Chapter 16

Conservation Status of Great Gray Owls in the United States

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INTRODUCTION

Previous chapters outlined the biology and ecology of great gray owls as well as the ecology of this species in the western United States. That technical review provides the basis to assess the current conservation status of great gray owls in the United States. Are populations of great gray owls in the United States currently threatened? Are current land management practices likely to lead toward the peril of these populations?

In this chapter I will synthesize the information and conclude that: 1) populations of great gray owls in the United States are secure and will likely remain so given current land management practices; 2) populations of great gray owls are in peril (declining or experiencing some demographic trauma) or are likely to be in peril in the future given current land management practices, or 3) there is insufficient evidence to determine the species' conservation status. A minimum of references are presented here because the literature was reviewed in the previous chapters.

Is the Distribution and Abundance of the Great Gray Owl Declining in All or Part of Its Range?

Great gray owls occupy a vast area in western and north-central United States. The distribution and the abundance of local populations do not appear to have declined systematically in the United States, but few data are available to examine the trend.

Distribution

Available evidence does not indicate any consistent trend, either expansion or decline, in the distribution of great gray owls in the United States. Sites near the great gray's southern range boundary have been continuously occupied for at least several decades. The distribution of this owl has not been thoroughly documented nor is it monitored. Therefore, based on limited knowledge, I conclude that its distribution has not recently changed.

Abundance

Except in a few isolated areas, local and regional trends in great gray owl abundance cannot be assessed with available data. Most documented breeding populations of great gray owls have not been monitored more than 2-3 years, a period too short to discern a long-term trend in a species that preys upon fluctuating populations of vertebrates. In Oregon, Bull *et al.* (1989) documented stable reproductive success over a 4-year period (she currently has 10 years of data with only one poor reproductive year—E. L. Bull pers. comm.). Groves and Zehntner (1990) surveyed for great gray owls during 1989 in the area of Idaho and Wyoming studied by Franklin (1988) from 1980-1982. The 1989 surveys located numerous calling great gray owls but few previously occupied sites were occupied. The 1989 surveys did not provide quantitative evidence for a decline in great gray owls for this area although the authors suggest that a reduction in nests reported by USDA Forest Service crews and birders in the area may suggest a decline.

Do Habitats Vary in Their Capacity to Support Great Gray Owl Populations or to Support Particular Activities of the Owl? What Are the Important Characteristics of Those Habitats?

Studies of habitat use by great gray owls in the western United States and in Canada provide convincing evidence that great gray owls use particular habitats for nesting and foraging. Experimental studies or properly designed mensurative investigations have not been conducted to determine how the pattern of habitat use translates into differences in fitness for owls using various habitats. Despite the lack of data on differences in reproduction and mortality across habitats, existing knowledge based on the observations of habitat use provides sufficient evidence to infer that certain habitats are more valuable to the species than others.

Great gray owls consistently nest in forested habitat. In the western United States, nests occur most

often in mature and older forest stands. An experiment in Oregon employing nest platforms demonstrated that individuals prefer to nest within forest stands rather than on the edge of clearcuts. Because this owl needs a large platform for nesting, large broken-top snags and trees, trees with large stick nests, or trees with large mistletoe clumps are necessary for nesting. These habitat features occur most commonly in mature and older forest stands. Therefore, conclude that patches of mature and older forest are important for great gray owls. Patches of mature forest used for nesting need not be extensive but must occur frequently throughout the landscape. Each patch of mature forest cannot be expected to provide suitable nesting structures because raptor nests, flat-topped snags, and broken-topped trees are rare elements of many forest stands. Finally, younger forest stands with residual older forest components can provide nesting habitat.

Quality foraging habitat occurs in a variety of vegetation structures but does not include dense, young forest stands. Small meadows, open forest, treed muskeg, and clearcuts with residual perches were reported as important foraging habitat in different studies. During winters when snows crust in meadows and clearcuts, open mature and older forest may be important foraging habitat.

Do Habitats Vary in Their Capacity to Support Principal Prey Species?

Microtus voles and pocket gophers dominate great gray owl diets in populations studied in the western United States and Canada. Populations of *Microtus* are more abundant in grasslands and less common in closed-canopy forests. Pocket gophers inhabit forested and unforested habitats but also are not abundant in closed canopy forest.

Red-backed voles are the only other prey species representing over 10% of the owl's diet in a major study in North America. These voles inhabit forest environments and are most abundant in mature and older forests (see Chapter 9). Studies of great gray owls in Oregon, where red-backed voles are preyed upon, did not establish whether great gray owls captured the voles along forest edges or in the forest interior.

If the Great Gray Owl or Its Prey Relies on Specific Habitats, Are These Habitats Declining or Being Stressed by Current Management?

A long history of fire suppression, livestock grazing, and timber harvest has altered forest structure of montane forests in the Rocky Mountains. These changes have resulted in both positive and negative consequences for great gray owls. As described in Chapter 15, presettlement fires occurred at shorter intervals resulting in forests with lower canopy cover than observed today. A combination of grazing and fire suppression have contributed to invasion of conifers into meadow and grassland communities in the montane zone. Loss of natural meadows and grasslands, especially small open habitats within forested landscapes, degrades foraging habitat for great gray owls. In some areas this trend continues today. Similarly, increased canopy cover and the resulting decrease in understory reduces habitat quality for potential great gray owl prey and results in forest structure less suitable for great gray owl foraging.

Clearcut and partial cut timber harvests have created new foraging habitat in many areas. The quality of this habitat depends on many factors, particularly the size of the harvest units and the availability of hunting perches. Portions of harvest stands over 30 m from an edge or perch are of little value. Therefore large harvest units without residual forest or snags provide less foraging habitat than an equivalent area of many small units. Timber harvest during the past 3-4 decades has relied largely on clearcutting. Therefore, foraging habitat has increased in many areas. The increase in foraging habitat will be short-lived in some cases, compared to the lifetime of natural meadows. The establishment of dense regeneration on clearcut units renders the site unsuitable for foraging until later in succession when the forest stand opens through tree mortality. In cases where forest does not establish after harvest, the new foraging habitat will be long-lived.

The increase in foraging habitat that often results from clearcutting has in some instances been offset by pocket gopher control practices used in forest regeneration. Pocket gophers are intensively controlled on some forests through poisoning gophers in their burrow systems. Data are not available to evaluate whether great gray owls are indirectly poisoned through these efforts; however, if the practice is successful in reducing pocket gopher populations, foraging habitat quality is reduced.

While clearcuts may provide temporary foraging habitat, timber harvest may remove nesting habitat. In many areas of the Rockies, especially in the Southern Continental Province and to a lesser extent the Northern Continental and Intermountain Provinces, mature and older forest stands represent a minority of the landscape (table 1, Chapter 15). In eastern and central Oregon the remaining old forest is a small

fraction of the original old forest. Existing older forests are generally more valuable and thus selected for harvest. Therefore, even modest reductions of mature and older forest through timber harvest can have a long-term impact on available nesting habitat. These mature and older forests frequently occur in topographic sites that are less likely to burn. Following the removal of these stands, management of alternative stands to provide nesting habitat may be difficult because of the higher probability of fire.

Reductions in mature and older forest habitats must be considered potential reductions in great gray owl nesting habitat. This owl will nest in small patches of mature forest but only if suitable nesting structures exist. Therefore maintenance of nesting habitat depends most on the dispersion (rather than aerial extent) of sites with suitable nesting platforms. Based on historic patterns of timber management, nesting habitat is being stressed and has been degraded through past forest management.

Do the Life History and Ecology of the Great Gray Owl Suggest That Populations Are Vulnerable to Habitat Change?

Platform Nesting

Great gray owls nest primarily on old raptor nest platforms or broken-topped trees and snags. These structures occur most commonly in mature and older forest stands. Although individual great gray owls do not need a large stand of older forest for nesting, landscapes must have sufficient mature and older forest to produce a sustained "population" of well dispersed suitable nest structures. Therefore, the aerial extent of mature and older forest necessary to support a great gray owl population must be greater than the extent of stands with nesting great gray owls in any given year. The dynamics (production and survival) of nest platforms (including raptor nests, broken-top snags, etc.) are unknown so estimating the area of forest necessary to sustain sufficient nesting sites is not possible given current knowledge. This aspect of great gray owl ecology indicates that the species is vulnerable to habitat change. Because the species does not require large nest stands, management of nesting habitat should not be difficult, once the dynamics of nest platform populations is understood.

Productivity and Survival

Populations of great gray owls studied in North America exhibit relatively high, constant productivity for a large bird. Clutch size, nest success, and age of first reproduction each appear strong compared to other large owls.

Although a number of investigators have documented productivity of great gray owl populations in North America, few studies report survival and the information available is not precise. Existing estimates indicate relatively high juvenile and adult survival. None of the estimates, however, cover a long time period or examine survival under different environmental conditions. In general, though, existing information suggests that productivity and survival of studied populations are favorable for persistence. Studies in California are an exception, but the methods and rigor of these studies are questionable.

Home Range Size

A limited number of investigations indicate that individual great gray owls use large areas of forest landscapes. Because these owls do not defend their entire home range, densities of great gray owls are higher than their large home ranges would suggest. Despite the potential for several pairs of owls to occur within the area of a single home range, land management must provide habitat with an interspersion of nesting and foraging habitat over large areas to ensure population persistence. This aspect of the species ecology indicates vulnerability to decreases in habitat quality at the landscape scale.

Trophic Position

Great gray owls prey upon small mammals, particularly voles and pocket gophers in the western U. S.. As such, they rely on the integrity of 2-3 trophic levels. The probability for persistence of species at higher trophic levels is thought to be less than for primary producers or primary consumers indicating this species is relatively vulnerable to habitat changes which negatively influence lower trophic levels.

What Is the Current and Projected Conservation Status of the Great Gray Owl?

Direct scientific knowledge is insufficient to make a sound judgment of the current conservation status of great gray owls. The species has, however, been investigated in several locales and over a longer period than many owls. These studies provide the basis from which to draw informed but tentative conclusions. Available evidence, although limited and indirect, suggests that the status of the great gray owl varies across its geographic distribution in the United States. Over the short term, persistence of great gray owls appears secure in the Northern

Rockies. Researchers most aware of the owl's ecology in eastern and central Oregon and in California suggest that persistence of the species is less certain in these areas. As a whole great gray owls in the United States occur over a broad geographic range, and evidence from the few populations studied indicates strong reproduction. Furthermore, the life zone occupied by great gray owls is continuous over large areas compared to subalpine and alpine species. Therefore, this owl is not as susceptible to problems associated with small population size as some other species.

Many species of owls are food limited and foraging habitat is critical in maintaining populations (e.g., Korpimaki 1984, Hirons 1985). Great gray owls appear to be similar. Historical forest management has produced positive and negative results for great gray owl foraging habitat. Livestock grazing and fire suppression has created a loss of small natural meadows (used for hunting by the owls) while clearcutting in some cases has created forest openings. The abundance of foraging habitat, then, may be similar to or somewhat greater than in the previous century.

The relationship between nesting habitat structure and nesting success is not understood. Observations of nesting habitat use, however, indicate that great gray owls will nest in a variety of forest conditions given that a suitable platform is present. In Oregon, the abundance of suitable platforms is thought to limit the number of breeding great gray owls (E. L. Bull, pers. comm.). In this area, loss of potential nesting habitat has been severe. Whether this is the case elsewhere is not known; however, management of nest-building raptors will be critical to providing necessary nest sites.

The long-term persistence of great gray owls south of Canada and in Alaska seems likely provided that forests of all successional stages are maintained and well dispersed on a local and regional scale. Persistence on a local geographic scale is less certain. Maintaining persistence will require special attention to the long-term persistence of mature and older forest stands on sites where natural fire is less likely to destroy the old forest and where suitable nesting platforms are abundant. These stands will be necessary to consistently produce nesting structures. Furthermore, mature and older forest likely provide important alternate foraging habitat during periods when crusted snow prevents great gray owls from accessing their preferred rodent prey.

Given the large home ranges used by great gray owls for foraging, management of foraging habitat is critical to maintaining persistent owl populations. Maintaining quality great gray owl foraging habitat should be compatible with forest management for commodity resources if management takes a long-term view. Natural meadow systems must be maintained and restored through fire management. Similarly, temporal continuity of foraging habitat must be maintained through long-term harvest planning. Harvest units can provide open foraging habitat that is most used by great gray owls. As mentioned above, alternate foraging sites used during critical periods of low prey availability in the primary foraging habitat must also be maintained.

The conclusions reached in this chapter are different from views held by at least one ecologist who has conducted long-term research on great gray owls. The other ecologist feels the short-term persistence of the species is less secure than indicated here and that management of the species will be more difficult than I infer. A summary of the review comments of this ecologist are available upon request.

WHAT ARE THE MANAGEMENT CONSIDERATIONS?

This assessment of the conservation status of great gray owls leads to several consequences for management. Below, I outline several of these.

1. Great gray owls occupy forest landscapes and use habitats from the extremes of the successional spectrum. As a result, management of this species should fit naturally into forest management that provides for commodity development within the framework of conserving biological diversity. This is not to say that haphazard management will accommodate this owl but indicates that, given attention to the owl's habitat, extractive management is compatible with conserving great gray owls.

2. Management of great gray owl habitat must take a long-term view of forest succession and consider landscape and regional forest patterns. Because the owl hunts meadows, treed muskegs, open forest, clearcuts, and other forest openings, disturbance agents such as fire and insects influence foraging habitat quality. Clearcuts are usually short-lived compared to muskeg and meadows; and foraging habitat within clearcut openings will span only 2-4 generations. Even natural meadows are transient under some circumstances without disturbance by fire. Nesting habitat is also succession dependent. Once lost through stand replacement disturbance, nesting platforms will not be replaced naturally for a century or more in many forest types. Similarly, loss of mature and older forest habitats will influ-

ence other raptors (particularly goshawks) that build many of the nest platforms used by great gray owls for nesting.

3. The large home ranges of great gray owls and the resulting dispersed population structure dictate a broad landscape and regional perspective to management. The interacting members of great gray owl populations may inhabit an area greater than individual ranger districts. Interacting subpopulations likely span several National Forests. Therefore, management must be coordinated among administrative units to maintain links between interacting biological units.

4. Efficient, cost-effective progress toward improved management will come most rapidly through cooperative efforts of research and management. This conservation assessment highlights how little is known about the demography, metapopulation structure, and even habitat use of great gray owls. Because the species is not in immediate peril in some portions of its geographic distribution, efforts to obtain further knowledge of great gray owl ecology should be approached with a modest, determined program designed to obtain data efficiently over the long term. This may be accomplished through adaptive management. By examining great gray owl response to alternative management in areas where studies of small mammal dynamics are occurring (in conjunction with other work), management of great gray owls can be improved at low cost.

5. The loss of nesting habitat in central and eastern Oregon has been identified as the most immediate threat to great gray owl persistence in that region. This may be the case in other areas. Therefore. determined management of nesting habitat should be a priority, without which local persistence of the species will be in jeopardy.

6. Within the context of adaptive management, great gray owls represent a classic case upon which to develop ecosystem management. The broad spectrum of habitats used by the owl encompass important ecosystem transitions (among successional stages). The owl consumes vertebrates that are important in forest processes. Finally, the large areal requirements of the owl will force managers to approach planning from a landscape perspective.

REFERENCES

Bull, E. L. Research Wildlife Biologist, U. S. Forest Service, Pacific Northwest, Range and Forest Experiment Station, LaGrande, OR. [Personal communication]. January 1994.

Bull, E. L., M. G. Henjum, and R. S. Rohweder. 1989. Reproduction and mortality of Great Gray Owls in Oregon. Northwest Science 63:38-43.

Franklin, A. B. 1988. Breeding biology of the Great Gray Owl in southeastern Idaho and northwestern Wyoming. Condor 90:689-696.

Groves, G., and E. Zehntner. 1990. Distribution and status of Great Gray Owls (*Strix nebulosa*) on the Targhee National Forest, 1989. Idaho Department of Fish & Game, Boise, Idaho, USA.

Hirons, G. J. M. 1985. The importance of body reserves for successful reproduction in the Tawny Owl (*Strix aluco*). Journal of Zoology London B 1:1-20.

Korpimaki, E. 1984. Population dynamics of birds of prey in relation to fluctuations in small mammal populations in western Finland. Annales Zoologici Fennici 21:287-293.

Korpimaki, E. 1987. Clutch size, breeding success and brood size experiments in Tengmalm's Owl *Aegolius funereus*: a test of hypothesis. Ornis Scandinavica 18:277-284.