NORTH CASCADES NATIONAL PARK SERVICE COMPLEX

NORTHERN SPOTTED OWL

INVENTORY AND MONITORING PROGRAM

1995

PROGRESS REPORT

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EXECUTIVE SUMMARY

This report summarizes progress made during 1995 of an inventory and monitoring project for northern spotted owls (*Strix occidentalis caurina*) in North Cascades National Park Service Complex (NOCA). This marks the third year of a five-year study designed to inventory spotted owl activity sites and monitor these sites to determine occupancy and productivity. We restricted our 1995 field efforts to surveys conducted in the Ross Lake watershed.

From March 20 to July 1, 1995 we surveyed a total of 351.4 km of transects. From this survey effort, we encountered two spotted owl detections and one spotted owl/barred owl hybrid detection. This resulted in the confirmation of one pair of spotted owls and one male spotted owl/barred owl hybrid paired with a female barred owl. A crude estimate of response rate was 0.0056 spotted owl responses per km surveyed; or one spotted owl response per 175.7 km surveyed. We could find no evidence that either of these pairs successfully reproduced in 1995. Only the male spotted owl/barred owl hybrid was banded. All efforts to band the spotted owl pair were precluded by our limited success with mousing attempts and our inability to relocate them during daytime follow-up visits.

An additional 41-45 owls of four other species were also detected. This included 31-35 barred owls (*Strix occindentalis varia*), four northern pygmy-owls (*Glaucidium gnoma*), three northern saw-whet owls (*Aegolius acadicus*), and one great horned owl (*Bubo virginianus*). Two owls could not be identified to species. The numerous barred owl detections were distributed throughout the Ross Lake watershed.

In 1995, three "historic" spotted owl activity sites in the Stehekin River drainage, where breeding pair status had previously been confirmed in 1993, were visited a minimum of three times between April and July to determine occupancy and productivity. An additional two "historic" activity sites in the Stehekin River drainage, where nonbreeding pair status was determined in 1993 and 1994, were visited on two occasions. Three "historic" activity sites found during 1994 inventories of the Newhalem Creek drainage were also visited a minimum of three times. Spotted owl occupancy was confirmed at two sites in the Stehekin River drainage and no owls were relocated in the Newhalem Creek drainage. Of the two occupied sites, we found a banded pair at one site and a banded male near an unbanded subadult female at the other site. The subadult female was captured and marked for future identification. We found no evidence of successful reproduction at either of the Stehekin activity sites.

Further recommendations are identified to streamline efficiency and productivity needed to support efforts in FY96. Funding to accomplish project goals continues to be problematic.

INTRODUCTION

The northern spotted owl (*Strix occidentalis caurina*) was listed as a "threatened" species in June, 1990. Northern spotted owl populations are thought to have declined over the last century due to habitat loss (Gutierrez 1994). Logging and urbanization of mature and old-growth forests have been identified as major causes for declines in spotted owl habitat (Thomas et al. 1990). In southern British Columbia and the North Cascade Range of Washington, the invasion of barred owls over the last forty years may also have contributed to declines in spotted owl abundance (Dunbar et al. 1991, Kuntz et al. 1993, Kuntz and Christophersen 1994). Since listing, Anderson and Burham (1992) have indicated that northern spotted owl populations are continuing to decline throughout their range and this decline may be accelerating.

North Cascades National Park, Lake Chelan National Recreation Area, and Ross Lake National Recreation Area, collectively referred to as North Cascades National Park Service Complex (NOCA) contain 276,815 ha encompassing a gradient from low elevation forested valleys to high elevation glaciated mountain peaks. Approximately 93% of NOCA is designated as the Stephen Mather Wilderness. Within NOCA, 131,610 ha (47.5% of NOCA) have been identified as potential suitable habitat for spotted owls. Two recent conservation plans direct federal land management agencies to inventory and monitor spotted owls and their associated habitats (USDI 1992a, USDA 1994).

Past efforts to assess the status of spotted owls within NOCA have included mostly reconnaissance-level surveys and surveys done in conjunction with environmental assessments of National Park Service operations (USDI 1989). Additionally, the National Council of the Paper Industry for Air and Stream Improvement, Incorporated (NCASI), while conducting spotted owl investigations on U.S. Forest Service (USFS) lands adjacent to NOCA, has helped complete reconnaissance surveys on park lands within the Stehekin River watershed. In 1993, park biologists initiated an effort to survey suitable spotted owl habitat within NOCA and begin monitoring spotted owl pairs for reproductive success. Inventory and monitoring efforts continued in 1994 and 1995. This progress report summarizes those efforts of the 1995 field season.

OBJECTIVES

In 1995, NOCA resource management staff continued an inventory and monitoring effort with the following primary objectives:

1. Inventory potential spotted owl habitat within the Ross Lake watershed to locate new spotted owl activity sites and index spotted owl relative abundance.

2. Determine productivity at all new spotted owl activity sites found in 1995.

3. Continue monitoring "historic" spotted owl activity sites found in past years (1993 and 1994) to determine occupancy and productivity.

STUDY AREA

NOCA is located in the North Cascades physiographic province in northwestern Washington. Spanning the crest of the Cascade Range, NOCA lies within two major biogeographic zones: temperate marine and semi-arid continental (Franklin and Dyrness 1973). In 1995, survey activities were confined to sampling an area of 62,830 ha west of the Cascade crest encompassing the Ross Lake watershed (Figure 1). The topography of the area consists of very rugged mountainous terrain with deep-seated valleys of great relief. Elevations in the study area range from 489 m along the shores of Ross Lake to a high of 2,737 m at the summit of Mt. Spickard. Areas exceeding 1,980 m are heavily glaciated and commonly consist of permanent snowfields.

Below 1,220 m elevation, forested habitat within the study area is dominated by the Douglas fir (*Pseudotsuga menziesii*) cover type with the largest concentrations found along the east side of Ross Lake (Agee and Kertis 1986). Depending on specific site conditions, western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) are also well represented in this cover type. The Ross Lake area falls within a rain shadow of the massive peaks to the west, creating more coastal characteristics with some continental elements along the west slopes and valleys of Ross Lake, while those east of the lake have more continental

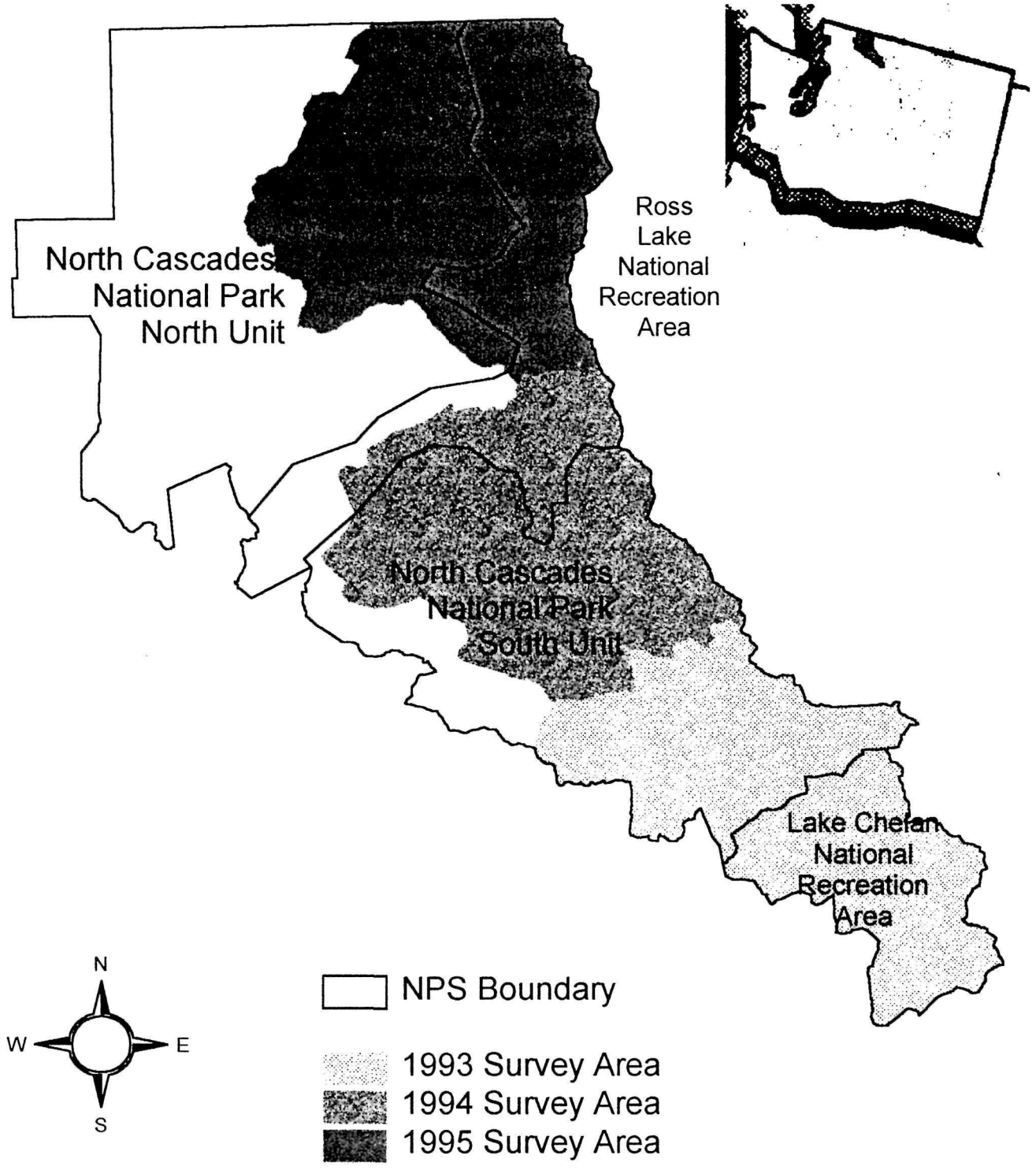

Figure 1. Map of North Cascades National Park Service Complex showing areas where spotted owl surveys were conducted during 1993, 1994 and 1995.

characteristics with some coastal influences (Franklin and Dyrness 1973). Field observations revealed large stands of logdepole pine (*Pinus concorta*) distributed along the drier east side of Ross Lake. The ponderosa pine (*Pinus ponderosa*) open canopy cover type is found at xeric low elevation sites, particularly in the Hozomeen area where it is present in scattered proportions (Agee and Kertis 1986). Above the 1,220 m elevation line, forested habitat within the drainages surveyed is dominated by the Pacific silver fir (*Abies amabilis*) cover type, the third most common forest cover in the study area (Agee and Kertis 1986). Mountain hemlock (*Tsuga mertensiana*) on the west side of Ross Lake and Englemann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) along the drier east side of the lake were also observed as contributing tree species in this cover type.

METHODS

Survey Design Procedures:

Survey transects were used as the sampling unit for censusing spotted owls (Figure 2). These transects generally consisted of 8-12 stations (point counts) placed 400 m apart in potential spotted owl habitat. Potential spotted owl habitat was defined as all coniferous forests within the park (Appendix 1). This broad definition allowed us to include sampling areas in marginal habitats to determine what areas spotted owls use in NOCA. However, most coniferous habitats in the subalpine and alpine zones (elevations above 1,220 m) were not included in this study, because these areas do not have the minimum forest stand attributes that spotted owls require (Thomas et al. 1990).

Most agencies conducting spotted owl surveys in the Pacific Northwest use the minimum standard six survey protocol to determine pair occupancy and reproductive status within a defined geographical location (USDI 1992b). This protocol requires the study area be surveyed six times in a single year, or if determining only occupancy, three times in each of two consecutive years. Each survey must be completed at least a week apart and all surveys should be spaced throughout the breeding season. This standard was mainly developed for use in

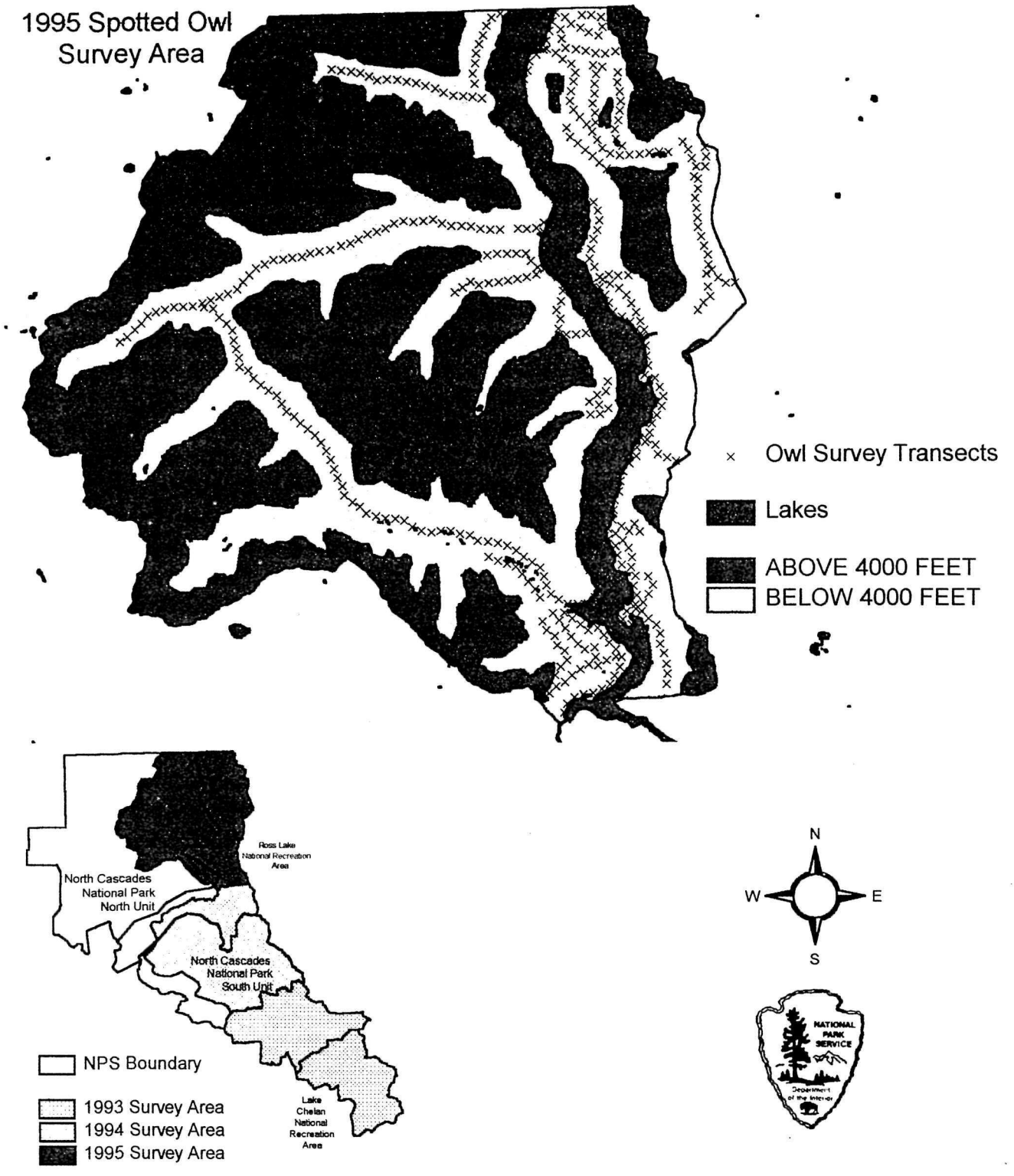

Figure 2. Map showing locations of spotted owl transects surveyed in the 1995 study area, North Cascades National Park Service Complex, Washington.

determining spotted owl presence or absence in areas where forest manipulations (e.g. logging, road construction) are planned.

Our survey methods differed from the standard protocol. We attempted to survey all transects in the study area once. A subset of these transects were selected to be sampled an additional two times. These extensive samples (one-visit surveys) and intensive samples (three-visit surveys) were selected to evaluate development of a cost-effective sampling method that will maintain a high probability of detecting a resident spotted owl pair. Results from surveys at Olympic National Park showed there was a 97.2% chance of detecting at least one member of a resident pair during the first three surveys and most owl pairs were detected on the first survey (Seaman et al. 1992).

Additional influences on detection probabilities that were accounted for in our sampling design included elevation of the study area and time of day the surveys occurred. The current range of the northern spotted owl in the Washington Cascades is considered to be from sea level to approximately 1,220 m (USDI 1992a). Although a few owls do occur above 1,220 m particularly on the east slopes of the Washington Cascades (T. Fleming, NCASI, pers. commun.), we concentrated our survey efforts on potential habitat below 1,220 m.

Current protocols recommend conducting surveys at night when owls are more active and are more responsive to survey techniques (USDI 1992b). Because much of our study area was in inaccessible, rugged backcountry, the location of transects influenced the time of day they were conducted. Off-trail transects were sampled during daylight hours to provide a safe working environment for field crews. Trail, road, and boat transects were sampled at night. In order to reduce the effects of day/night influences on detection probabilities, we stratified the study area by time of day (day/night). A subset of transects to be sampled three times (intensive sample) was randomly selected from each category.

The "Level 1" vegetation map, developed from Landsat multispectral scanner satellite data to determine if suitable grizzly bear habitat exists in the North Cascades (Almack et al. 1993), was used to identify areas of potentially suitable spotted

owl habitat. Based on spotted owl habitat use in the Wenatchee National Forest (Buchanan 1991), the spotted owl habitat definition used by the Interagency Scientific Committee (Thomas et al. 1990), and the North Cascades Grizzly Bear Ecosystem vegetation map (Almack et al. 1993), we developed a Geographical Information System (GIS) map showing potential spotted owl habitat for the study area drainages. Appendix 1 gives the classes and class definitions used to identify spotted owl habitat to survey. Overlaying U.S. Geological Survey (USGS) 1:24,000 scale topographic maps onto our GIS spotted owl habitat map, we mapped survey routes along trails and in non-trail areas to maximize coverage of potential habitat.

To determine how much potential spotted owl habitat was sampled, we digitized all calling stations into the GIS and gave each station a buffer of 400 m. To make the buffer, the computer created a circle with a radius of 400 m, with the calling station at its center. Because the stations were 400 m apart, the buffer circles overlapped. This effectively created a fairly linear buffer along the calling route. We then calculated the habitat falling within the total buffer area. A buffer of 400 m was used to insure the maximum effective coverage of the survey areas. Other northwest national parks also use this standard (Fredrickson et al. 1992, Seaman et al. 1992). However, many other federal, state, and private agencies have used 800 m when surveying along roads (Forsman 1983, USDI 1992b).

Field Survey Procedures:

Surveys consisted of a series of stations (point counts) placed every 400 m along a transect. Each transect station was called for ten minutes. Calling consisted of using a series of vocal imitations of various spotted owl calls, usually the three-note or four-note location calls, and series calls (Forsman 1983). Additionally, mid-points between stations (half-stations) were called for two minutes. Stations were not called during periods of precipitation, when tree-drip occurred after precipitation events, or when winds gusted above 25 km/hour. Calling at stations was suspended, or stations were skipped, when evidence of barred owls (*Strix varia*) or spotted owl predators (e.g. northern goshawks "*Accipiter gentilis*", great horned owls "*Bubo virginianus*") were found.

When a spotted owl was detected, observers stopped the survey and attempted to visually locate the owl to determine its sex, age, and if the bird was banded, band colors and band positions. Using a standard mousing technique (Forsman 1983), the owl was followed to determine pair status and locate nests and juveniles. An attempt was made to band all unbanded adult and juvenile spotted owls. Banding was used to individually mark birds for future identification, without having to further handle birds. On "night" surveys, we attempted to determine pair status and locate nests and juveniles the following day.

In 1995, all banding activites at sites within NOCA were conducted by park biologists. Banding consisted of placing a silver metal U.S. Fish and Wildlife Service band with a unique band number on one leg and a color band, either a single solid color or a combination of colors, on the opposing leg. By changing colors and leg combinations, all study area birds could be uniquely marked, making identification possible by observation from a distance. Unbanded adults were uniquely marked with solid color bands, while the subadult found this year was marked with a YELLOW/BLACK/YELLOW combination color band to signify the year it was banded. This subadult will receive a unique band-leg combination when it becomes a breeding adult with its own established territory.

"Historic" Activity Site Monitoring Design Procedures:

In addition to continuing the standardized surveys to find new spotted owl pair sites, NOCA personnel also monitored spotted owl occupancy and productivity at sites where pair status was confirmed in previous years (1993 and 1994). Of these historic sites, preference for monitoring visits was given to sites known to have successfully produced young in 1993 or 1994. Second priority for monitoring visits was given to pair sites where reproductive status in previous years was unsuccessful or unknown. Sites with documentation of only single birds, possibly floaters, were given last priority.

Protocol standards for monitoring historic sites are similar but less rigid than standards for inventory surveys. Most historic monitoring visits were conducted during daytime hours. However, when owls were unresponsive to daytime efforts, occasional dawn and/or dusk visits were utilized.

During monitoring at historic sites, observers proceeded directly to known nest/roost areas and began soliciting responses from an owl by giving soft whistles, mouse squeaks, and visually searching the area thoroughly. If an owl was not located, observers began imitating 3-note and 4-note location calls, and series calls. This intensive survey method continued while enlarging the search area until a response was elicited or an owl was visually identified. If, after approximately four hours, no visual or auditory owl responses were identified, the search effort was discontinued. Subsequent visits were made to the site until owls were found, or until some inference could be made concerning the current status of the activity site. All succeeding visits were appropriately spaced throughout the breeding season to account for variations in owl site use and detectibility.

Once banded owls were located at an historic site, color bands were visually examined to confirm identification of individual birds. Using the same methods described in the survey banding protocol, an attempt was made to capture and mark (color band) any adult owls or juveniles not previously banded. Follow-up visits were made to determine if successful reproduction occurred.

RESULTS AND DISCUSSION

Inventory:

A total of 33,360 ha of potential spotted owl habitat was identified in the Ross Lake watershed. Approximately 67% (22,219 ha) of this potential suitable habitat is below 1,220 m (4,000 ft) elevation. We surveyed 10,194 ha (46%) of the potential habitat identified below 1,220 m and only 98 ha (0.9%) of the potential habitat identified above 1,220 m elevation (Table 1). Of the total potential spotted owl habitat, approximately 10,292 ha (31%) were surveyed during the 1995 field season from March 20 through July 1 (Table 1).

We surveyed a total of 50 transects (194.4 km) in the Ross Lake watershed during the 1995 field season. Of these completed transects, twenty-one (83.4 km) were surveyed a second time and nineteen (73.6 km) were surveyed a third time. From this effort

Table 1. A summary of potential spotted owl habitat surveyed and spotted owls detected in the Ross Lake drainage, North Cascades National Park Service Complex, from March through July, 1995.

	POTENTIAL SUITABLE HABITAT (ha)	HABITAT SURVEYED (ha)	% COVERED	LINE TRANSECT DISTANCE (km)	SPOTTED OWL RESPONSES
Below 1,220 m	22,219	10,194	45.8	349.4	2
Above 1,220 m	11,141	98	0.9	2.0	0
Total	33,360	10,292	30.9	351.4	2

we detected spotted owls twice. Of these detections, one owl responded on the first transect survey and one responded on the third transect survey (Table 2). These owls were encountered near the same location on both occurrences and were found to be of the same pair. A crude estimate of the overall response rate was 0.0056 spotted owl detections per km surveyed, or one spotted owl detection per 175.7 km surveyed. Similar survey work conducted during 1994 in the Thunder Creek, Panther Creek, Ruby Creek, and Newhalem Creek drainages resulted in a response rate of 0.015 spotted owl detections per km surveyed, or one spotted owl detection per 68.8 km surveyed (Kuntz 1994). A survey of spotted owls in southwestern British Columbia by Banci (1989) calculated response rate as 0.042 spotted owls per km surveyed, or one spotted owl per 23.5 km surveyed. Banci calculated response rate as the total linear distance covered once, regardless of the number of times the area was surveyed. We recalculated Banci's data to conform to our method of counting total linear distance, which includes all areas that were surveyed one, two, and three times. When applying our method to Banci's data, we calculated his overall response rate at 0.032 spotted owls per km surveyed, or one spotted owl per 30.6 km surveyed.

Table 2. A summary of spotted owl survey effort showing number of transects completed and spotted owl responses by survey visit in the Ross Lake watershed, North Cascades National Park Service Complex, from March 20 through July 2, 1995.

SURVEY VISIT NUMBER	NUMBER OF TRANSECTS	KM OF TRANSECTS	NUMBER OF RESPONSES
1	50	194.4	1
2	21	83.4	0
3	19	73.6	1
TOTAL	90	351.4	2

One male and one female spotted owl, confirmed as pair status, were found during inventory surveys in 1995 (Table 3, Appendix 2). Initially the female was detected on the first survey visit of a three-visit nighttime survey transect. On the next day, during the follow-up visit, both owls were located and observed in a copulatory position. Subsequent visits resulted in only the male responding at night with no success of visually locating either member of the pair during daytime follow-up visits. No nest tree was located and we could find no evidence of successful reproduction.

In addition to locating the spotted owl pair, a confirmed male spotted owl/barred owl hybrid was found paired with a female barred owl. This hybrid owl was identified by its unique plumage, unusual vocalizations, and morphological measurements. The hybrid owl was captured and color banded for future identification and monitoring (Appendix 4). We found no evidence that this pair bred in 1995.

Both spotted owl responses occurred below 660 m (Appendix 2). We surveyed very little habitat above 1,220 m. However, much survey effort was conducted between 700 m and 1,220 m with no spotted owl responses. This coincides with past efforts in the Washington Cascades that have shown most spotted owls are found below 1,220 m (USDI 1992a, Kuntz et. al. 1993, Kuntz and Christophersen 1994).

We surveyed a total of 226.2 km of "on-trail" (night) transects and 125.2 km of "off-trail" (day) transects including all one, two, and three-time visits. Both spotted owl responses encountered were from "on-trail" transect surveys. The responses occurred on or before June 16. Data are based on only two responses from two owls of the same pair. Even with the inclusion of 1993 and 1994 (9 responses), it is premature to draw conclusions as to the effectiveness of "on-trail" versus "off-trail" surveys and "one-visit" versus "three-visit" surveys. A larger number of detections is needed to further evaluate our survey techniques for effectiveness and cost-efficiency.

In 1995, we made every effort to mark all individual spotted owls detected during the course of our survey work. Of the spotted owl pair and the male spotted owl/barred owl hybrid found, only the hybrid was banded (Appendix 4). Attempts to relocate or mouse the spotted owl pair were unsuccessful on all subsequent follow-up visits.

In addition to the pair of spotted owls and the spotted/barred owl hybrid pair, we also located 10-11 pairs of barred owls, 11-12 single barred owls, four northern pygmy-owls (*Glaucidium gnoma*), three northern saw-whet owls (*Aegolius acadicus*), one great horned owl, and two unidentified owl (sp.) during 1995 surveys (Table 3, Appendix 2 and 3).

Activity Site Monitoring:

In 1995, we continued to monitor "historic" spotted owl activity sites. Three activity sites in the Stehekin River drainage, where reproduction was confirmed in either 1993 or 1994, were visited a minimum of three times from April 21 to July 25 in order to locate and identify individual adults, determine their status (e.g. paired, nesting, reproducing), and band unmarked birds (both adults and juveniles). Two additional activity sites in the Stehekin River drainage (1993 and 1994 reproduction not confirmed) were only briefly visited due to lack of time and personnel, and are not included in the following summary. Three sites in the Newhalem Creek drainage, where only single status was confirmed at each site during 1994 survey efforts, were again examined in 1995.

Table 3. Owl detections recorded from 1995 spotted owl surveys of Ross Lake drainage, North Cascades National Park Service Complex, Washington.

OWL SPECIES	PAIRS W/YG	PAIRS W/O YG	SINGLES	YOUNG	TOTAL BIRDS
Spotted	**0**	**1**	**0**	**0**	**2**
Spotted/Barred	0	1	0	0	1[1]
Barred	0	10-11	11-12	0	31-34[2]
Northern Pygmy	0	0	4	0	4
N. Saw-whet	0	0	3	0	3
Great Horned	0	0	1	0	1
Unidentified	0	0	2	0	2

[1] Second member of this pair was a female barred owl.
[2] Does not include female barred owl from the spotted/barred owl hybrid pair.

Of the three monitored sites where previous pair status had been confirmed in the Stehekin River drainage, only two sites were found to be active. Two previously banded owls confirmed to be a pair were found at one site. An unbanded second-year subadult female and a previously banded adult male were found on separate days at the second activity site. The subadult was captured and marked this year (Appendix 4). Age of the subadult female was determined using the classification scheme described by Forsman (1981). The subadult female was located at an activity site where we had banded both members of an adult pair in 1993. Both banded adults were again observed in 1994. After intensively searching the former activity center, the previously marked adult female could not be found in 1995. With just one year of absence by the former adult female, it is premature to speculate whether turnover has actually occurred at this site. We found no evidence that reproduction occurred at any of the sites monitored in the Stehekin River drainage in 1995.

Attempts were made to relocate the three historic owls in the Newhalem Creek drainage on three separate occasions throughout the breeding season, but were met with limited success on each visit. Despite employing strategies such as varying the time of day or night for surveys and playing back prerecorded owl calls

to elicit a response, no owls were heard or relocated in this drainage. Since this is such a large drainage with varied topographic features, it may be necessary to increase the number of visits coupled with a greater number of observers in order to detect these birds during future monitoring efforts.

RECOMMENDATIONS

In 1995, NOCA spotted owl survey crews completed initial survey work in the Ross Lake watershed and continued to monitor "historic" spotted owl activity sites in the Stehekin River and Newhalem Creek drainages. Only minor problems occurred during the completion of this year's efforts. The following recommendations address these concerns and hopefully, will improve inventory and monitoring effectiveness and cost efficiency in the future.

1. Inventory procedures went well, but monitoring efforts were deficient due to a shortage of field personnel. On numerous occasions our fifth crew member, who was primarily responsible for the monitoring of historical sites, was needed on the inventory crew to fill in for unanticipated absences. This contributed to a significant loss in the amount of time spent monitoring historical sites. Eliciting responses from known activity sites proved difficult this season, probably due to a limited nesting year (T. Fleming, NCASI, pers. commun., D. E. Seaman, NBS, pers. commun.). This factor complicated matters even more, resulting in increased time and energy needed to look for owls at historic sites. Search areas had to be expanded immensely, and in many situations it became far more territory than one person could effectively cover. Despite our diligent efforts, owls were repeatedly difficult to find or were not located at all. In the past, NCASI biologists have aided us in our monitoring efforts at Stehekin. In return, NOCA biologists have assisted with their monitoring efforts on nearby Forest Service lands. However, due to the busy schedules of both groups and the logistics of getting to Stehekin, it has been difficult to coodinate these efforts. It is recommended that we have a minimum of six crew members, so that two can always be readily available for monitoring purposes and four can continuously conduct inventory objectives on schedule.

2. For the 1995 field season we were able to utilize two Student Conservation Association (SCA) personnel. This worked well, however, there are certain limitations that come with employing SCA's. These limitations include more training and supervision requirements, resulting in slower start-up time at the beginning of the season and less flexibility in scheduling. We should not rely on hiring SCA's as a means of solving our personnel problems.

3. Initial surveys to inventory spotted owls have been completed in approximately two-thirds of NOCA. Originally, NOCA resource management requested funding to complete a three-year parkwide survey. Since our budget has been less than anticipated in years past, we now estimate it will take a total of five years, through FY97, to complete our baseline inventory. Funding levels have been requested for FY96 (Appendix 5).

4. Housing needs for seasonal crew members have improved, but could still use some additional refinement, so as not to distract from inventory and monitoring schedules. An event this year resulted in our crew having to move from temporary housing in Marblemount to a house in Newhalem mid-way through the season. The new housing situation has worked out well, but the transition created a slight loss in valuable field time and should be avoided in the future.

5. Safety is a major concern for field crews working in the remote, rugged, backcountry locations within NOCA. Increased emphasis has been placed on this concern through regular tailgate safety sessions, training courses, and safety meetings. In 1995, no serious injuries were sustained that may have resulted in lost work days or adversely affected project targets and accomplishments. It is recommended that we continue to offer and improve on our safety training program within NOCA to help promote a positive and safe working condition.

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Appendix 1. Vegetation classes and class definitions of potential spotted owl habitat (from: Almack et al. 1993, by permission of the authors).

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1 - CONIFER 70+ - Conifer forest of trees over 10 ft tall with greater than 70% canopy closure. In the upper ecological zone this class is restricted to stands greater than 50 years old.

2 - CONIFER 50% TO 70% - Conifer forest of trees over 10 ft tall with 50% to 70% canopy closure. In the upper ecological zones all forests with this canopy closure are included. In the PSME (*Pseudotsuga menziesii*) andPIPO (*Pinus ponderosa*) zones only those forests with 50% to 70% conifer canopy cover and total tree, shrub, and herb cover less than 130% are included.

3 - CONIFER 30% TO 50% - Conifer forest of trees over 10 ft tall with 30% to 50% canopy closure. Herbaceous or shrubby vegetation may be greater than tree cover.

4 - CONIFER 50% TO 70% IN PSME AND PIPO ZONES - Conifer forests with 50% to 70% canopy closure and lush shrub and/or herbaceous occurring in PIPO or PSME zones. Total tree, plus shrub and herbaceous vegetation must be greater than 130%.

5 - RIPARIAN CONIFER OVER 70% CANOPY COVER - Same as 1, except in the riparian zone. Includes forest with over 70% conifer cover in the upper ecological zone.

6 - RIPARIAN CONIFER 50% TO 70% CANOPY CLOSURE - Same as 2 and 4, except in the riparian zone.

7 - RIPARIAN CONIFER 30% TO 50% CANOPY CLOSURE - Same as 3, except in the riparian zone.

APPENDIX 2. Summary of *Strix* sp. owl responses, during 1995 spotted owl survey of Ross Lake watershed, North Cascades National Park Service Complex, Washington.

SPECIES	[1]DATE	ELEVATION[1] (in meters)	ON/OFF TRAIL	STATUS
Spotted	4/08	591	ON	PAIR
Spotted/Barred	5/04	536	ON	PAIR[2]
Barred	3/20	658	ON	UNK
Barred	3/22	585	ON	PAIR
Barred	4/03	655	ON	MALE
Barred	4/04	890	ON	MALE
Barred	4/08	549	ON	UNK
Barred	4/18	762	ON	UNK
Barred	4/18	658	ON	UNK
Barred	4/22	628	ON	PAIR
Barred	4/23	902	ON	MALE
Barred	5/03	524	ON	PAIR
Barred	5/04	536	ON	PAIR[3]
Barred	5/06	582	ON	PAIR
Barred	5/17	524	OFF	PAIR
Barred	5/18	719	OFF	MALE
Barred	5/20	597	ON	PAIR
Barred	5/21	853	OFF	FEMALE
Barred	6/01	658	ON	PAIR
Barred	6/01	567	ON	PAIR
Barred	6/04	512	ON	PAIR
Barred	6/15	695	ON	UKN
Barred	6/27	670	ON	UNK
Barred	6/28	732	ON	PAIR
Barred	6/29	792	ON	PAIR
Barred	6/30	1122	ON	UNK

[1] Includes only first-time detections. In the case of single responses prior to pair confirmation, only pair responses are shown as they would indicate a more accurate focal point of the activity site.

[2] Second member of this pair was a female barred owl.

[3] Second member of this pair was a male spotted/barred owl hybrid.

APPENDIX 3. Summary of non-*Strix* sp. owl responses, 1995 spotted owl survey of Ross Lake watershed, North Cascades National Park Complex, Washington.

SPECIES	DATE[1]	ELEVATION[1] (in meters)	ON/OFF TRAIL	STATUS
Northern Pygmy	3/26	655	OFF	UNK
Northern Pygmy	4/09	738	ON	UNK
Northern Pygmy	4/20	671	OFF	UNK
Northern Pygmy	6/27	634	ON	UNK
Northern Saw-whet	4/03	774	ON	UNK
Northern Saw-whet	4/04	847	ON	UNK
Northern Saw-whet	5/07	1170	OFF	UNK
Great Horned	4/09	701	ON	UNK
Unknown owl sp.	4/09	509	ON	UNK
Unknown owl sp.	4/22	579	ON	UNK

[1] Includes only first-time detections.

APPENDIX 4. 1995 banding records for spotted owls banded in North Cascades National Park Service Complex, Washington.

BAND NUMBER[1]	LEG[2]	COLOR BAND[3]	LEG[2]	AGE[4]	SEX[5]	DATE BANDED
1387-79402[6]	R	ORANGE	L	A	M	09/MAY/95
1387-79403[7]	R	YELL/BLK/YELL	L	S	F	03/JUN/95

[1] U.S. Fish and Wildlife Service issued band number.
[2] Leg band is on: R = right, L = left.
[3] Color band is unique band used to mark individual adults and subadults.
[4] A = adult; S = subadult
[5] M = male; F = female;
[6] Bird banded was identified as a spotted/barred owl hybrid.
[7] Bird banded at a spotted owl "historic" activity site.

APPENDIX 5. Proposed FY96 Budget to inventory and monitor spotted owls at North Cascades National Park Service Complex, Washington.

Salaries and Benefits:

1 - GS 7/1 Wildlife Biologist (12 pp)	$17,850.00
1 - GS 6/1 Biological Technician (10 pp)	$11,430.00
2 - GS 5/1 Biological Technicians (9 pp each)	$18,900.00
2 - Student Conservation Ass. Tech. (13 wks each)	$ 4,830.00
(Base salary, plus night differential, holiday pay, overtime, and benefits)	
SUBTOTAL	**$53,010.00**

Per Diem:

Staff (7 days/pp @ $15/day)	**$ 4,000.00**

Vehicle, Equipment and Supplies:

2 Vehicles(4 months, $165/month, plus $.145/mile)	$ 1,600.00
Equipment and Supplies (camping gear: sleeping bags, tents, stove fuel, radios, maps, etc.)	$ 1,250.00
SUBTOTAL	**$ 2,850.00**
REQUESTED TOTAL	**$59,860.00**

NOCA COMMITMENT

Salaries and Benefits for Park Biological Staff (planning, oversight, field data collection)	$20,000.00
Admin and clerical support	$ 700.00
Equipment and supplies	$ 800.00
SUBTOTAL	$21,500.00
PROJECT TOTAL	**$81,360.00**