the distribution and population status of all Idaho birds (Stephens and Sturts 1991), and finally, IDFG has been a participant in the USFWS gap analysis project in Idaho (Scott et al. 1993). One facet of this project is examining distributional patterns of neotropical migrants in relation to vegetation types and protected areas.

Elk Management

As previously indicated, revenue from elk hunting accounts for the largest portion of IDFG's annual budget. Using 1992 data on elk hunter-days and 1982 data on expenditures of elk hunters (Sorg and Nelson 1986), we conservatively estimated the annual net economic value of elk hunting to Idaho at \$25 million in 1992. Because of the economic importance of elk hunting, every national forest in Idaho classifies elk as a management indicator species (MIS) (see discussion below). Elk are the only MIS consistently listed on every national forest in Idaho. Furthermore, they are the only MIS for which habitat models and guidelines have been extensively developed and implemented on Idaho national forests.

Nine of 10 Idaho national forests use elk habitat guidelines (e.g., Boss et al. 1983, Leege 1984) in forest plans and at the project level (e.g., environmental assessment of timber sale) that are based upon habitat effectiveness models (Lyon et al. 1985). These models (Fig. 3) predict the percentage of available habitat

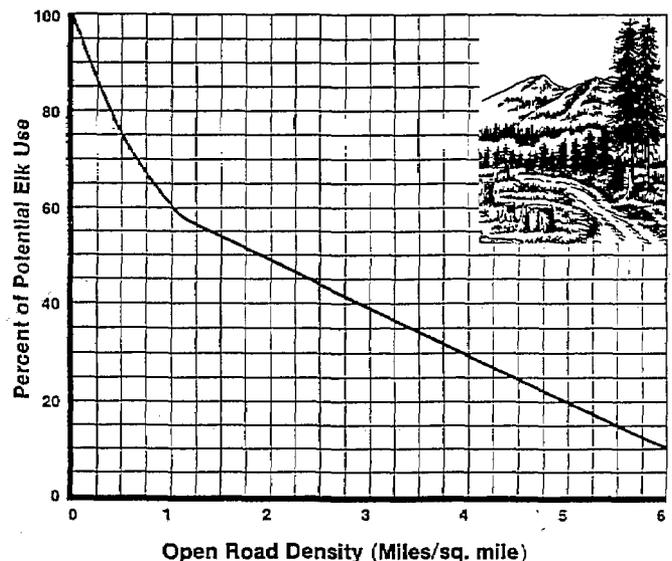


Figure 3. — The relationship between open road density and potential elk use of habitat (Lyon 1983).

usable by elk outside the hunting season (Lyon and Christensen 1992). Habitat effectiveness is most often based on road-density models; that is, with increasing road density there is a corresponding decrease in elk habitat effectiveness. Calculations of habitat effectiveness also often incorporate a 60:40 forage/cover component (Leege 1984). More recently, elk managers and researchers in both IDFG and USFS have emphasized elk vulnerability (Christensen et al. 1991). In contrast to habitat effectiveness, which deals with summer range habitat and behavioral responses of elk to habitat disturbance, elk vulnerability is a functional concept dealing with susceptibility of elk to being killed during the hunting season (Lyon and Christensen 1992).

METHODS

To examine roles of IDFG and USFS in wildlife management on national forest lands, three tasks were undertaken. First, we reviewed wildlife portions of all Idaho national forest plans and IDFG's comments on these plans (1985-1986) to determine the extent of their focus on elk, neotropical migrants, and other wildlife. Then, eight national forest biologists and six IDFG regional wildlife managers were interviewed via telephone to obtain information on: 1) positive and negative aspects of interactions between the two agencies, 2) adequacy of elk habitat effectiveness models and use of MIS, and 3) how wildlife management on USFS lands could be improved through individual and collective efforts of the two agencies (Table 1). Literature on ecology of elk and neotropical migratory landbirds was also reviewed to determine potential effects of forest fragmentation and elk habitat management on neotropical migrants.

Table 1. — Questions asked of U.S. Forest Service and Idaho Department of Fish and Game biologists concerning wildlife management on national forest lands in Idaho.

1. How are management indicator species (MIS) used on your forest (USFS biologists only)?
2. What wildlife species are usually involved in interactions between USFS and IDFG? What wildlife issues are usually involved in this interaction?
3. How strong of an influence does the IDFG have on your forest's wildlife program (USFS only)?
4. What do you view as the positive and negative aspects of the interaction between the IDFG and USFS?
5. How could the interaction between the two agencies on wildlife issues be improved?
6. Are the elk habitat effectiveness models useful? What changes would you suggest to improve elk management on national forest lands?
7. Have elk habitat management guidelines been skirted or manipulated by USFS personnel?
8. Do you focus most of your attention on game or nongame species (USFS only). How could management of these two groups be better integrated?
9. Is the IDFG focus in wildlife management on national forest lands too narrow (IDFG only)? If so, should it be broadened and what are the mechanisms for broadening it?
10. What tools do you need (excluding staff and \$) to improve your wildlife management program?

RESULTS

Elk Management and Neotropical Migrants

Literature on elk and discussions with IDFG and USFS biologists all point out that elk can and do adapt to a wide variety of habitats. The notion that elk need trees for thermal cover and that forage/cover ratios of 60:40 are optimal for elk (Thomas 1979) may be useful in some parts of their range (e.g., Blue Mountains of Oregon), but clearly does not have wide-ranging applicability. In southern Idaho, elk herds flourish with good production year-round in sagebrush habitats (IDFG, unpublished data). Similarly, there are other herds living in areas with no tree cover in southern Washington, Jackson Hole, WY, and Wind Cave National Park, SD (Peek et al. 1982). Recent findings in northern Idaho that elk populations there are controlled by hunter access and behavior, not habitat factors, corroborates this point (Unsworth et al. 1993).

It is also clear that there have been considerable misunderstandings and miscommunication between the two agencies on elk management. What it amounts to is that maintaining elk herds and elk hunting are two different issues. Whereas IDFG's intent is to promote elk hunter opportunities, that is not always how the USFS perceives their goal. As Jack Ward Thomas (1991) noted, "...merely producing elk is not enough. The hunting experience and effect of hunting on elk welfare are also important and must be addressed simultaneously with the production of elk." Although the argument can be made that one charge of USFS is to provide recreational opportunity, including elk hunting, it is an unresolved matter as to whether USFS can meet elk harvest goals in the face of other mandates (e.g., timber harvest, maintenance of biodiversity).

Because of the emphasis placed on elk management, a perception still exists on some forests and ranger districts that managing for elk habitat will sufficiently meet the needs of other wildlife species. The following quote from an Idaho forest plan demonstrates this point: "Since elk use all forest cover types and successional stages, managing for elk is, in essence, managing for all species that occupy some part of elk habitat." Though dubious biologically, this thinking is too often espoused by USFS line officers (according to our interviewees) who feel that if they meet elk habitat or population goals, there is little else to be concerned about with regard to wildlife. Certainly the recent debates over spotted owls/old growth forests (Thomas et al. 1990) and even more recent concern for the Northern Goshawk (*Accipiter gentilis*) in relation to timber management (Reynolds et al. 1992) should put such thoughts to rest.

Forest fragmentation is a major concern for many of Idaho's neotropical migrants. Over 40% of Idaho's neotropical migrants nest in coniferous forest habitat (Fig. 4) and about 60% of these are canopy-nesters (Saab and Groves 1992). What effects forest fragmentation, either natural or human-caused, is having on these species is largely unknown. Some forest birds may be "edge-sensitive," meaning they prefer to nest in the forest interior

away from edges, whereas other species may be "area-sensitive," that is, they may be eliminated or have lower density populations on forest fragments below a minimum size threshold. Increased forest edge from clearcuts and fragmentation can result in increased nest predation (Wilcove 1985) and parasitism by Brown-headed Cowbirds (*Molothrus ater*) (Rothstein et al. 1984).

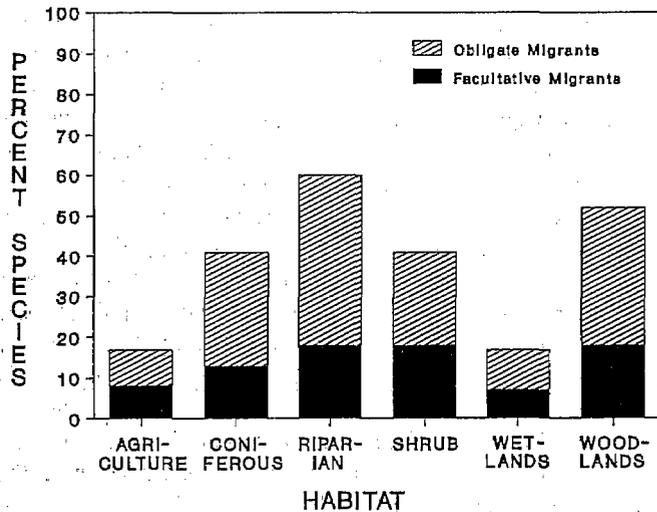


Figure 4. — General habitat associations of Idaho's neotropical migrants (Saab and Groves 1992). Most species use more than one type of habitat.

Although only a few western studies address the effects of forest fragmentation (see Faaborg et al. 1993; Freemark et al. 1993 for review) on avian communities, there is clearly cause for concern. Aney (1984), in a short-term study, examined bird distributions in old-growth forests of western Montana and noted the number of bird species increased with stand size. Hejl (1992) examined habitat associations of birds at stand and landscape levels in old-growth and second-growth Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) forests of western Montana and adjacent Idaho. She found several species of birds more abundant in old-growth than mature second-growth forests. Brown-headed Cowbirds were notably more abundant in second-growth stands surrounded by a greater amount of agricultural lands and grasslands. Keller and Anderson (1992) compared avian populations in uncut and fragmented stands of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) in southeastern Wyoming. They found two species, Brown Creeper (*Certhia americana*) and Hermit Thrush (*Catharus guttatus*), negatively affected by fragmentation whereas Pine Siskins (*Carduelis pinus*) were positively affected.

One link between elk and neotropical migrant habitat is riparian areas. Marcum (1975, 1976) found elk using areas within 320 m of water disproportionately greater than other summer range areas. Skovlin (1984) also reported a heavy preference for summer range within 0.8 km of water. Whether elk are attracted to riparian areas for lush forage or water or both is unclear (Ohmart and Anderson 1986). Riparian areas are

the most important habitat in arid portions of the West for neotropical migrants (Knopf et al. 1988, Terborgh 1989). In Idaho, 60% of the migrant landbirds are associated with riparian habitats in the breeding season (Saab and Groves 1992). Thus, conservation of riparian habitats is wise stewardship for elk, neotropical migrants, and other wildlife species.

Review of Forest Plans and IDFG Comments on Forest Plans

Of nine forest plans reviewed, six plans clearly featured elk management as the highest wildlife management priority, whereas no single species stood out in the other plans. Several mentioned specific elk population or habitat effectiveness goals that the plan was striving to achieve, and several forests had developed standards and guidelines within their forest plans for elk. Elk was notably the only management indicator species for which a specific habitat model had been developed.

IDFG's comments on forest plans relative to wildlife management emphasized concerns about elk. On each plan, IDFG was consistently most concerned about the impacts of increased roading on elk security areas and inconsistencies in elk population goals between IDFG and USFS. Although selected endangered and sensitive species were occasionally mentioned, the word *nongame* was mentioned only once in nine sets of forest plan comments.

Management Indicator Species

NFMA regulations indicate that each national forest is to specify MIS for planning and state reasons for selections (Code of Federal Regulations 1985). Species may be selected because they are: 1) a threatened, endangered, or sensitive species (TES), 2) commonly hunted, fished, or trapped, or 3) ecological indicators of the condition of populations of other species or habitats. Because neither the Northern or Intermountain Region of the USFS had implemented Sensitive Species programs (Groves and Melquist 1991) prior to the writing of forest plans, none of these plans listed any Sensitive species as MIS. The number of MIS averaged 7.4 species (n=10) and ranged from 4-15 species (excluding the federally listed threatened and endangered species). Two or three of the MIS on each forest were consistently big game species, including elk as a MIS on every forest. The Pileated Woodpecker (*Dryocopus pileatus*) and the Northern Goshawk were also selected by several forests as old-growth indicators. Several neotropical migrants including Red-naped Sapsucker (*Sphyrapicus nuchalis*), Williamson's Sapsucker (*S. thyroideus*), Brown Creeper, Ruby-crowned Kinglet (*Regulus calendula*), Mountain Bluebird (*Sialia currucoides*), Yellow Warbler (*Dendroica petechia*), Vesper Sparrow (*Pooecetes gramineus*), and Brewer's Sparrow (*Spizella breweri*) were also selected, but there was little consistency in their selection from one forest to another.

Elk were selected as MIS because of their socioeconomic value as a game species. Classification as MIS has undoubtedly been helpful in promoting the growth and maintenance of elk herds on national forest lands. The problem with elk classification as MIS is they are often treated as an ecological indicator species. Because they are habitat generalists, they are a poor choice for an ecological MIS, and their use as such may be indirectly detrimental to other wildlife such as neotropical migrants with more specialized habitat needs. Thus, selecting MIS for reasons other than ecological indicators can lead to management conflicts. More than one USFS and IDFG biologist indicated elk were of little to no value as an ecological MIS, and elk habitat effectiveness models should be eliminated or modified. Several biologists in both agencies indicated a new model was needed that incorporated features of habitat effectiveness and vulnerability or which focused primarily on elk mortality and vulnerability.

Interviews with USFS and IDFG Biologists

Several consistent answers emerged from USFS biologist interviews. All but one biologist indicated they used MIS in the forest plan and to evaluate impacts of proposed projects such as timber sales. Similarly, all but one forest biologist indicated elk was the MIS receiving the most attention and that IDFG had a strong influence on the USFS emphasis on elk management. Nearly all USFS biologists felt that IDFG influence on elk management was positive in that it helped them achieve wildlife habitat goals internally within the USFS. However, all expressed concerns that IDFG over emphasized elk management at the expense of other species. Most USFS biologists also expressed frustration concerning the IDFG's lack of expertise at a regional level in areas other than big game management. At least two forest biologists had been openly criticized for spending too much money on TES species and not enough on elk. On the flip side, two USFS biologists positively noted that IDFG had begun to address issues other than big game. Most forest biologists felt they had balanced wildlife management programs, but that nongame, particularly TES species, were increasingly important.

Despite limitations, most forest biologists felt that elk habitat effectiveness models were useful in habitat conservation and noted few attempts to skirt or manipulate the model guidelines. As to improving relationships between agencies, the most consistent USFS answers were that IDFG needs to: 1) broaden its horizons beyond big game, 2) communicate better so that employees of both agencies better understand their respective agencies' mandates and limitations, and 3) be more involved from the beginning and throughout the planning/evaluation process on USFS projects such as timber sales. Finally, nearly all USFS biologists commented that their greatest need was information on habitat relationships of TES

species and a larger-scale approach (i.e., landscape-level analysis) that would use geographical information system (GIS) analysis.

IDFG biologists concurred that game species' issues, particularly surrounding elk, dominated their interactions with the USFS. All agreed that IDFG's focus was narrow, but necessarily so due to pressures of meeting needs of IDFG's primary constituent - the hunter, and limited funding/personnel to focus on nongame species. Nearly all IDFG biologists expressed a strong desire and need to have regional expertise on nongame matters. Several IDFG biologists expressed frustration at getting the USFS biologists to do what they felt was the right thing for the biological resource (usually a game species) as opposed to other resource values such as grazing or timber harvest. Most placed blame for any negative interactions on the differences in mandates between the agencies.

Contrary to USFS biologists' responses, IDFG biologists noted considerable problems with elk habitat effectiveness models. Among problems identified were misapplication of the model outside of summer range, lack of model standardization among forests, and manipulation of models to bias outputs towards timber harvest. One biologist observed that USFS often used the guidelines as a reason for harvesting timber under the auspices of improving habitat for elk. As for how the two agencies could work together better, IDFG responses varied from "they'll improve when the last tree on the forest is cut" to the need for increased interaction through frequent informal meetings.

SYNTHESIS AND RECOMMENDATIONS

Elk and Neotropical Migratory Landbirds

Although Unsworth et al. (1993) indicate that habitat factors are of little importance in control of elk herds in northern Idaho, their mortality model was developed in an area of relatively high tree cover. Cover may play a more important role in areas where it is relatively more limited. In addition, the value of cover to elk may diminish at high hunter densities but be more important to elk survival at lower hunter numbers (A. Christensen, *pers. comm.*) An obvious corollary is that habitat effectiveness models and guidelines may be most useful in areas with limited cover and fewer hunters. These models and guidelines have resulted in protection of some forest cover that might have otherwise been lost to timber harvest. Nevertheless, it seems safe to assume that elk have tolerated habitat fragmentation well and focusing our primary attention on managing forested habitats for an adaptive species such as elk makes little sense. How ironic that this fragmentation was often intended (ostensibly) to encourage higher levels of elk use of the managed forest (Thomas 1991).

How then are forested habitats to be managed for the diverse needs of neotropical migrants and other species? Managing landscape patterns and processes so they resemble

presettlement times and re-establishing natural disturbance regimes is one alternative (Noss 1985, Hejl 1992, Huto et al., this proceedings). This approach necessitates investigating what presettlement vegetation in an area would look like and determining factors responsible for shaping the vegetation patterns. For example, in the northern Rocky Mountains, several factors (e.g., elevation, aspect, fire, avalanches, disease, insects, vulcanism) play a role in determining landscape patterns (Hejl 1992). Some USFS land managers recently re-focused efforts towards landscape-level management (e.g., Losensky 1991), and recent emphasis of ecosystem management (Kessler et al. 1992) in USFS will undoubtedly result in more landscape-level planning.

A similar and complementary approach, espoused by Jerry Franklin and colleagues in the Pacific Northwest (Swanson and Franklin 1992), uses knowledge of natural ecosystems to develop sustainable ecosystem management. Such a strategy might include modifying stand management practices to retain some live trees and greater amounts of woody debris instead of practices resulting in clearcut plantations. At the landscape level, timber harvest might shift from a pattern of dispersed to aggregated cuts to provide more forest interior habitat.

Management Indicator Species

Interviews with USFS biologists indicated several MIS were consistently used in evaluating individual projects such as timber sales on most forests, yet most MIS lack standards and guidelines developed for elk. Consequently, evaluating project impacts is more difficult. Several USFS biologists commented on lack of habitat-specific information for many MIS, particularly sensitive species. Only one biologist noted difficulties with the validity of MIS as a concept for evaluating environmental impacts.

A recent GAO report (1991) on USFS indicator species generally mirrors our interview results. GAO concluded there were several practical drawbacks to MIS including lack of understanding of the relationship between indicator species and habitat characteristics they are supposed to predict, detected changes in MIS levels due to habitat changes beyond management control, selection of MIS for other than reasons of ecological representativeness, and the large number of skilled staff required to implement the MIS approach. In addition, costs of monitoring populations of MIS to detect changes in habitat condition can be prohibitive. Despite acknowledgment by USFS staff of these problems, USFS headquarters officials believed the MIS concept to be basically sound and that many of the problems can be resolved.

This conclusion is inconsistent with findings of Landres et al. (1988) who thoroughly critiqued use of vertebrates as indicator species. They noted numerous, significant problems in MIS use including failure of assumptions behind their use on both a conceptual and empirical basis. They found selection criteria confounding, lack of guidelines for choosing the number

of indicator species, statistical problems associated with sampling populations of many MIS, and inappropriate use of the same MIS from one geographic area to another. They specifically pointed out that game species like elk are "especially problematic as ecological indicators because their population density and distribution are affected by hunters and direct control, actions to meet socioeconomic and political objectives." Landres et al. (1988) concluded that MIS use was inappropriate in most cases, and regulations and mandates requiring their use were biologically problematic and financially infeasible. Noss (1990) agreed, noting that MIS may mislead biologists into thinking that all is well in an area simply because an indicator species is thriving. As mentioned previously, this thinking is a problem with regard to elk management on some Idaho national forests.

Despite admonishments to abandon the concept, Landres et al. (1988) outlined a series of recommendations to improve MIS usefulness. Although there are some obviously compelling reasons to focus attention on MIS classified as TES, the critique of Landres et al. (1988) is persuasive that alternative approaches to environmental assessment are desperately needed. The landscape approaches mentioned above (Noss 1985, Swanson and Franklin 1992) will likely offer viable alternatives. Utilizing tools such as GIS and gap analysis (Scott et al. 1993) to identify protected and unprotected vegetation communities and species-rich areas should be a component of these landscape-level approaches. In Idaho, distributions of neotropical migrants and their habitats have been mapped under the auspices of the state's gap analysis project. Such information should be taken advantage of in determining "hot spots" of species richness, trends in habitats of declining species, and ecosystems and populations at risk.

Need for Nongame Expertise

"All wildlife, including all wild animals, birds, and fish, within the state of Idaho, is hereby declared to be the property of the state of Idaho. It shall be preserved, protected, perpetuated, and managed." -- *Idaho Code* 36-103

Like most state fish and game agencies, IDFG has focused most attention on a handful of game species which generate the bulk of the agencies' income through hunting license and tag revenues. Idaho law to the contrary, the vast majority of the state's wildlife species (i.e., nongame species) are arguably not being preserved, perpetuated or protected, and they certainly are not being managed. As mentioned previously, only a small portion of IDFG's budget is for nongame management. USFS and IDFG biologists repeatedly emphasized need for IDFG to provide nongame technical information to national forests for planning and project purposes. State departments of fish and game have a unique and influential role in wildlife management on national forest lands which is recognized by federal law and has recently been clarified (Overbay 1992). This unique role affords IDFG a sizeable opportunity to influence all wildlife

management on national forest land. If and when this opportunity is afforded, proponents of nongame will be indebted to sportsmen whose support of hunting and fishing has provided them a powerful, bureaucratic infrastructure from which to operate.

Idaho's Nongame Program ranks in the bottom 20% in funding and staff among state nongame programs nationally (Vickerman 1987). Like many agencies in the West, IDFG has been slow to respond to changing public attitudes concerning increased interest in nongame and watchable wildlife (Arrandale 1990). In fact, a recent IDFG policy plan for 1990-2005 pays scant attention to the nongame resource (IDFG 1991). This slow response is simply a reflection of the fact most state wildlife managers draw their pay from revenue derived from the sale of hunting, fishing, and trapping licenses. Thus, many state fish and game agencies, Idaho included, arguably manage sportsmen as much as they manage wildlife. Yet, there is light at the end of this tunnel. In 1991, IDFG hired environmental coordinators to focus on projects that could impact fish and wildlife populations and habitats. In 1992, the Idaho state legislature passed a bill that provides new funding to nongame through a wildlife license plate. Such funding will hopefully provide IDFG with regional nongame expertise desperately needed to effectively manage all wildlife species.

National forests are increasingly embroiled in conflicts with threatened, endangered, and sensitive species as well as other species such as neotropical migrants. If IDFG is to continue to be a major player in wildlife habitat management on public lands, it is imperative they obtain additional staff expertise in this area. But to deal with increasingly complex wildlife issues such as amphibian population declines, habitat fragmentation, and maintenance of viable populations, both USFS and IDFG biologists will need to call upon not only traditional wildlife management skills but new techniques and ideas. Some new tools emerging from the multi-disciplinary field of conservation biology include conservation genetics, population viability analysis, and landscape/ecosystem level analyses of biological diversity (Edwards 1989, Teer 1989).

Complexity of the Problem

Like many groups of species, neotropical migratory birds have received little attention on Idaho national forests from either USFS or IDFG. This neglect coupled with heavy emphasis on elk management is a technical, biological problem for which preliminary but scant data suggest there is cause for concern. However, the larger problem and its solution are far more complicated than its biological side would suggest. As we see it, there are several pieces to this puzzle. There is an economic aspect of the problem in that current wildlife management is largely driven by funding derived from big game hunting which, in turn, does not meet the needs of statewide conservation for all wildlife species. The two agencies involved, the USFS and

the IDFG, have differing mandates which cause them to manage differently, and occasionally brings them into conflict. This aspect is essentially a policy problem. Finally, there is a political side of this problem whereby power and authority to make decisions is fragmented, in this case, between two organizations. The desired goal of the conservation of all wildlife species is thereby more difficult to achieve. By coming to a consensus on the definition of this multi-faceted problem, a solution is much more likely. Our recommendations follow below.

Recommendations

1. USFS should de-emphasize MIS as it is deficient on theoretical, empirical, and cost-effective grounds. This requires a policy and regulatory change within the NFMA. At best, MIS should be confined to ecological indicators. Even if MIS use continues, elk should not be classified as a MIS; they are a poor choice due to adaptations to a wide variety of habitats.
2. Elk management should emphasize development of vulnerability and mortality models as opposed to habitat effectiveness models and guidelines. These models should be developed over a wide array of habitats and different hunter densities to be most effective.
3. To manage forest-dwelling neotropical migrants, conservation of riparian habitats and a landscape approach to analyzing and conserving forested habitats should be emphasized. Research and monitoring efforts focused on effects of forest fragmentation in the West should be expanded. Extensive wilderness areas in Idaho should be taken advantage of for control areas in research and monitoring programs. A landscape approach emphasizing maintenance of natural patterns and process through such actions as aggregated tree harvest units, snag and woody debris retention, and prescribed fire should be strongly considered. Tools such as GIS and gap analysis will be invaluable in landscape-level approaches. Attention should also be given to silvicultural techniques at the stand-level of management. Thompson et al. (1993) provide a management framework from the landscape to stand levels.
4. IDFG should expand its nongame expertise to have a greater impact on wildlife management on USFS and other lands. Innovative funding approaches to support nongame management efforts are critical. Increased cost-sharing programs with federal and private partners (e.g., timber industry), legislative efforts tied to natural areas, watchable wildlife or outdoor recreation initiatives, and grants from private foundations and corporations for specific nongame projects are but a few examples of possibilities.

5. IDFG should try to break down barriers and distinctions between "game" and "nongame" biologists, a segregation which is a distraction in focusing on a goal of the conservation of biological diversity. Both IDFG and USFS staff need to move beyond traditional wildlife management and utilize new tools of conservation biology.
6. IDFG and USFS personnel should improve communication through more frequent and informal meetings at the regional and forest-level. Interagency task forces which search for a consensus in problem definition and problem solution should be used in tackling complex problems as the decline of neotropical migratory landbirds. Both agencies need to make efforts to better understand the mandates and limitations of each other's organization.

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