FEDERAL AID
FINAL PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

COOPERATIVE ENDANGERED SPECIES CONSERVATION FUND

STATE: Alaska **GRANT AND SEGMENT NR.:** E -3 - 1
PROJECT NR.: 1

WORK LOCATION: Southeast Alaska

PROJECT DURATION: 30 September 2003 – March 31, 2005

PROJECT REPORTING PERIOD: 30 September 2004 – March 31, 2005

PROJECT TITLE: Analysis of Queen Charlotte Goshawk Radio-telemetry and Nest Site Data

---

Project Objectives:

1. Complete statistical analyses and resource selection modeling based on radiotelemetry data and complete final report.

2. Coordinate with U.S. Forest Service (FS) photo interpreter to complete analysis of forest structure at additional nest sites. Complete statistical analyses of this data and final report of results.

3. Provide goshawk technical expertise to the U.S. Fish and Wildlife Service (FWS) and FS as needed, and when reasonable given other ongoing study work.

Summary of Project Accomplishments with regard to the objectives:

1. We contracted with the FS to complete GIS analysis of this data using current coverage and layers for the Tongass National Forest. Subsequent to finalizing the contract, errors were found in the FS GIS database that prevented us from completing an analysis of goshawk habitat-use based on radio telemetry as planned. No acceptable solution could be found within acceptable time and cost constraints. Therefore, this portion of the data analysis will not be included in the final report.

2. We contracted an aerial photograph interpreter, Robert C. Smith, to analyze 29 additional nesting sites using aerial photographs supplied by FS. Smith was able to analyze 25 of the nesting sites we requested. The 4 additional sites were not analyzed because FS personnel were unable to locate the correct aerial photographs. In total, data from 63 nest sites in 50 unique nesting areas were analyzed. Methods of aerial photograph analysis are described in Alaska Department of Fish and Game (1997).

There was significantly more forested area associated within the 12-ha plots centered on goshawk nest sites than in random plots (Table 1). Mean difference in forested area between nest sites versus random plots was 1.2 ha. There was little variability in the amount of forest area surrounding goshawk nest areas but forested random samples had a larger range; only 4

goshawk nest sites had <10.9 ha of forest out of the 12 ha area around them while 17 random plots had <10.9 ha. We found no difference in the amount of forest area surrounding goshawk nests versus nearby random samples at the 65-ha scale (Table 2). The lack of statistical differences found in the sampling of the 65-ha plots may have been due to a decrease in power associated with higher variability.

We also found that the amount of productive forest land area in the 12-ha plot was significantly higher at goshawk nests than a nearby random sample centered on forest (Table 1). The area of productive forest was positively correlated ($r = 0.54$; $r = 0.53$; $n = 63$, $P < 0.001$) with the total area of forest for both the 12-ha and 65-ha plots, respectively. The lack of a very high correlation was due to the fact that total forest area may contain areas of forest that contained small trees that were not of commercial quality; hence they were not defined as productive forest.

Forest cover, and to a lesser extent productive forest land, dominated the area in the 12-ha plot. There was little range in the amount of forested area in the 12-ha plot indicating that few large openings occurred in close proximity to goshawk nests. We found negative correlations between the amount of forest area and the area of non-forest in the 12-ha and 65-ha plots, respectively ($r = -0.94$, $r = -0.64$, $n = 63$; $P < 0.001$).

Beach and riparian cover types occurred in relatively small amounts in both 12-ha and 65-ha plot (Tables 1, 2). Freshwater lakes were absent in the 12-ha nest site plots and only a fraction of the area around nests in the 65-ha plot (Tables 1, 2). Saltwater cover types occupied a small portion of both the 12-ha and 65-ha nest plots (Tables 1, 2).

We found no differences in the distance to land-cover features between goshawk nests and random samples (Tables 1, 2). Our inability to detectable differences in distance measures between nest plots and random plots differed from the patterns found by other researchers that found goshawks nesting farther from forest openings, paved roads and human habitation than random samples of forested habitat (Bosakowski and Speiser 1994, Falk 1990).

We considered border lengths to be indices of cover-type heterogeneity. At the 65-ha scale, we found less forest to non-forest edge at goshawk nesting areas than at random samples (Table 2). This likely occurred because of the lack of other forest cover types at goshawk nest plots. Hence, we found low cover-type heterogeneity at goshawk nests compared with other randomly selected forested areas.

Canopy cover was significantly higher in the 12-ha area surrounding goshawk nests than in other nearby forest areas (Table 1). Although the mean difference was only 8.7%, this was a narrow comparison of forest canopy at and away from goshawk nests. We would not expect great differences in forest canopy cover between goshawk nesting areas and random samples unless goshawks were selecting rare features of the habitat that did not occur elsewhere. Such differences would be unlikely on the highly fragmented and patchy Tongass National Forest. The mean percent canopy cover value of 50% was lower than reported in the literature for this species (Squires and Reynolds 1997). Based on a literature review, Siders and Kennedy (1994) found that nest site canopy cover varied from 60% to 95% for goshawks. In nearly all studies, canopy cover was measured differently from our study that evaluated canopy cover across 12-ha by using sub-samples and aerial photography. Siders and Kennedy (1994) cited studies where canopy cover was likely estimated much closer to the nest tree and by using on-the-ground, under-the-canopy estimates.

We found that there was significantly more hemlock at goshawk nest areas compared with nearby areas (Table 1); the mean difference was 12%. This difference may have been associated

with goshawk nesting areas being associated with productive forest lands and hemlock/spruce cover types, whereas some random samples may have contained a greater component of cedar or spruce only.

We did not test for differences in canopy structure or canopy texture between nest sites and random samples. A descriptive summary indicated that multi-story canopies dominated the samples with 89% of the nest sites and 84% of the random samples occurring in multi-story canopy forest stands. The aerial photograph interpreter determined that just 1 of 63 goshawk nesting areas had the majority of 9 sub-samples defined as a single-canopy layer. This was a nest on Douglas Island located in ~70 year old second-growth where 8 or 9 sub-samples were in a single-canopy layer. Our on-the-ground knowledge of these nesting areas supports the notion that nearly all goshawk nests were in stands with multi-layer canopies.

The aerial photograph interpreter found that 60% of the goshawk nest sites had a medium-grained canopy texture, 24% had fine-grained canopy texture, and 16% had coarse-grained canopy texture. In the random samples, we found 57% of the goshawk nest sites had medium-grained canopy texture, 25% had fine-grained canopy texture, and 18% had coarse-grained canopy texture. This canopy cover texture attribute was associated with tree size and canopy heterogeneity, with coarse-grained canopies to be a relative indicator of large trees and higher volume old-growth compared with medium- and fine-grained canopy textures. Inspection of the data indicated no differences in canopy texture between nest sites and random samples considering the sampling variability that was indicative of the forest canopy heterogeneity.

3. Technical assistance to both the FS and FWS has been provided in the following areas;
    a. Summarizing and reporting on yearly survey data;
    b. Assisting in occupancy checks of known nesting areas;
    c. Consulting with District biologist concerning suspected goshawk nesting areas;
    d. Assisting with interpretation of goshawk study data for an analysis of the northern goshawk Standards and Guidelines found in the 1999 revision of the Tongass Land and Resource Management Plan; and
    e. Commenting on on-going litigation concerning the Queen Charlotte Goshawk.

Summary of Project Accomplishments during last reporting period only (30 September 2004 – March 31, 2005):

1. No further progress was made on this objective (see above).

2. Analysis of data from the aerial photographic analysis took place during this reporting period.

3. Technical assistance to both the FS and FWS has been provided in the following areas;
    a. Summarizing and reporting on yearly survey data;
    b. Assisting in occupancy checks of known nesting areas;
    c. Consulting with District biologist concerning suspected goshawk nesting areas; and
    d. Commenting on on-going litigation concerning the Queen Charlotte Goshawk.

Literature Cited

Alaska Department of Fish and Game. 1997. Goshawk ecology and habitat relationships on the Tongass National Forest: selected analyses and 1995 field season progress report. Alaska Department of Fish and Game, Division of Wildlife Conservation, Southeast Regional Office, Douglas, Alaska, USA.

Bosakowski, T. and R. Speiser. 1994. Macrohabitat selection by nesting northern goshawks: implications for managing eastern forests. Studies in Avian Biology 16:46-49.

Falk, J. A. 1990. Landscape level raptor habitat associations in northwest Connecticut. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.

Siders, M. S. and P. L. Kennedy. 1994. Nesting habitat of *Accipiter* hawks: is body size a consistent predictor of nest habitat characteristics? Studies in Avian Biology 16:92-96.

Squires, J. R. and R. T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). Pages 1-32 *in* A. Poole and F.B. Gill, editors. The birds of North America, Number 298. Academy of Natural Science, Philadelphia, Pennsylvania, and American Ornithologists' Union, Washington, DC, USA.

Project Costs during reporting period:
Federal share $17,238.75 + state share $5,746.25 = total cost $22,985

Prepared By: Stephen B. Lewis, Wildlife Biologist I

Date: 24 June 2005

Table 1. Area of different land cover types, distance to landscape features, and length of landscape features within 12-ha plots surrounding northern goshawk nest sites and paired random plots as determined by analysis of aerial photograph analysis, Tongass National Forest, 1995 and 2004.

		Nest		Random		
Variable Type	Variable	Mean	SD	Mean	SD	*P* value[a]
Land Cover Area	Riparian	0.85	1.42	1.01	1.39	0.439
		0.20	0.88	0.14	0.84	0.484
		11.72	0.93	11.19	1.50	0.015
		0.38	0.88	0.80	1.36	0.024
	Productive Forest	10.83	1.70	9.98	2.49	0.006
	Non-productive Forest	0.98	1.48	1.18	2.01	0.708
		0.00	0.00	0.04	0.21	0.180
		0.04	0.30	0.05	0.35	0.593
Beach						
Distance to Type	Non-forest Edge	462	519	392	476	0.260
Non-forest	Freshwater Shore	2382	2595	2339	2245	0.910
	Saltwater Shore	3397	3112	3590	2946	0.162
		373	678	315	457	0.501
Freshwater		2747	5077	2752	4983	0.112
Saltwater	Forest Opening	897	907	974	1090	0.271
Length of Type	Non-forest Edge	119	237	158	256	0.179
	Freshwater Shore	12	48	4	29	0.068
	Saltwater Shore	5	40	5	41	1.000
Stream		151	227	138	195	0.841
Road		46	137	15	65	0.136
		17	68	7	44	0.273
	% TSHE	78	13	75	14	0.056
	% Canopy Closure	50	8	45	12	0.003

[a] *P*-value based on Wilcoxon matched-pairs signed-ranks test.

Stream
Road
Trail

Table 2. Area of different land cover types, distance to landscape features, and length of landscape features within 65-ha plots surrounding northern goshawk nest sites and paired random plots as determined by analysis of aerial photograph analysis, Tongass National Forest, 1995 and 2004.

		Nest		Random		
Variable Type	Variable	Mean	SD	Mean	SD	*P* value[a]
Land Cover Area	Riparian	4.68	4.00	4.91	4.38	0.556
		2.32	5.41	1.46	4.14	0.148
		59.33	8.99	57.75	8.17	0.191
		3.08	4.75	5.31	6.35	0.017
	Productive Forest	53.67	9.93	50.67	13.87	0.149
	Non-productive Forest	6.70	8.66	6.70	9.96	0.941
		0.35	1.18	0.74	2.89	0.480
		1.44	4.31	0.82	3.37	0.249
Beach						
Distance to Type Forest	Non-forest Edge	462	519	392	476	0.260
Non-forest	Freshwater Shore	2382	2595	2339	2245	0.910
	Saltwater Shore	3397	3112	3590	2946	0.162
		373	678	319	455	0.649
Freshwater		2747	5077	2752	4983	0.112
Saltwater	Forest Opening	897	907	974	1090	0.271
Length of Type	Non-forest Edge	698	878	949	845	0.038
	Freshwater Shore	100	48	69	218	0.638
	Saltwater Shore	110	40	89	261	0.753
Stream		765	227	698	511	0.854
Road		192	137	121	329	0.306
	Trail	86	68	69	214	0.799

[a] *P*-value based on Wilcoxon matched-pairs signed-ranks test.

Stream
Road