ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

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PROJECT TITLE: Distribution, abundance and ecology of forest owls in Southeast Alaska

PARTNER: U. S. Fish & Wildlife Service, Alaska Department of Fish and Game

COOPERATORS: U.S. Fish & Wildlife Service, Juneau Raptor Center

PRINCIPAL INVESTIGATORS: Stephen B. Lewis (ADF&G) and Michelle L. Kissling (USFWS)

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REPORT PERIOD: July 1, 2008 – March 31, 2009

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Little is known about the distribution and abundance of nocturnal owls continent-wide, and most owl populations are not adequately monitored. In the United States, owl research and monitoring has focused on a few species of conservation concern (e.g., Northern Spotted Owl). Recently, biologists in Canada and Montana developed guidelines for monitoring nocturnal owl species in North America by standardizing survey efforts across the region. These guidelines were implemented in Canada in 2000, and the volunteer-based program has been extremely successful. Boreal Partners in Flight ranked forest owls as the highest priority raptor species group for conservation effort. This study evaluated survey methods typically used to estimate owl abundance to ensure that surveys are producing biologically meaningful results. It developed a survey protocol appropriate for Southeast Alaska to meet regional objectives and to contribute to ongoing continent-wide efforts for monitoring nocturnal owls. Distribution and abundance of forest owls in Southeast Alaska subsequently can be documented.

This project generates data on distribution, abundance and habitat for 10 species of owls, all listed in Alaska's CWCS as Species of Greatest Conservation Need (Appendix 7, page 20). The lack of information about population status, trends and habitat use is one of the biggest impediments for management of these species in southeast Alaska (Appendix 4, sections C and E, page 263). This project begins to fill that information gap. It seeks to build a sound monitoring program, as well as address several other related conservation actions noted in the Forest Owl Template (Appendix 7, section G, page 264).

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

Boreal Partners In Flight ranked forest owls as the highest priority raptor species group (Schempf 2001). Information about the distribution and abundance of owls in Southeast

Alaska (SEAK) is lacking, and a comprehensive study has never been initiated. During the 1970's on Prince of Wales Island, broadcast surveys were conducted for breeding owls in May/June. Nest boxes were distributed locally (e.g., Juneau, Petersburg, POW, and Heceta Island), but efforts to check for owl use are inconsistent, and few (<5) boxes have been used by owls for roosting or nesting. Recently, owl surveys have been conducted on the Thorne Bay Ranger District, and have resulted in a surprisingly high number of owl observations (C. Mlodik pers. comm.). These results suggest that while nest boxes are not used often, owls are present at low densities in the forest and likely could be monitored using standard methods (e.g., broadcast surveys).

Prior to field efforts to document distribution and abundance of nocturnal owls in SEAK, an efficient survey protocol needs to be developed. The objective of the guidelines outlined by Takats et al. (2001) was to provide a sound basis for developing regional owl monitoring protocols to provide comparable data across North America. Information regarding optimal timing for surveys, and route selection and accessibility varies among regions. In geographic areas not yet studied, such as SEAK, this information is critical to designing a successful monitoring program. In this study, we propose to gather information to allow for participation in the continent-wide, owl monitoring program, and to develop guidelines for monitoring trends in forest owl populations as a result of forest management activities in SEAK.

Singing owl surveys may not be appropriate for monitoring some owl species (Benson 2001), and there is concern whether broad-scale auditory surveys produce an accurate estimate of owl abundance because these surveys assume that all birds are equally detectable. For example, singing of Boreal Owls has been positively correlated to pairing status, and may be inversely related to breeding success (Lundberg 1978). Point counts are the most common method for estimating abundance of birds, but typical analysis methods fail to account for differences in detection probabilities. A common misconception is that point count data is a complete census; in reality, the number of birds counted at a point is a proportion of the true population at that point (Lancia et al. 1996). Probability of detection can be considered a correction factor, which is used to compensate for individuals that are present but are not detected (Iverson and Fuller 1991). It can be estimated by using distance sampling methods (Reynolds et al. 1980), repeating counts on a survey route (Hewitt 1967, Seber 1982), and using radio telemetry methods. Failure to account for differences in detection probabilities results in biased population estimates that can be substantially below true densities. We propose to evaluate survey methods for estimating abundance of nocturnal owls in SEAK.

Recently, biologists in Canada and Montana developed guidelines for monitoring nocturnal owl species in North America by standardizing survey efforts across the region. These guidelines were implemented in Canada in 2000, and the volunteer-based program has been extremely successful.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

OBJECTIVE 1: Establish a Southeast Alaska Owl Network – train volunteers to participate in region-wide owl monitoring efforts.

We created the Southeast Alaska Owl Network (SEAKON) in conjunction with the Juneau Raptor Center (JRC) to assist us in documenting owl occurrence throughout the year and across the entire region. Working with JRC, we recruited members of the public with an interest in owls and wildlife. We made public presentations in 6 communities (Juneau, Petersburg, Sitka, Ketchikan, Wrangell, and Craig) around Southeast Alaska to generate interest in owl conservation, explain the need to gain information on owls, and identify potential volunteers. We enlisted 46 volunteers and agency personnel from 14 Southeast Alaskan communities to conduct owl surveys over 4 years (2005-2008). We used these survey data to estimate site occupancy and trend of 3 common owl species (northern saw-whet owl, western screech-owl, and barred owl). An additional 134 individuals submitted owl sightings to SEAKON; these sightings assisted in documenting seasonal variation of all owl species in Southeast Alaska.

The SEAKON proved to be an extremely valuable resource for completion of the region-wide survey. Most of our volunteers were exemplary, but, as with most volunteer-based programs, there were inherent challenges to overcome. Coordinating SEAKON was time-consuming at some times of the year and, at those times, required more time than a partially-volunteer coordinator could afford. Some volunteers were unavailable during part or all of the survey period (e.g., other commitments, travel) or had permanently moved without informing the SEAKON Coordinator, leaving us scrambling to find a new volunteer before surveys were scheduled to begin. A few volunteers were unwilling to participate in broadcast surveys because of potential disturbance to the owls; we worked directly with these volunteers on a survey protocol that would still collect valuable data without compromising their principles. On occasion, we received incomplete datasheets from volunteers, which prevented us from using some of the data in our final analyses. Similarly, many volunteers failed to document survey hours in the timesheet format required by the State Wildlife Grant Program and therefore, we estimate that roughly 30 % of non-federal match was lost because of documentation issues. We received feedback that this step was an excessive burden on volunteers and only reduced enthusiasm to participate in SEAKON. In fact, some volunteers ceased participating in surveys because of the extra steps required of them. Overall, the benefits of the SEAKON exceeded the drawbacks, particularly in terms of generating interest in owls, educating the public and school groups on the conservation of owls in Southeast Alaska, surveying relatively remote areas that otherwise we would not have been able to reach, and providing data for a region-wide survey.

OBJECTIVE 2: Design a survey protocol for nocturnal owls in Southeast Alaska.

We dedicated our entire first year of study to evaluating survey methods and design, considering the allocation of survey effort, and identifying sources of variation in detection probabilities. We were particularly concerned with imperfect detection of owls at survey stations; information is lost when a site is surveyed but no owl is detected because it is not clear if the site is not occupied by an owl or if it is occupied but the owl was not detected. Because we expected owls to occur in relatively low densities in Southeast Alaska, we wanted to design a survey protocol that maximized detection probabilities. Therefore, we tried to estimate and incorporate detection probabilities into the survey protocol to ensure unbiased results and to get the most out of our survey effort.

At the conclusion of the first field season, we developed a survey protocol that was appropriate for the landscape and weather conditions of Southeast Alaska (see Final Report). The final protocol used in this study is compatible with owl surveys that have been conducted across Canada and a few select areas in the United States since 2000 (Takats et al. 2001).

OBJECTIVE 3: Describe distribution and abundance of forest owls in Southeast Alaska.

During the early stages of this study, a derivative of mark-recapture methodology was being refined to estimate occupancy probabilities while accounting for imperfect detectability. The proportion of sites occupied can be a surrogate for abundance of owls in the region (MacKenzie et al. 2006) and, because it has a measure of the variability in the data, can be repeated to learn if site occupancy is changing over time. After careful evaluation, we concluded that this approach has several advantages for monitoring populations of nocturnal owls in Southeast Alaska. First, occupancy modeling incorporates heterogeneity in detection probabilities. Second, this technique provides a measure of confidence on the occupancy estimates. Third, occupancy modeling relies on presence-absence data and therefore, it is realistic to achieve adequate sample sizes to estimate occupancy of rare species. We believe this approach offers an efficient and economical method for monitoring nocturnal owls in Southeast Alaska and elsewhere.

We estimated occupancy of the 3 most common owl species (northern saw-whet owl, western screech-owl, and barred owl) in Southeast Alaska using methods developed by MacKenzie et al. (2006). In addition, we identified habitat features associated with occupancy and factors influencing detectability of these species (Final Report, Chapter 2). During the course of the study, we learned of an owl survey designed and conducted by L. Suring (USFS) in the late 80s and early 1990s in Southeast Alaska. Suring agreed to share his data with us to evaluate trends in owl numbers over the 2 time periods (1986-1992 and 2005-2008). Although survey techniques differed slightly, we were able to model site occupancy and trend across the time periods by making several realistic assumptions. Most notably, we were unable to estimate detection probabilities directly for the historical data; instead we applied detection probabilities from our study to the historical data and assumed that we encountered similar conditions (e.g., weather) during our surveys. After close examination of our protocol with that used during the historical surveys, we believe this was a reasonable assumption. Our collaborative effort with Suring resulted in valuable information on the status of 3 owl species in Southeast Alaska by utilizing previously-gathered data that would otherwise have not been reported.

OBJECTIVE 4: Develop recommendations for a broad-scale monitoring protocol for this species group.

We designed and conducted a region-wide survey for nocturnal owls in Southeast Alaska. We recommend that this survey be repeated annually to estimate colonization and extinction rates because these values would be most useful for management purposes. If annual surveys are cost-prohibitive, we recommend repeating surveys at 2- or 3-year intervals to monitor trends in occupancy of the more common owls of Southeast Alaska's forests. This survey could involve collaboration between ADF&G's Nongame Program, the USDA Forest Service, and the U.S. Fish and Wildlife Service, as well as volunteers from SEAKON.

1. We provide a protocol for conducting surveys for nocturnal owls (see Final Report, Appendix I), specifically Western Screech-Owls and Barred Owls. If other owls are of interest, the protocol could easily be modified to accommodate them. If broadcast segments for additional species are included, we recommend broadcasting calls in the order of increasing owl size and using the same time intervals we used for this study.
2. To maximize efficiency in occupancy surveys, we recommend increasing detection probabilities of target species. In our protocol, we provide advice on conditions to avoid and variables to measure during surveys to account for detectability issues in the occupancy-modeling process. All data sheets should be completed properly, including all weather and noise variables and coordinates from a GPS unit.
3. We recommend a minimum of 200 stations across the region to monitor occupancy of target owl species. These sites should be visited 3 times during the survey season. There is a trade-off between number of sites that can be visited and the number of visits at each site. The survey we executed was designed based on using volunteers from various communities across the region to conduct the bulk of the surveys. Thus, most surveys were located close to cities or towns. Future surveys, utilizing agency personnel, could incorporate additional sites further away from population centers (i.e., sites requiring greater logistics to reach). If an understanding of owl occupancy was desired at a smaller scale (e.g., a FS District) than the entire region, additional sites could be added at that level of spatial resolution to resolve finer scale differences in site occupancy.
4. Despite some of the hurdles we encountered with the SEAKON, we believe that a volunteer-based program for monitoring owls in Southeast Alaska could be successful with a few minor improvements. We recommend the following if a volunteer-based owl monitoring program is implemented in Southeast Alaska:
    a. Create a web-based data submission platform that allows volunteers to enter and submit survey data. We collaborated with Bird Studies Canada (contact: Denis Lepage) on several proposals to fund a data entry system and database for monitoring nocturnal owl populations across North America. Bird Studies Canada led the effort and we wrote letters of support committing to use the system should it be funded. Unfortunately, only a portion of the proposal was funded, supporting the design of the website and database, which is now part of the Avian Knowledge Network. For a small annual fee, Bird Studies Canada will customize the system to meet regional needs. We recommend working with Bird Studies Canada to incorporate any owl survey efforts and data into this system, which will allow for broad-scale analysis of owl populations and status.
    b. Serve information on training, protocols, datasheets, and frequently asked questions on a website for volunteers and other surveyors.
    c. Hire 2-4 technicians to rotate around Southeast Alaska during surveys to fill in gaps when volunteers are unavailable and to ensure that the protocol is properly followed. We suggest that each new volunteer be required to survey first with a seasoned volunteer or hired technician before leading surveys on their own.

   d. Hire a coordinator to communicate with volunteers, update information on the website regularly, present survey results, and manage the volunteer database.

5. Populations of some nocturnal owls are monitored successfully at migration stations. The Rocky Point Bird Observatory in coastal British Columbia has been banding migrating owls since 2002. We recommend investigating the feasibility of collaborating with Rocky Point Bird Observatory on the long-term monitoring of nocturnal owl populations at migration stations.
6. We suggest continued monitoring of owl populations in Southeast Alaska in order to determine any effects of Barred Owls on other owl species. Similarly, information on the status of owl populations, especially if combined with diet studies, would complement small mammal investigations and potentially serve as a surrogate to documenting the status of some small mammal species in Southeast Alaska.
7. We recommend investigating the use of automated recording systems (e.g., "frogloggers") to collect information on the distribution and occupancy of owls in unroaded areas. This approach could be used to validate roadside surveys or to address specific hypotheses related to owl occupancy.

IV. MANAGEMENT IMPLICATIONS

See Objective 4 above for management implications and recommendations on owl monitoring in Southeast Alaska. Here we provide implications and recommendations regarding the ecology and conservation of forest owls in Southeast Alaska.

The Owl Expert Panel convened for ADF&G's CWCS recommended several conservation objectives and actions, including learning more about owl habitat associations and diet. We recommend the following studies and considerations to address conservation concerns for forest owls in Southeast Alaska.

1. The relatively recent range expansion of Barred Owls (Livezey 2009) and the resulting effects on resident raptors (e.g., Northern Spotted Owls; Kelly et al. 2003, Olson et al. 2005) has garnered much attention in the literature lately. We recommend further evaluation of several aspects of Barred Owl ecology in Southeast Alaska and points further north.
   a. We recommend a detailed study of Barred Owl food habits involving video documentation of deliveries to nests. Understanding the diet of Barred Owls would be an important component of its ecology to learn because 1) Barred Owls may compete with smaller owls (e.g., screech-owls) for prey; 2) Barred Owls might be active predators of smaller owl species; and 3) Barred Owls are large enough that, in a prey-depauperate region such as Southeast Alaska, they may be food competitors with other resident raptors (e.g., northern goshawk).
   b. We recommend that in conjunction with the diet study above, it would be useful to learn about habitat use of Barred Owls. This would give insight into the potential habitats important for this expanding bird and, perhaps most importantly, those habitats that are avoided. A better understanding of habitat use (including nesting habitat) would provide information on the potential for Barred Owls to compete with other comparably-sized and smaller raptors.

2. Vehicle collisions with owls appear to be a noteworthy source of mortality, especially for Western Screech-Owls (Final Report, Appendix IV). Relatively open, grassy roadsides probably offer owls good hunting opportunities. Of the known sources of mortality of owls in Southeast Alaska, starvation and trauma are the primary causes of owl deaths. Starvation is the natural outcome of reduced food resources, but trauma events (e.g., vehicle collisions) could be reduced. We recommend conducting a risk assessment in a few select communities of Southeast Alaska, including an attempt to quantify owl deaths along relatively busy roads. Based on our cursory evaluation, we think that a fairly large number of both resident and migratory owls are killed in vehicle collisions each year, especially in the fall when young birds are learning to hunt.
3. In Southeast Alaska, Western Screech-Owl home ranges were focused on riparian forests associated with larger, fish-bearing streams in all cases. While we did not capture and radiotag any owls in higher elevations away from larger stream valleys, we rarely detected screech-owls in such areas during nocturnal surveys (Chapters 1 & 2). Riparian zones are rich ecological areas, providing critical habitats for many wildlife species and the food they depend on (e.g., bears and Pacific salmon; Naiman et al. 2000, Schindler et al. 2003). Based primarily on anadromous fish needs, riparian standards and guidelines for the Tongass National Forest prohibit commercial timber harvest within 30 m of streams that contain fish (i.e., Stream Class 1 or 2; USDA Forest Service 1997). We found that while only 13 % of locations were within the 30-m buffer, 68 % of locations were in 150 m of streams. This distance relates to the buffer placed on parts of streams that are deemed “important bear foraging areas” (USDA Forest Service 1997) and should be applied to all fish-bearing streams to benefit bears as well as the other species that use these riparian forests.
4. Harvest operations, especially clearcutting, can lower the number of trees with suitable nest and roost cavities for owls. Managers could mitigate this impact by leaving clumps of large and small standing trees within harvest units to ensure persistence and future recruitment of cavity-bearing trees (DeGayner et al. 2005). This may be consistent with timber harvest economic objectives since many of the large old-growth trees that may recruit into suitable nest-cavity trees have little timber value due to their poor form and high degree of wood defect (DeGayner et al. 2005). Because of Western Screech-Owl use of riparian forests and need for trees relatively large and old enough to support natural cavities, continued protection of the valley-bottom forest of Southeast Alaska would benefit Western Screech-Owls in this area.
5. Although Short-Eared Owl (*Asio flammeus*) is not a forest owl, we recommend a study of the migration and stopover ecology of this species. This species is not surveyed by traditional nocturnal owl surveys as we recommended (Final Report, Appendix I) and thus, additional techniques will need to be used to learn about their ecology in this region. It has been documented in the past that waves of Short-Eared Owls appear during fall migration in large wetland and tidal grassflat areas (e.g., Gustavus Forelands, Mendenhall Forelands). Capturing and marking Short-Eared Owls with satellite tags could help to elucidate their habitat use and stopover ecology in Southeast Alaska.

V. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY (July 1, 2008 – March 31, 2009)

JOB/ACTIVITY 1A: Recruit and train volunteers in cooperation with the Juneau Raptor Center.

We no longer solicited volunteers for the Southeast Alaska Owl Network and our contract with the Juneau Raptor Center ended.

JOB/ACTIVITY 1B: Send volunteers to the field to begin collecting data.

Following data collection in Spring 2008, we stopped having volunteers do owl surveys as we were working on completing the project. Some volunteers continued to collect sightings but otherwise, we stopped working on this objective.

JOB/ACTIVITY 2A: Use distance sampling, repeated surveys, and radio-telemetry to estimate probability of detection of at least one species of owl in SEAK and evaluate survey methods for estimating abundance of forest owls.

The field portion of this job was completed during 2006; final analysis and reporting will be completed during the final year of this project, by 30 June 2009.

JOB/ACTIVITY 2B: Determine the influence of temporal, weather, and lunar factors on vocalizations of forest owls in Southeast Alaska.

The field portion of this job was completed during 2006; final analysis and reporting will be completed during the final year of this project, by 30 June 2009.

JOB/ACTIVITY 3A: Design and conduct broad-scale surveys for forest owls during the peak period of detectability and using the optimal survey method.

The field portion of this job was completed during the last reporting period; final analysis and reporting will be completed during the final year of this project, by 30 June 2009.

JOB/ACTIVITY 3B: Locate marked owls using radiotelemetry to describe habitat associations, nesting and roosting habitat (if possible), and diet through pellet analysis (if possible).

Based on radio-telemetry relocations of western screech-owls gathered during 2005 and 2006, we generated estimates of use area size and documented roosting and nesting habitat. Final analysis and reporting will be completed during the final year of this project, by 30 June 2009.

JOB/ACTIVITY 3C: Investigate and opportunistically survey unroaded areas.

We evaluated several options for surveying unroaded areas but concluded that surveying away from roads is too difficult and would not provide sufficient additional information beyond our region-wide survey.

JOB/ACTIVITY 4A: Analyze data.

We compiled all data and completed final analyses during this reporting period.

JOB/ACTIVITY 4B: Write reports and journal articles.

We drafted and completed the final report for this project during this reporting period. We submitted the final report to the ADF&G Nongame program in May 2009. We

designed the report to have several chapters, each of which was submitted for publication to a peer-reviewed journal. In addition, the report had several appendices containing additional information gathered during the study, including our recommended survey protocol, monthly occurrence of owls based on volunteer sightings, and information on owl mortalities learned from carcass collection and necropsy.

VI. PUBLICATIONS

We did not publish any manuscripts during this reporting period to date but will submit 5 articles for publication upon completion of the final report (see Final Report). Article citations are listed below with the journal that each manuscript will be submitted to:

1. Kissling, M.L., S. B. Lewis, and G. W. Pendleton. *In prep*. Factors affecting owl detectability in Southeast Alaska. Condor.
2. Kissling, M.L., S. B. Lewis, and G. W. Pendleton. *In prep*. Decadal changes in occupancy of forest owls in Southeast Alaska, 1986-2008. Journal of Wildlife Management.
3. Lewis, S. B. and M. L. Kissling. *In prep*. Home range, habitat use, and movements of Western Screech-Owls (*Megascops kennicottii*) in central Southeast Alaska. Journal of Raptor Research.
4. Lewis, S. B. and M. L. Kissling. *Submitted*. Western Screech-Owl (*Megascops kennicottii*) capture in Southeast Alaska: technique evolution and capture rates. North American Bird Bander.
5. Kissling, M.L., S. B. Lewis, and D. A. Cushing. *In prep*. Diet of the Western Screech-Owl (*Megascops kennicottii*) in Southeast Alaska. Journal of Raptor Research.