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Ecology of Martens in Southeast Alaska

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RESEARCH PROGRESS REPORT

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SUMMARY

During the seventh year of fieldwork on this project, we captured 50 martens (*Martes americana*) (32 males and 18 females) on the Salt Lake Bay study area and 23 martens (15 males and 8 females) in Upper Game Creek, on northeast Chichagof Island. At Salt Lake Bay, we radiocollared 3 male martens and 6 other animals (3 males and 3 females) previously eartagged. At Game Creek we radiocollared 2 previous captures (2 females) and eartagged 14 others. We monitored 33 martens (22 males and 11 females) at least part of the year.

During March 1997 we estimated that 12 martens, or 0.15 martens/km^2, were on the Salt Lake Bay study area. This abundance estimate was much less (68%) than the number of martens estimated in March 1996. Trappers reported taking 32 tagged martens during the December season including 10 martens with active radiocollars. Most of the trapping effort was from the logging road system on private lands near Hoonah and along the north shore of Tenakee Inlet. Three martens were trapped on southern Chichagof Island, about 100 km away. One trapper trapped a portion of the primary study area at Salt Lake Bay during the last week of December and caught 9 resident animals.

We recorded habitat use of radiocollared martens at 200 aerial locations during the year. Habitat data were not analyzed for this report. We monitored 5 adult females closely during the late spring to locate den sites. Only 1 of the females showed localized movements, and we found her natal den in a log. Our observations indicated that none of these females successfully reared young. In addition, we located 36 resting sites. We measured habitat attributes at the den and resting sites to examine microhabitat use. Also, we measured habitat attributes at 41 random sites to estimate the availability of habitat attributes and evaluate a new landcover map developed from LANDSAT TM imagery.

Our snap-trap index for small mammal numbers showed a decrease (48%) from fall 1995. The catch of long-tailed voles (*Microtus longicaudus*) declined 54% (11.0 to 5.1 captures/100 trap nights). Because voles are an important food source for martens, lower vole numbers may have stressed the marten population last year. Martens were more vulnerable during the trapping season, causing a large trapper catch. In addition, radiocollared females failed to rear young for the second year, probably because of reduced food availability.

Key words: Chichagof Island, demographics, forestry, habitat use, martens, *Martes americana*, modeling, old-growth forests, population biology, Southeast Alaska

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BACKGROUND

We completed a seventh year of ecological research on martens in Southeast Alaska. This progress report contains a brief summary of information collected from 1 July 1996 to 30 June 1997. We present progress on each of the 10 specific components, or study jobs. During this report period, not all of the jobs were equally active. This year, we put more effort into studying marten movements and microhabitat use at den and resting sites. In addition, we periodically live-trapped and tagged martens on the primary study area on northeast Chichagof Island to monitor population status. Tagged martens were monitored to collect information on movements, demography, and habitat use. We collected additional demographic information from martens caught by trappers on northeast Chichagof Island.

American martens (*Martes americana*) have been associated with late-succession and old-growth forests across North America (Buskirk and Ruggiero 1994). Martens are among the most habitat-specific mammals in North America (Buskirk and Ruggiero 1994). In western North America, they are closely tied to mesic, old-growth, coniferous forests (Marshall 1951, Koehler and Hornocker 1977, Thompson and Harestad 1994). Old-growth forests are structurally diverse with a variety of tree sizes, dense multi-layered canopies, and an abundance of coarse woody debris (CWD) (i.e., snags, stumps, and downed logs) (Samson et al. 1986, Boughton et al. 1991). Many marten populations have declined with the removal of forested habitat, increased human access, and unrestricted trapping (Clark et al. 1987). In southeast Alaska, the Tongass National Forest (TNF) encompasses 80% of the land area. Although most of the original forested land was in an old-growth condition, industrial scale logging has converted large areas of old-growth forest habitat into clearcuts and second growth. About 162,000 ha (400,000 acres) of old-growth habitat have already been logged on the TNF, nearly all by clearcutting. The new Tongass Land Management Plan (TLMP) schedules an additional 274,000 ha (676,000 acres) of old-growth forests for timber harvest (USDA Forest Service 1997). The clearcutting of old-growth forests removes the forest canopy along with all above-ground structures including decadent live trees and snags that are important components of marten habitat.

Martens select for old-growth features when choosing reproductive dens (Ruggiero et al. in press) and resting sites (Wilbert 1992). Marten dens are any structure occupied by a mother and young (Henry and Ruggiero 1993), and resting sites are structures where independent martens rest between bouts of activity (Buskirk et al. 1989). Henry and Ruggiero (1993) described 2 types of dens. Natal dens are sites where kits are born, and maternal dens are all other dens occupied by the mother and kits. Large trees and CWD provide cover from predators (Vernam 1987, Lindstrom et al. 1995) and inclement weather while resting (Buskirk et al. 1989, Martin and Barrett 1991) or denning (Hauptman 1979, Wynne and Sherburne 1984, Baker 1992, Ruggiero et al. in press). Spaces under CWD provide access to subnivean foraging areas (Corn and Raphael 1992) and resting sites (Buskirk et al. 1989, Taylor and Buskirk 1994). Adequate denning and resting habitats provided by these old-growth features are probably important for survival of martens.

Clearcutting, the predominant method of tree harvesting in western North America, (Franklin and Forman 1987, Vance 1990), negatively affects martens (Bergerud 1969, Campbell 1979, Major 1979, Soutiere 1979, Clark et al. 1987, Snyder and Bissonette 1987, Bissonette et al. 1989, Jones and Raphael 1992, Thompson and Harestad 1994). In typical clearcuts, structures important to martens, such as live trees and snags, are felled. Although an abundance of CWD may exist immediately after clearcutting, the amount and size of CWD will decline as the slash and residual CWD decay (Franklin and Waring 1980, Tritton 1980). Because all trees have been removed, new large CWD will not be recruited into the stand with a 100-year timber rotation. Martens generally avoid areas with little overhead cover (Buskirk and Ruggiero 1994), and abundant CWD in recent clearcuts probably is of little value to them. However, martens will use residual CWD in second-growth stands (Baker 1992), but how long these structures will remain useful to martens is unknown. Highly decayed CWD probably provides little value to martens (Wilbert 1992). New logs or snags of sufficient size to accommodate marten dens or resting sites may require over 200 years to grow (Harris 1984, Franklin et al. 1981). Currently planned 100-year timber rotation times on managed forests will not permit the formation of large CWD before the next cutting (USDA Forest Service 1997).

Martens are the focus of the fur industry in southeast Alaska; the annual harvest has averaged 2770 animals between 1984 and 1996 (ADF&G Unpub. records, Douglas). Trappers consistently report that martens are the most important species to them (ADFG 1997). Because forest management activities were expected to affect population abundance and pelts represented significant economic value to local residents, martens were selected as a management indicator species (MIS) for the revision of the TLMP (Sidle and Suring 1986). Although old-growth forests were identified as a special habitat, more information is needed on the specific habitat components used by martens. The TLMP (USDA Forest Service 1997) contains standards and guidelines for managing marten habitats on Forest Service lands. These standards require the retention of forest features important to martens in timber harvest areas, particularly in areas heavily affected by timber harvest. Additional information on forest features used by martens for denning and resting will be needed for evaluation of the standards.

Density of marten populations has been linked to habitat quality (Soutiere 1979), specifically the availability of late succession forest features (Campbell 1979, Thompson and Harestad 1994). Island populations are naturally more vulnerable to extirpation because they are not augmented by immigration. When isolated marten populations are subjected to habitat degradation, densities may fall to the point where inbreeding, genetic drift, and stochastic events may contribute to extirpation (Buskirk and Ruggiero 1994). This has already occurred on Cape Bretton Island, Nova Scotia, and martens are threatened on Newfoundland (Gibilisco 1994). In western North America, martens have been extirpated from the Tobacco Root Mountains of Montana, and isolated populations in northern California and the Olympic Peninsula are threatened (Buskirk and Ruggiero 1994).

OBJECTIVES

This research was designed to describe the habitat and population ecology of martens on northeast Chichagof Island. The information from this study will be used to evaluate the interagency habitat capability model.

The specific study objectives (Jobs 1-8) are listed below.

1. Determine seasonal habitat use and selection patterns of a sample of martens living in logged and unlogged landscapes at the microsite, stand, and landscape level;

2. Determine the composition of habitats within the northeast Chichagof Island study area;

3. Evaluate the interagency habitat capability model;

4. Determine the demographic characteristics of marten populations on northeast Chichagof Island;

5. Determine marten movement and spatial patterns of martens on northeast Chichagof Island;

6. Determine the relative abundance of small mammal prey within the Chichagof Island study area;

7. Determine the seasonal diets of martens on northeast Chichagof Island; and

8. Evaluate whether the skull size criteria developed by Magoun et al. (1988) correctly classify Southeast martens by sex and age.

STUDY AREA

We chose northeast Chichagof Island for the study because its topography and habitats were typical of northern Southeast Alaska. In addition, logging roads provided good access, part of the area had been logged, camp facilities were available at a Forest Service float house, and the area was relatively close to Juneau. The primary study area comprised lands adjacent to Salt Lake Bay (58° 56' N, 135° 20' E), located about 90 km (56 miles) west of Juneau and 26 km (16 miles) south of Hoonah. The Salt Lake Bay study area (125 km^2) was bounded by Port Frederick to the north, Tenakee Inlet to the south, the portage (a narrow strip of land between the large water bodies) on the west, and the Game Creek and Indian River drainages on the east and north (Fig. 1). In 1992 we extended the study into the upper Game Creek watershed (102 km^2), located north of Salt Lake Bay. Most of the study area was under the jurisdiction of the USDA Forest Service within the Chatham Area of the Tongass National Forest. Habitats in the study area were further described in Flynn (1991).

About 7% of the Salt Lake Bay study area was logged from 1984 to 1988, and 27 km of logging roads were constructed. An additional 486 ha were clearcut from 1990 to 1992 (USDA Forest Service 1989). Logging activity began in June 1990 with the construction of about 10 km of logging road. Two units were felled before a court injunction suspended all logging activity at the end of June 1990. The court injunction was lifted during August 1991, and logging resumed September 1991. Logging activity continued until 10 December and about one half of the units were felled. Logging activity was suspended for the winter and resumed again in April 1992. All logging activity in the Salt Lake Bay area was completed 31 October 1992.

The upper Game Creek watershed was the last major unlogged watershed on northeast Chichagof Island. Road building in the upper Game Creek drainage began in April 1992 with the construction of a bridge across the North Fork and 2 bridges across Game Creek. Road building continued at a rapid pace for the remainder of the year, and most of the planned road system was completed by winter. All the low-elevation cutting units were felled during summer and fall. During spring 1993, road building continued into the upper watershed of adjacent Seagull Creek, and the remaining upper-elevation units in Game Creek were felled during 1993 and 1994. All of the logging activity was completed during 1995.

Recreational and subsistence trapping seasons for martens, mink, and weasels on the northeast portion of Chichagof Island were closed for the 1990-1991 regulatory year because of depleted marten populations. The portion of northern Chichagof Island west of Port Frederick remained open with season dates from 1 December to 15 February. The trapping season for both portions of northern Chichagof Island opened on 1 December for the 1991-1992 season. On northeast Chichagof Island, trapping with the use of a motorized land vehicle was prohibited on federal lands by federal subsistence regulation. The trapping seasons for marten, mink, and weasels were closed by emergency order on 24 January 1992 because of concern about overharvest of martens. During the 1992-1993 season, marten trapping on northern Chichagof Island was allowed only during December. The prohibition of trapping with the use of a motorized land vehicle on federal lands by federal subsistence regulation was extended to cover the west side of Port Frederick. For the remainder of Unit 4, the marten trapping season ran from 1 December to 15 February with no additional restrictions. Marten trapping seasons remained the same in 1993-1994 as the previous year's seasons.

For 1994-1995, the recreational and subsistence trapping seasons for martens, mink, and weasels on Chichagof Island were closed on federal lands by the federal subsistence board because of low marten numbers. The state season on nonfederal lands remained the same, a 31-day season on northeast Chichagof Island during December and a 75-day season everywhere else beginning December 1. For 1995-1996, the Federal Subsistence Board established a 31-day trapping season, opening on December 1, for federal lands on Chichagof Island, and prohibited the use of motorized land vehicles for trapping. The state trapping seasons remained the same as the previous year's seasons. All trapping regulations for the study area remained the same for the 1996-1997 seasons.

METHODS

Most study jobs required the capture and radiocollaring of a sample of martens on the primary study area. Martens were live-trapped throughout the year at permanent trap sites systematically located along the logging road system. Trap sites were usually about 500 m apart. Traps (Models 203 and 205, Tomahawk Live Trap Co., Tomahawk, WI) were baited in summer with strawberry jam and the rest of the year with sardines or venison scraps, covered with a green tarp, and placed under a log or the base of a tree at trap sites. We checked the traps at least daily. Captured martens were pressed in the end of the trap using a folded blanket and injected with a mixture of 18.0 mg/kg ketamine hydrochloride (Vetalar) and 1.6 mg/kg xylazine hydrochloride (Rompun) for immobilization. For short-term chemical restraint, we used a dosage of 13.0 mg/kg of ketamine and 1.0 mg/kg xylazine. All captured martens were eartagged (Size 1, Style 1005, National Band and Tag Co., Newport, KY), sexed, weighed, and measured. Two first premolar teeth were pulled for age determination by cementum analysis (Matson's Laboratory, Milltown, MT). We drew a 3.0 cc blood sample from the jugular vein from most captured animals, separated the serum, then froze both portions for future analyses for disease, diet, and pregnancy studies. Some of the captured martens were radiocollared (Telonics, Mesa, AZ). This year, we radiocollared only individuals that had been previously captured on the study area. A 30 g radio collar (MOD-070 1A, expected life of 8 months) was placed on females and a 49 g collar (MOD-080, expected life of 12-18 months) was placed on males. After a marten had recovered from the immobilization, we released it near the capture site. Martens recaptured during a trapping session were released without additional processing. During subsequent trapping sessions, all recaptures were chemically restrained, weighed, and measured. We replaced collars on several animals throughout the year.

We attempted to capture all resident martens on the study area to determine the minimum number present and the sex and age composition of the resident population. Martens present on a study area throughout the year were considered resident animals. Martens that remained on the study area for less than a month and showed no site fidelity to a home range area were considered transients. Martens more than 1-year-old were classified as adults unless otherwise identified. Young-of-the-year animals, or birth-year martens, were called juveniles.

JOB 1. HABITAT USE

We located radiocollared martens from small aircraft (Mech 1974, Kenward 1987) during daylight hours throughout the year. Mostly, we used a Piper Super Cub aircraft. After an animal was located, while circling in the aircraft we plotted its location on paper copies of high-resolution orthophoto maps (1:31,680 scale). We also described the habitat at each location while in the aircraft according to USDA Forest Service definitions of timber volume class, stand size class, old-growth forest type, and physiographic location (riparian, upland, beach fringe, estuary fringe, subalpine, or alpine). At the office, we transferred the locations to mylar overlays on color aerial photographs (1:15,840 scale) for a permanent record. The locations were plotted on digital versions of the orthophoto maps using geographic information system (GIS) software (ArcView 3.0a) on a personal computer. Additional attribute information for each location was recorded from the orthophoto maps, including elevation, slope, and aspect.

We will determine habitat selection by comparing the proportionate use of habitats with their availability (see Job 2) in the study area (Neu et al. 1974, White and Garrott 1990). We considered data collected from September through May to represent habitat use during the fall/winter/spring season. In future analyses, the habitat use of each animal will be compared with the availability of habitats within its home range area and the primary study area. A Chi-squared goodness-of-fit test will be used to test the null hypothesis that habitats were used by martens in proportion to their availability. If the null hypothesis is rejected, then each habitat will be evaluated separately for selection using Bonferroni normal statistics (Neu et al. 1974, Byers and Steinhorst 1984, White and Garrott 1990). Manly's measure of preference (Manly et al. 1972, Chesson 1983) will be computed for each habitat category to characterize the degree of selection of a particular habitat.

Marten Den/Resting Sites

If we found a female marten at the same place 3 or more times, we assumed it had localized at a den. We then ground-tracked the female to locate the den structure. When constant strength and location of radio signals indicated the target marten was stationary, we walked in on the animal to determine the actual den site. We found resting sites in a similar manner. Dens were distinguished from resting sites by their repeated use over several days or weeks and the presence of latrines and prey remains. Resting sites were defined as sites occupied by a marten for at least 30 minutes. These sites were flagged in the field and marked on aerial resource photos. We digitized site locations on digital orthophotos to create a GIS point coverage. The den/resting sites were buffered by a 62-m radius circle to create a polygon coverage. We revisited the sites after the martens had abandoned the dens or left the immediate area. We measured habitat attributes within the polygons, using the same procedures as described below for random sites.

JOB 2. HABITAT COMPOSITION

The composition of the study areas will be determined from US Forest Service GIS databases. Now we have a library of GIS data files from US Forest Service staff including landcover, timber type, soils, land status, streams, elevation, clearcuts, and roads. We will consider the proportional area of habitats in the analysis area our measure of habitat availability. To evaluate landscape-level effects, we will collect additional landscape attributes such as roads, corridors, stand size, and composition. This information will be further analyzed with GIS software for the final report.

Because of problems with the accuracy of the timber-type map, we continued working with USDA Forest Service staff on evaluating LANDSAT TM satellite technology for mapping landcover in Southeast Alaska. We are hopeful that this technology can provide an improved map of habitats on the study area. In 1995 the USDA Forest Service contracted with Pacific Meridian Resources to produce 3 landcover maps of northern Southeast Alaska using LANDSAT TM imagery (Pacific Meridian Resources 1995). The map types were size/structure, tree species, and canopy cover. The size/structure type was developed to distinguish forest stands by their density of trees by size class and to separate multistoried canopies from singlestoried.

To collect information about habitat attributes of the landcover types, we visited random sites (stratified by the size/structure map) in the field and measured numerous habitat attributes. We selected the size/structure map for further evaluation because we believe the size/structure map best represented structural features of the forest. The habitat attributes of forest structure include the density of live trees by size class, the density of snags by size class, the amount of down wood by size class, and the amount of understory. Forest structure provides important habitat components for wildlife species associated with forests, especially old-growth associated species (Sidle and Suring 1986). Because size/structure is usually correlated with the amount of overstory canopy closure, the size/structure map probably also provided us with a measure of canopy cover. We also collected data on the tree species map, but did not include it because this project was not specifically designed to evaluate this map.

In addition, we collected information on the accuracy of the landcover maps. Our 1996 field data were provided to USFS staff and combined with their data for additional accuracy assessment (AA) evaluations (Fehringer 1997). We present additional AA information here based on a combination of our 1996 and 1997 data.

Sample Selection

Random Sites

The size/structure map developed from LANDSAT TM imagery by Pacific Meridian Resources (1995) for northern Southeast Alaska was used to define map strata. For this evaluation, we collapsed the 17 size/structure categories into 5 forest strata and 3 nonforest strata for a total of 8 strata (Table 1). The multistoried categories were large/multistoried (Large/MS), medium/multistoried (Medium/MS),intermediate/multistoried(Intermediate/MS), and a combined small/multistoried and pole/multistoried class (Small/MS). All of the single-storied classes were collapsed into a single category called Singlestoried because the single-storied classes represented only a small proportion (3.6%) of the study area (Table 1). The 3 nonforest strata were shrub, other nonforest (combined herbaceous, sparsely vegetated, and snow), and "recent clearcuts" (<15 years old). The recent clearcut stratum was derived from the USFS clearcut GIS coverage. This stratum was composed of Other nonforest (7.9%), Shrub (41.4%), Large/MS (14.1%), Medium/MS (23.0%), Intermediate/MS(7.9%), Small/MS (4.4%), and Singlestoried (1.3%) strata. Many of the clearcuts were more recent than the 1992 satellite imagery, especially in the upper Game Creek drainage. These areas had been mapped mostly as forest types, primarily Large/MS and Medium/MS. Actual clearcut areas had been mapped mostly as shrub. Older clearcuts were mostly mapped as singlestoried. Because of their different origin, recent clearcuts represented a different habitat condition than the other nonforest types and the older clearcuts.

A polygon coverage (GIS) was created from the raster landcover map by grouping adjacent like pixels into polygons (Gary Fischer, USFS Juneau, pers commun). We selected a random sample of 8 polygons within each strata for field sampling (64 polygons). Only polygons at least 1.2 ha (3 acres) in size and within 0.6 km (0.4 mile) of the road systems at Salt Lake Bay or upper Game Creek were eligible for selection. Additionally, a 1.2-ha circle needed to fit completely within the polygon (Fig 2). We printed the selected polygons on digital orthophoto maps using GIS software and transferred them to resource photos (1:15,840), using the digital orthophoto maps for reference. Compass bearings and distances from known landmarks to the polygon centers were determined from the digital orthophotos.

We designed this project to provide an evaluation of the LANDSAT TM map while minimizing costs. We restricted field sites to within reasonable walking distance (0.6 km) of access roads because funding for helicopter transport was unavailable. Some of the sites still required considerable effort because of crossing steep terrain. Volunteers were used extensively for field personnel, especially in 1997 after funding for field assistance was unavailable. We found that a field crew of 4 members worked most efficiently. One person measured the site attributes and recorded all of the plot data while 2 people measured trees. A fourth person completed the overstory canopy cover sheet, then recorded logs. Usually, we completed about 2 sites each day instead of the projected 3-4 sites. To maintain consistency, only 1 field crew was used at a time and the same persons (R. Flynn or T. Schumacher) made the overstory estimates and completed the plot forms.

DATA COLLECTION

A field crew located the polygons on the ground by walking the bearing and distance from known landmarks. We also used resource photos and a hand-held global positioning system (GPS) device to locate some plots. At each site, we estimated canopy cover by tree size class for the polygon, using the procedures established for training and accuracy assessment sites (Pacific Meridian Resources 1995). We used the same data sheets and criteria to determine the correct map labels for the polygon, including size/structure, species, and canopy cover. In addition, several site attributes were recorded near the polygon's center including elevation (altimeter), aspect (compass), and slope (clinometer).

The vegetative characteristics for the polygon were measured using a cluster-sampling procedure similar to the USFS GRID project (USDA Forest Service 1995) (Fig. 2). Four sample points were established in each polygon. The first sample point was established near the polygon's center. We determined the location of this first sample point by pacing from the edge of the polygon toward its center, a distance equal to the radius of the polygon. Sample point 2 was located 36.6 m north of point 1; point 2 was located on a 120°-azimuth 36.6 m from point 1; and point 4 was located on a 240°-azimuth 36.6 m from point 1.

A single, 7.3 m radius fixed plot was established around each sample point to measure tree, snag, and down wood attributes. For each tree >12 cm in diameter (live and dead), we recorded the species, height, diameter (dbh), status (whether live or dead), crown class, and decay category. We noted other habitat attributes such as elevated roots, squirrel middens, extensive cavities, etc. Instead of using transects to measure down wood, we recorded all logs within the plot including its species, length within the plot, diameter of each end, and decay class. Dead trees were considered snags.

A single, 5.64 m radius fixed plot was established around the sample point to measure the understory. The composite cover of each shrub and herb species was estimated along with the average height of the shrub layer. A single, 2.0 m radius fixed plot was established around the sample point to count all seedlings and saplings (trees<12 cm) by species.

DATA ANALYSIS

All data were recorded on paper forms in the field. We obtained a data-entry program developed by USFS GRID project staff (USDA Forest Service 1995) to input the plot attribute data into a personal computer. Thus, data structures and formats would be similar to their data set. For our analyses, the tree data were converted into an SAS data set using SAS statistical software (SAS Institute 1996).

Landcover labels were assigned to the random sites using criteria developed by Pacific Meridian Resources (1995). Map accuracy was evaluated by comparing the field labels for sites to the map labels using an error matrix approach (Pacific Meridian 1995). The numbers of exact matches were tallied by landcover strata and expressed as the percentage classified correctly. Also, an "acceptable" call was assigned to each field site using a "fuzzy logic" approach described by Pacific Meridian (1995). An acceptable call was given if the site was close (i.e., within 10% canopy cover) to the adjacent category. The numbers of acceptable matches were also tallied by landcover strata and expressed as the percentage classified correctly.

The den/resting site polygons were intersected with the size/structure polygon map to determine the composition of strata within the polygons. Usually, these polygons consisted of several strata. A size/structure map label was assigned to each polygon based on the labeling rules described by Pacific Meridian (1995).

For this evaluation, a tree was defined as a live or dead tree greater than 230 mm (9 in.) diameter at breast height (dbh) and taller than 2 m (6.6 ft). Thus, the tree data included live trees and snags, but not stumps. We computed 4 tree size-class variables from the field data for each site. We used the same dbh breaks to create tree size classes as the size/structure map classification (Pacific Meridian 1995). Large trees were defined as trees/snags greater than 820 mm (32.0 in.) dbh; medium trees were from 590 to 819 mm (23.0-31.9 in.) dbh; intermediate trees from 385 to 589 mm (15.0-22.9 in.); and small trees from 230 to 384 mm (9.0-14.9 in.) dbh.

We summed the number of trees in each size class for the 4 subplots at each site. Thus, the total area sampled at each site was 0.067 ha (0.165 acre), or 5.5% of the 1.2 ha polygon. Descriptive statistics (means and SEs) for the tree size-class variables were computed for each strata using SAS statistical software (SAS Inst. 1996). Separate sets of statistics were calculated for the random sites, den/rest sites, and combined data sets. The random and den/rest sites were compared with a series of t-tests of the tree-class variables by strata. Because none of the strata was significantly different (alpha = 0.05) between the site type for any tree-class variable, the random and den/rest sites were pooled for the rest of the analyses. In addition, the shrub, recent clearcut, and other nonforest strata were combined into a single, nonforest stratum because these strata had few trees.

Differences among size/structure strata were evaluated for each tree size-class variable using a series of one-way analysis of variance tests (ANOVA) (SAS Institute 1996). We tested the hypothesis that the means for a tree-class variable were the same for all the map strata. If the strata were significantly different, based on the ANOVA (alpha < 0.05), then Tukey's Studentized Range test was used to determine which strata differed (alpha = 0.1) for the tree size class. This analysis identified the map strata that were statistically different for at least 1 tree size-class variable. In addition, we identified the variable means that were significantly different in the comparison.

JOB 3. HABITAT CAPABILITY MODEL EVALUATION

The habitat capability model for martens in Southeast Alaska, developed by an interagency group of biologists (Suring et al. 1992), will be evaluated in 2 ways using the general considerations listed by Schamberger and O'Neil (1986). During model testing, we will compare habitat coefficients values with observed habitat selection indices. Habitat selection indices for fall/winter/spring will be compared to habitat capability coefficients in the marten habitat capability model (Suring et al. 1992). We will compare the estimated density of adult resident martens on the primary study area to values predicted by the model.

JOB 4. POPULATION ECOLOGY

Each study area was live-trapped intensively during October and March to determine the sex and age composition of the martens. We recorded the time and location of all known deaths of radiocollared martens. We attempted to retrieve the carcasses of martens that died naturally and examined them for cause of death. We obtained the carcasses of many trapper-caught study animals. These carcasses were processed according to procedures established for the general collection of trapper-caught carcasses.

We surveyed martens on the Salt Lake Bay study area using mark-recapture methods (Seber 1982, White and Garrott 1990). For the survey, we considered captured martens marked with only eartags or wearing failed collars as new individuals. Based on our earlier radiotracking data, we assumed the population was closed during the 5-day trapping session and each animal had an equal probability of being captured at least once during the trapping session. The study area was defined by the composite home ranges of resident martens (84 km^2). We computed a Lincoln-Petersen estimate of population number for a closed population, single mark-release experiment for each trapping session. During a trapping session (at least shortly before or after), we located all of the radiocollared martens on the study area to determine the number of marked animals present during the trapping session. In the mark-recapture analysis, we used the number of radiocollared martens on the study area during the trapping session as n_1, the total number of martens captured as n_2, and the number of radiocollared martens recaptured as m_2. We used an Excel spreadsheet, originally developed by Sterling Miller (pers commun, Alaska Department of Fish and Game, Anchorage), for the numeric analyses, including the population estimate, variance, and 95% confidence intervals using a normal distribution. Also, we determined the minimum number of martens on the study area during the trapping session by adding the number of new captures to the number of previously radiocollared animals present. At this point, we have not determined whether all of the assumptions for a Lincoln-Petersen mark-recapture experiment were met in this situation. We will further evaluate the appropriateness of our methods.

We attempted to collect the carcasses of all martens caught by trappers on northern Chichagof Island. Before the opening of the 1 December trapping season, we contacted trappers in Hoonah and Tenakee Springs and offered them $3.00 for each marten carcass delivered to us. Trappers were instructed to record the date and location of each capture and to freeze the carcasses immediately after skinning. Upon receiving the carcasses from the trappers, we kept them frozen until processing.

We weighed each carcass and assigned an index of internal and external fat content, using an ocular estimation procedure developed by Blundell and Flynn (1992, unpubl. report, ADF&G, Douglas, AK). We measured each skull according to Magoun et al. (1988) and classified the animal as juvenile or adult. We heated the skulls in water for 3 hours at 70° C, then extracted the lower canine and premolar 4 teeth. The teeth were stored frozen until sent to Matson's Laboratory (Milltown, MT) for age determination by cementum analysis (Poole et al. 1994). We measured total, body, and tail lengths of each carcass, recording the method of skinning (i.e., feet skinned out or not). We examined the stomachs of each carcass for the presence of parasites, especially *Soboliphyme baturini* worms. We extracted the ovaries from the reproductive organs of females and preserved them in 10% formalin. All ovaries were washed in tap water, then sent to Matson's Laboratory (Milltown, MT) for evaluation for the presence and number of corpora lutea (Strickland and Douglas 1987).

JOB 5. SPATIAL PATTERNS AND MOVEMENTS

Radiocollared martens were located from small aircraft, usually a Super Cub, about once every 2 to 4 weeks to monitor general movements (Kenward 1987). Aerial locations were plotted on high-resolution orthophoto maps (1:31,680 scale) and digitized as stateplane coordinates using a PC-based GIS computer program. We will model home ranges of resident martens using either the computer program HOME RANGE (Ackerman et al. 1990) or RANGES V (Kenwood and Hooder 1996). Locations were tested for independence (Swihart and Slade 1985) and outliers examined (Samuel et al. 1985). We will calculate the area of home ranges using 90 and 100% convex polygons and adaptive kernel estimates.

During summer and fall, we located several resident martens at 1 to 4-hour intervals over a 4 to 24 hour period to describe short-term movements. Jena Hickey will analyze and present the short-term movements data as part of her M. S. thesis at the University of Wyoming.

We spent little effort radiotracking transient martens this year. We searched the entire northeastern portion of Chichagof Island periodically (every few months) from aircraft to locate transient martens. We recorded the maximum distance traveled from initial capture sites and the maximum distance between relocations for each transient animal.

JOB 6. SMALL MAMMAL ABUNDANCE

The abundance of small mammals, excluding red squirrels, was estimated using a snap-trap index (Calhoun 1948). Transects were established in 3 stands: a productive western hemlock old-growth stand; an unproductive, mixed conifer/blueberry old-growth stand; and a 9-year-old clearcut. We established 25 stations along each transect at 15 m intervals. Two Museum Special snap traps were placed at each station, baited with a mixture of peanut butter and rolled oats, and set for 3 consecutive nights (450 trap nights). We operated the traplines in September when small mammal populations were at their annual peak. We recorded the number of animals of each species caught per 100 trap nights.

JOB 7. SEASONAL DIETS

We collected marten scats at trap sites and opportunistically along roads and trails while working in the field. The scats were labeled and frozen for future analyses. The scats will be examined for frequency of prey items.

Beginning in fall 1992, we drew a 2-3 cc sample of blood from the jugular vein of most captured martens. At camp, the blood was spun at 3000 rpm in an electric centrifuge, and the serum siphoned into a separate vial. The clotted blood cells were frozen for storage, then sent to Merav Ben-David, University of Alaska Fairbanks, for analysis of the stable isotopes of carbon and nitrogen (Schell et al. 1988). As part of her Ph.D. dissertation, Merav Ben-David compared the stable isotope signatures of the marten blood samples with the signatures of samples collected from potential food items to study marten diets (Ben-David 1996).

JOB 8. EVALUATION OF FIELD SEXING AND AGING TECHNIQUE

We collected marten skulls from trappers operating on northern Chichagof Island to evaluate the field technique for sexing and aging martens proposed by Magoun et al. (1988). We recorded total skull length and length of temporal muscle coalescence for each specimen according to procedures of Magoun et al. (1988). A lower canine tooth and premolar 4 were extracted from each skull for age determination by cementum analysis (Matson's Laboratory, Milltown, MT). We will compare the skull measurements according to Magoun et al. (1988).

RESULTS AND DISCUSSION

During 1996-1997, we captured 50 martens (32 males and 18 females) on the Salt Lake Bay study (Tables 2, 3). Thirty-three of these martens (14 males and 9 females) were captured for the first time this year. We radiocollared only 3 of the new martens (all males) and put radiocollars on 6 martens (3 males and 3 females) for the first time that had been eartagged in previous years. In upper Game Creek, we caught an additional 23 martens (15 males and 8 females). Two of the male martens had been captured previously at Salt Lake Bay. We removed expired radiocollars from 3 animals. During the spring, we put radiocollars on 2 martens (1 male and 1 female) in Game Creek. All captured martens were weighed and measured; they were aged by cementum analysis. We did not trap in the drainages of Freshwater Bay or Indian River this year.

JOB 1. HABITAT USE

During the year we located 33 radiocollared martens (22 males and 11 females) 200 times from small aircraft. The location information was recorded, plotted on aerial photographs, and entered into a GIS computer file. We did not complete any additional analyses for this report. More information on the selection of habitats will be included in the final report.

Den Sites

We spent considerable time locating marten dens in the spring. During March to early May, we live-trapped the study area to increase our sample of radiocollared adult females. Because of the high catch by trappers in the fall, few adult females were on the study area during the spring. We monitored 5 radiocollared adult females during at least part of the denning period, all at Salt Lake Bay.

During mid April, we monitored the movements of 4 radiocollared females about every 5 days from fixed-wing aircraft to locate den sites. None of these females localized their movements and probably did not den or produce young. We did find the natal den of adult female #220. She had been originally captured and eartagged on 11 March 1996. During a recapture on 28 May 1997, she appeared pregnant and was radiocollared for the first time. On 30 May, she was located in a large log with a litter. She abandoned the site shortly thereafter and apparently lost her litter.

Only 1 of 5 adult females attempted to den, and we found no evidence the females successfully reared young. We speculate that a decrease in the availability of prey, particularly long-tailed voles, may have led to a failure to produce young. Food habits data from previous years have shown that voles are the primary prey of martens on northeastern Chichagof Island during spring and early summer. In addition, all radiocollared martens seemed to be more active than in previous years, indicating more hunting may be required to meet their food requirements.

We sampled vegetation around 13 den sites that have been located since 1995. We used the same procedures as described for the random sites. For 10 den sites associated with live trees or snags, the mean dbh of the trees was 102.1 cm (SD = 43). The mean dbh of the 5 dens in down logs was 91.2 cm (SD= 38). This data will be further analyzed for the final report. For this report, we combined the den and resting sites and reported some of the structural characteristics by landcover type (see below).

Resting Sites

We located 19 winter and 17 summer resting sites used by male and female martens and sampled the vegetation around each site, using the same procedures as for the random sites. The structures used for resting were usually cavities in live trees or snags; some were in down logs. All the structures were characteristic of old-growth forest. For 36 resting sites associated with trees or snags, the mean dbh was 66.9 cm (SD = 30). The mean dbh of the 3 resting sites in down logs was 87.3 cm (SD= 33). This data will be further analyzed for the final report.

JOB 2. HABITAT COMPOSITION

During summer and fall 1996, we sampled the landcover at 39 field sites. Of these sites, 19 sites were part of the stratified random sample (Fig. 3), and 20 sites were centered on marten dens or resting sites (Fig. 4).

An additional 46 sites were sampled (22 random) during summer 1997 for 85 sites (41 random, 44 marten den/rest sites). Although we did not meet our original target of 64 random sites, our total sites exceeded the targeted number of sites by 21. Also, the den/rest sites provided information on heterogeneous, mixed-pixel areas. We anticipate completing the complete 64 random sites later in 1997. The sites represented homogenous and heterogeneous polygons. Because of the selection criteria, each random polygon contained only 1 size/structure pixel type. Conversely, the marten den/rest sites always contained more than 1 pixel type (1 to 7). Often, these polygons contained a variety of pixel types and varying proportions of pixel types. The map labels assigned to the mixed-pixel polygons depended on the labeling rules developed by Pacific Meridian Resources (1995). We did not investigate how changing the labeling rules may have affected outputs.

Accuracy Assessment

For 41 random sites, the field label exactly matched the map label 32 times (78%) (Table 4). For only forest strata, the exact match was 68% (17 of 25). In each of the mismatches, the labels differed by 1 size class. Using the "fuzzy" approach to labeling field sites, the acceptable matches increased to 88% for all sites and 80% for forest sites (Table 4). We found the poorest accuracy within the medium/MS (exact = 33%) and intermediate/MS (acceptable = 67%) strata. These strata appeared to be the most variable and difficult to map accurately. Fehringer (1997) also found relatively low map accuracy for the intermediate/MS type (acceptable = 63%). Additional plots are needed in these types to better determine whether they are "good" landcover types. The nonforest and small/MS strata were nearly 100% accurate. The LANDSAT TM procedures appeared to map these types well. We eliminated salt water from our study area because salt water can be accurately mapped from other GIS coverages. We mapped recent clearcuts from the USFS GIS coverage, so these sites were not used in the AA evaluation. Many of the recent clearcuts were logged since the time of the LANDSAT TM image (August 1992).

Generally, we found greater overall map accuracy than reported by Pacific Meridian Resources (1995) (88 to 71%) and Fehringer (1997) (88 to 72%). We may have found greater map accuracy because our random sites were selected from homogenous areas greater than 1.2 ha. In addition, our sites were field-visited and tree attributes were measured. The AA sites selected for the original pilot project (Pacific Meridian Resources 1995) and supplemented by Fehringer (1997) were generally more heterogeneous than our random sites. In addition, the map labels for these sites depended on the labeling procedures for mixed-pixel polygons.

Our data indicated that the LANDSAT TM mapping procedures mapped larger (>1.2 ha), homogenous areas more accurately than heterogeneous areas. We have not yet assigned map labels to the marten den/rest sites based on the field measurements. Because these sites were more heterogeneous, they may be mapped less accurately. In addition, the polygon labeling rules for mixed-pixel areas may need additional evaluation.

Habitat Attributes

We considered the mean numbers of trees/snags per plot by size class, a measure of habitat structure. We did not separate the trees by species or report live trees and snags separately. Other habitat attributes were measured (i.e., stumps, logs and understory), but these data were not summarized for this report. These forest attributes all contribute to habitat quality for old-growth associated species.

The means for the tree-class variables by landcover strata for the random sites (Table 5) were similar to the den/rest sites (Table 6) (t-tests, alpha = 0.05). The lack of statistical differences may have resulted from a lack of power in these comparisons. Because many of the sites within strata were quite variable, more field sites may be needed to show statistical differences. Additional analyses will be completed after more plots have been field-sampled. We combined the random and marten den/rest sites for the remainder of the analyses (Table 7).

The landcover strata were significantly different for tree-class variables (ANOVA, alpha = 0.05). Because of the numerous comparisons, we summarized the landcover strata that differed by tree-class variable (Table 8). Generally, Large/MS sites had more large trees and fewer intermediate and small trees. Medium/MS sites were well-stocked with lots of trees of all size classes. Intermediate/MS sites were highly variable. Some sites had clumps of larger trees mixed with intermediate and small trees. Some of the Intermediate/MS sites had only intermediate and smaller trees. Also, several of the intermediate/MS sites were misclassified; these sites added substantial variance to the data for this stratum. Small/MS sites had few large trees and numerous small trees.

Some of the differences were obvious. The nonforest stratum had few trees of any size and differed from most other forest strata for nearly all variables. Although only 2 singlestoried sites were measured, this stratum differed from all others because of the large number of intermediate and small trees present. One of the singlestoried sites resulted from natural wind throw; the other resulted from a 35-year old clearcut.

The magnitude of the differences among means was large in some cases, but the differences were not statistically significant because of large variances or small sample sizes. The Intermediate/MS strata was the most variable and not different from Medium/MS or Small/MS strata. The other multistory strata were different for at least 1 tree-class variable (86). Large/MS differed from Medium/MS (fewer intermediate trees), Intermediate/MS (more large trees), and Small/MS for 2 variables (more large trees, fewer small trees). Medium/MS was also different from Small/MS (more large and intermediate trees).

Additional power analyses may help determine the number of additional plots needed to increase the precision of the estimates. Additional plots in the singlestoried strata would likely result in significant differences with the rest of the strata. Some of the strata seemed quite variable and limited additional sampling may not improve estimates much.

We suspect that some of the other habitat variables should also differ by strata and, collectively, may increase our ability to distinguish strata. The size class distribution of down logs should follow the patterns of the trees, except for recent clearcuts. In addition, recent clearcuts should have a large number of stumps. Stands that are more open should have a more abundant understory. By including all of the habitat attributes, our final interpretations of the data should be improved.

JOB 3. HABITAT CAPABILITY MODEL EVALUATION

In a previous progress report (Flynn 1991), we compared the habitat selection indices from this study to the habitat capability coefficients in the habitat capability model. No additional analyses were completed during this report period.

JOB 4. POPULATION ECOLOGY

Of the 33 radiocollared martens monitored at least part of the year, 22 were males and 11 were females. We weren't able to radiocollar all resident martens. Some of the eartagged martens were captured subsequently on the study area, indicating they were probably residents.

We had 2 good opportunities for mark/recapture trapping sessions during the year. During October 1996, we estimated that 35 martens (95% CI = ±7) were on the Salt Lake Bay study area for a density of 0.42 martens/km^2 (Fig. 5). In contrast, we estimated 38 martens (95% CI = ±6) on the area in March 1996, or a density of 0.45 martens/km^2 (Flynn and Schumacher 1996). Thus, the number of martens on the Salt Lake Bay study area was similar from spring 1996 to the following fall (38 to 35). During March 1997, we estimated that 12 martens (95% CI = ±2) were on the Salt Lake Bay study area for a density of 0.15 martens/km^2. Our estimated number of martens decreased 66% from the previous fall (35 to 12). Compared to March 1995, the estimated number of martens in March 1996 decreased 68% (38 to 12).

Trappers reported taking 32 tagged martens (77% males) during the December trapping season (Table 9). Ten trapped martens had working radio collars and 5 were wearing expired collars. We had recently removed the expired radio collars from 2 trapped males. Eleven of the trapped martens were caught within their previous home range areas, most (10) along the shore of Upper Port Frederick within the Salt Lake Bay study area. One trapper operated a trapline there during the last week of the season. The other tagged martens (21) had moved from their original capture sites, some a substantial distance. Three animals were trapped on the southern portion of Chichagof Island, about 100 km (62 miles) away.

A substantial amount of trapping effort was expended on northern Chichagof Island this year; 522 martens (37% females) were taken by trappers. On the northeast portion of Chichagof Island, 391 martens (32% females) were reported taken by 15 trappers. In contrast, 140 martens were taken by 5 trappers in 1995. Most of the trapping activity was along the road system on private lands near Hoonah and along the south shore near Tenakee Springs. On the portion of northern Chichagof Island west of Port Frederick, an additional 131 martens (85 males and 46 females) were taken by 5 trappers.

JOB 5. SPATIAL PATTERNS AND MOVEMENTS

We located 31 radiocollared martens 200 times to collect information on movements and spatial use patterns. The data were recorded and entered into a GIS data file. Next year, we will use GIS software to complete a comprehensive analysis of the movements and spatial use data.

JOB 6. SMALL MAMMAL ABUNDANCE

During September 1996 we captured 19 deer mice and 23 long-tailed voles on 3 transects in 450 trap nights (9.3 captures/100 trap nights). The snap-trap index indicated small mammal numbers decreased 48% from fall 1995 (Fig. 6). The index decreased for the second year in a row from a high of 26.9 captures/100 trap nights in 1994. Both species decreased with long-tailed vole numbers decreasing the greatest (11.0 to 5.1 captures/100 trap nights). Because vole numbers decreased sharply (54%), the availability of important foods for martens on northeast Chichagof Island was probably greatly reduced during 1996-1997.

JOB 7. SEASONAL DIETS

No additional results were available. Previous results were published (see below).

JOB 8. EVALUATION OF FIELD SEXING AND AGING TECHNIQUE

We did no additional analyses. These data will be evaluated for the final report.

JOB 9. SCIENTIFIC MEETINGS AND WORKSHOPS

We attended the annual meeting of the Northwest Section of The Wildlife Society during May and presented a paper. We collaborated on 5 other presentations made by project cooperators.

JOB 10. REPORTS AND SCIENTIFIC PAPERS

Ben-David, M., R. Flynn, and D. M. Schell. 1997. Annual and seasonal changes in diets of martens: evidence from stable isotope analysis. *Oecologia.* 111:280-291.

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LITERATURE CITED

ADF&G 1997. Trapper Questionnaire. 1995-96 Statewide Report. Alas. Dep. Fish and Game. Unpub. Rep. Juneau, AK. 28pp.

ACKERMAN, B., F. LEBAN, M. SAMUEL, AND E. GARTON. 1990. User's manual for program Home Range. For. Wildl. Range Exp. Stn. Tech. Rep. 15, Univ. Idaho, Moscow. 80 pp.

BAKER, J. M. 1992. Habitat use and spatial organization of pine marten on southern Vancouver Island, British Columbia. M. S. thesis, Simon Fraser Univ., Burnaby, B. C. 119pp.

BATEMAN, M.C. 1986. Winter habitat use, food habits, and home range size of the marten, *Martes americana*, in western Newfoundland. Can. Field-Nat. 100:58-62.

BEN-DAVID, M. 1996. Seasonal diets of mink and martens: effects of spatial and temporal changes in resource abundance. Ph.D. thesis. Univ. Alaska, Fairbanks. 207pp.

BERGERUD, A. T. 1969. The status of the pine marten in Newfoundland. Can. Field-Nat. 83:128-131.

BISSONETTE, J. A., R. J. FREDRICKSON, AND B. J. TUCKER. 1989. American marten: A case for landscape - level management. N.A. Wildl. & Nat. Res. Conf. 54:89-101.

BOUGHTON, J., J. MARTIN, AND R. FLYNN. 1992. Ecological definitions for old-growth forest types in Southeast Alaska. USDA For. Serv. Rep. R10-TP-28, Juneau, AK.

BUSKIRK S. W., S. C. FORREST, M. G. RAPHAEL, AND H. J. HARLOW. 1989. Winter resting site ecology of marten in the central Rocky mountains. J. Wildl. Manage. 53(1):191-196.

BUSKIRK S. W. AND L. F. RUGGIERO. 1994. American marten. Pages 7-37 *in* L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, eds. The scientific basis for conserving forest carnivores. USDA For. Serv. Gen. Tech. Rpt. RM-254. 184pp.

BYERS, C. R. AND R. K. STEINHORST. 1984. Clarification of a technique for analysis of utilization-availability data. J. Wildl. Manage. 48:1050-1052.

CALHOUN, J. B. 1948. North American census of small mammals. Rodent ecology project, release 1. John Hopkins Univ., Baltimore. 8pp.

CAMPBELL, T. M. 1979. Short-term effects of timber harvests on marten ecology. M.S. thesis, Colorado State Univ., Fort Collins. 71pp.

CHESSON, J. 1983. The estimation and analysis of preference and its relationship to foraging models. Ecology 64:1297-1304.

CLARK, T. W., E. A. ANDERSON, C. DOUGLAS, AND M. STRICKLAND. 1987. *Martes americana*. Mammal. species 289:1-8.

CORN, J. G. AND M. G. RAPHAEL. 1992. Habitat characteristics at marten subnivean access sites. J. Wildl. Manage. 56:442-448.

FEHRINGER, D. 1997. Existing vegetation TM mapping project, Chatham Area Pilot. Summary of 1996 accuracy assessment. Rep. to USDA For. Serv. USDA For. Serv., Alas. Region, Juneau. 20pp.

FLYNN, R. W. 1991. Ecology of martens in Southeast Alaska. Alas. Dep. Fish and Game. Fed. Aid in Wildl. Rest., Prog. Rep., W-23-4, Study 7.16. Juneau. 33pp.

—— AND T. V. SCHUMACHER. 1996. Ecology of martens in Southeast Alaska. Alas. Dep. Fish and Game. Fed. Aid in Wildl. Rest. Prog. Rep., W-24-4, Study 7.16. Juneau. 23pp.

FRANKLIN, J. F. AND R. H. WARING. 1980. Distinctive features of the Northwestern coniferous forest: Development, structure, and function. Pages 59-85 *in* R. H. Waring ed., Forests: Fresh perspectives from ecosystem analysis. Proc. 40th Biology Colloquium. Corvallis, Oregon.

FRANKLIN, J.F., K. CROMACK JR., W. DENISON, A MCKEE, C. MASER, J. SEDELL, F. SWANSON, AND G. JUDAY. 1981. Ecological characteristics of old-growth Douglas fir forests. Gen. Tech. Rep. NW-118. USDA For. Serv. Portland, Oregon.

FRANKLIN, J.F. AND R. T. T. FORMAN. 1987. Creating landscape patterns by forest cutting: ecological consequences and principles. Landscape Ecol. 1:5-18.

GIBILISCO, C. J. 1994. Distributional dynamics of martens and fishers in North America. Pages 59-71 *in* S.W. Buskirk, A. S. Harestad, M. G. Raphael, and R. A. Powell eds., Martens, sables, and fishers: biology and conservation. Ithaca, New York, Cornell Univ. Press. 484pp.

HARRIS, L. H. 1984. The fragmented forest: island biogeography theory and the preservation of biotic diversity. Univ. of Chicago Press. Chicago, Ill. 211pp.

HAUPTMAN, T. N. 1979. Spatial and temporal distribution and feeding ecology of the pine marten. M. S. thesis, Idaho State Univ., Pocatello. 83pp.

HENRY, S. E. AND L. F. RUGGIERO. 1993. Den use and kit development of marten in southern Wyoming. In: Proceedings of the XXI International Congress of Game Biologists; 1993. August 15-20; Halifax, Nova Scotia. International Union of Game Biologists.

JONES, L. L. C. AND M. G. RAPHAEL. 1992. Ecology and management of American Martens in fragmented habitats of the Pacific Northwest. (Unpubl. Rpt.). USDA For. Serv., Pacific Northwest Research Station. Portland, Or. 8pp.

KENWARD, R. E. 1987. Wildlife Radio Tagging. Academic Press, London. 222pp.

KOEHLER, G. M., W. R. MOORE, AND A. R. TAYLOR. 1975. Preserving the pine marten: management guidelines for western forests. West. Wildlands 2:31-36.

LINDSTROM, E. R., S. M. BRAINERD, J. O. HELLDIN, AND K. OVERSKAUG. 1995. Pine marten - red fox interactions: a case of intraguild predation? Ann. Zool. Fennici. 32:123-130.

MAGOUN, A. J., R. M. GRONQUIST, AND D. J. REED. 1988. Development of a field technique for sexing and aging marten. Unpubl. Rep., Alas. Dep. of Fish and Game. Fairbanks, AK. 33pp.

MAJOR, J. T. 1979. Marten use of habitat in a commercially clearcut forest during summer. M. S. thesis, Univ. of Maine, Orono. 32pp.

MANLY, B. F., P. MILLER, AND L. M. COOK. 1972. Analysis of a selective predation experiment. Am. Nat. 106:719-736.

MARSHALL, W. H. 1951. Pine marten as a forest product. J. For. 49:899-905.

MARTIN, S. K. AND R. H. BARRETT. 1991. Resting site selection by marten at Sagehen Creek, California. Northwestern Nat. 72:37-42.

MECH, L. D. 1974. Current techniques in the study of elusive wilderness carnivores. Pages 315-322 *in* I. Kjerner and P. Bjurholm, eds. XIth Int. Congress of Game Biologists. National Swedish Envion. Protection Board, Stockholm. 631pp.

NEU, C. W., C. R. BYERS, AND J. M. PEEK. 1974. A technique for analysis of utilization-availability data. J. Wildl. Manage. 38:541-545.

PACIFIC MERIDIAN RESOURCES. 1995. Tongass National Forest Vegetation Mapping Project. Final Rpt. To USDA For. Serv. USDA For. Serv., Alas. Region, Juneau. 52pp.

POOLE, K., G. MATSON, M. STRICKLAND, A. MAGOUN, R. GRAF, L. DIX. 1994. Age and sex determination for American martens and fishers. Pages 204-223 *in* S. Buskirk, A. Harestad, M. Raphael, R. Powel, eds. Martens, fishers, and sables: Biology and conservation. Cornell Univ. Press, Ithaca, NY. 484pp.

RUGGIERO, L., D. E. PEARSON, AND S. E. HENRY. In press. Multiscale characteristics of american marten den sites an dimplications for management. J. Wildl. Manage.

SAMSON, F. B., P. ALABACK, J. CHRISTNER, T. DEMEO, A. DOYLE, J. MARTIN, J. MCKIBBEN, M. ORME, L. SURING, K. THOMPSON, B. G. WILSON, D. A. ANDERSON, R. W. FLYNN, J. W. SCHOEN, L. G. SHEA, AND J. L. FRANKLIN. 1989. Conservation of rain forests in Southeast Alaska: report of a working group. N. A. Wildl. and Nat. Res. Conf. 54:121-133.

SAMUEL, M. D., D. J. PIERCE, E. O. GARTON, L. J. NELSON, AND K. R. DIXON. 1985. Identifying areas of concentrated use within the home range. J. Anim. Ecol. 54:711-719.

SAS INSTITUTE, INC. 1996. SAS user's guide: statistics, ver 6.11. SAS Inst., Cary, N.C.

SCHAMBERGER, M. L. AND L. J. O'NEIL. 1986. Concepts and constraints of habitat-model testing. Pages 5-10 *in* J. Verner, M. L. Morrison, and C. J. Ralph, ed. Wildlife 2000 - modeling habitat relationships of terrestrial vertebrates. Univ. Wis. Press, Madison. 470pp.

SCHELL, D. M., S. M. SAUPE, AND N. HAUBENSTOCK. 1988. Natural isotope abundances in bowhead whale (*Balaena mysticetus*) baleen: markers of aging and habitat usage. Pages 260-269, in P. Rundel, J. Ehleringer, and K. Nagy ed. Ecological Studies 68. Springer-Verlag, New York. ?pp.

SEBER, G. 1982. The estimation of animal abundance and related parameters. Macmillan Publ. Co., New York. 654pp.

SIDLE, W. S. AND L. H. SURING. 1986. Management indicator species of the national forest lands of Alaska. U. S. For. Serv. Tech. Publ. R10-TP-2, Juneau. 62pp.

SIMON, T. L. 1988. An ecological study of the marten in the Tahoe National Forest, California. California State Univ. Sacramento, CA. 187pp.

SNYDER, J. E. AND J. A. BISSONETTE. 1987. Marten use of clear-cuttings and residual forest stands in western Newfoundland. Can. J. Zool. 65:169-174.

SOUTIERE, E. C. 1978. The effects of timber harvesting on the marten. Ph.D. thesis. Univ. Maine, Orono. 61pp.

STRICKLAND, M. A. AND C. W. DOUGLAS. 1987. Marten. Pages 531-546 *in* M. Novak, J. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ont. Trappers Assoc., North Bay, Ont. 1150 pp.

SURING, L. H., R. W. FLYNN, AND E. J. DEGAYNER. 1992. Habitat capability model for marten in Southeast Alaska: winter habitat. USDA For. Service, Unpubl. manuscript, Alas. Region, Juneau, AK. 32pp.

SWIHART, R. K. AND N. A. SLADE. 1985. Testing for independence of observations in animal movements. Ecology 66:1176-1184.

TAYLOR, S. L. AND S. W. BUSKIRK. 1994. Forest microenvironments and resting energetics of the American marten, *Martes americana*. Ecography 17:249-256.

THOMPSON I. D. AND A. S. HARESTAD 1994. Effects of logging on American martens with models for habitat management. Pages 355-367 *in* S.W. Buskirk, A. S. Harestad, M. G. Raphael, and R. A. Powell eds., Martens, sables, and fishers: biology and conservation. Ithaca, New York, Cornell Univ. Press. 484pp.

THOMPSON I. D. AND P. W. COLGAN. 1987. Numerical responses of martens to a food shortage in northcentral Ontario. J. Wildl. Manage. 51(4):824-835.

TRITTON, L. M. 1980. Dead wood in the northern hardwood ecosystem. Ph.D. dissertation, Yale Univ., New Haven, Connecticut.

VANCE, J. E. 1990. Tree planning: a guide to public involvement in forest stewardship. British Columbia Public Interest Advocacy Center. Vancouver. 148 pp.

VERNAM, D. J. 1987. Marten habitat use in the Bear Creek Burn, Alaska. M.S. Thesis, Univ. of Alaska, Fairbanks. 72pp.

WECKWERTH, R. P., AND V. D. HAWLEY. 1962. Marten food habits and population fluctuations in Montana. J. Wildl. Manage. 26:55-74.

WHITE, G. C., AND R. A. GARROTT. 1990. Analysis of wildlife radio-tracking data. Academic Press, New York. 383pp.

WILBERT, C. J. 1992. Spatial scale and seasonality of habitat selection by martens in southeastern Wyoming. M. S. thesis, Univ. of Wyoming, Laramie. 91pp.

WYNNE, AND J. A. SHERBURNE. 1984. Summer home range use by marten in northwestern Maine. Can. J. Zool. 62:941-943.

USDA FOREST SERVICE. 1989. Alaska Pulp Corporation long-term timber sale contract 1981-86 and 1986-90 operating periods. Final Supplement to Environmental Impact Statements. USDA For. Serv., R10-MB-81c. Juneau, AK.

——. 1995. Field procedures for the Southeast Alaska inventory. USDA For. Serv., For. Sciences Lab. Anchorage, AK.

——. 1997. Tongass Land And Resource Management Plan. USDA For. Serv. R-10MB 338-CD. Juneau, AK.

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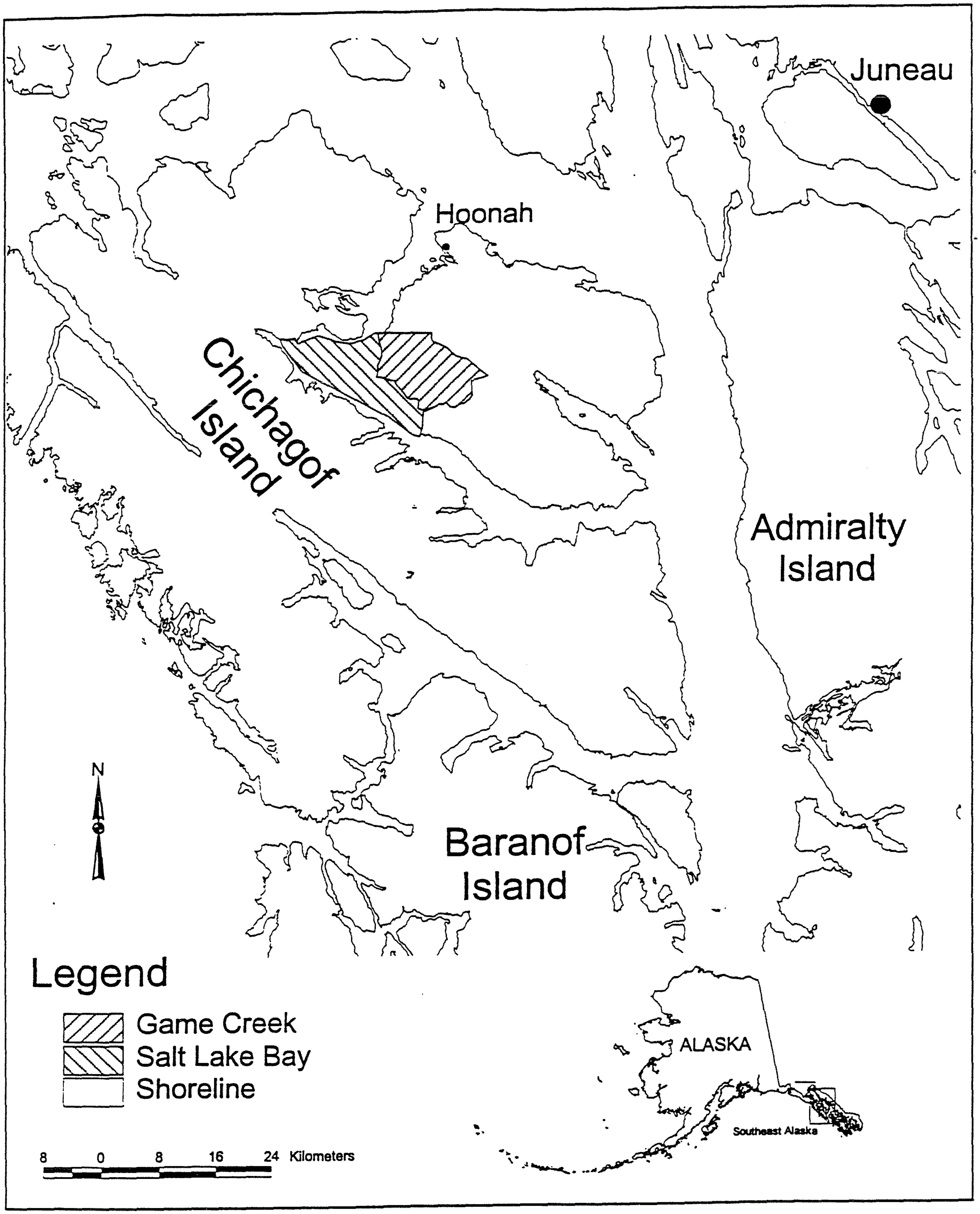


Figure 1 Location map of northern Chichagof Island study areas. The primary study areas at Salt Lake Bay and Upper Game Creek are indicated by cross-hatching.

FIELD PLOT LAYOUT

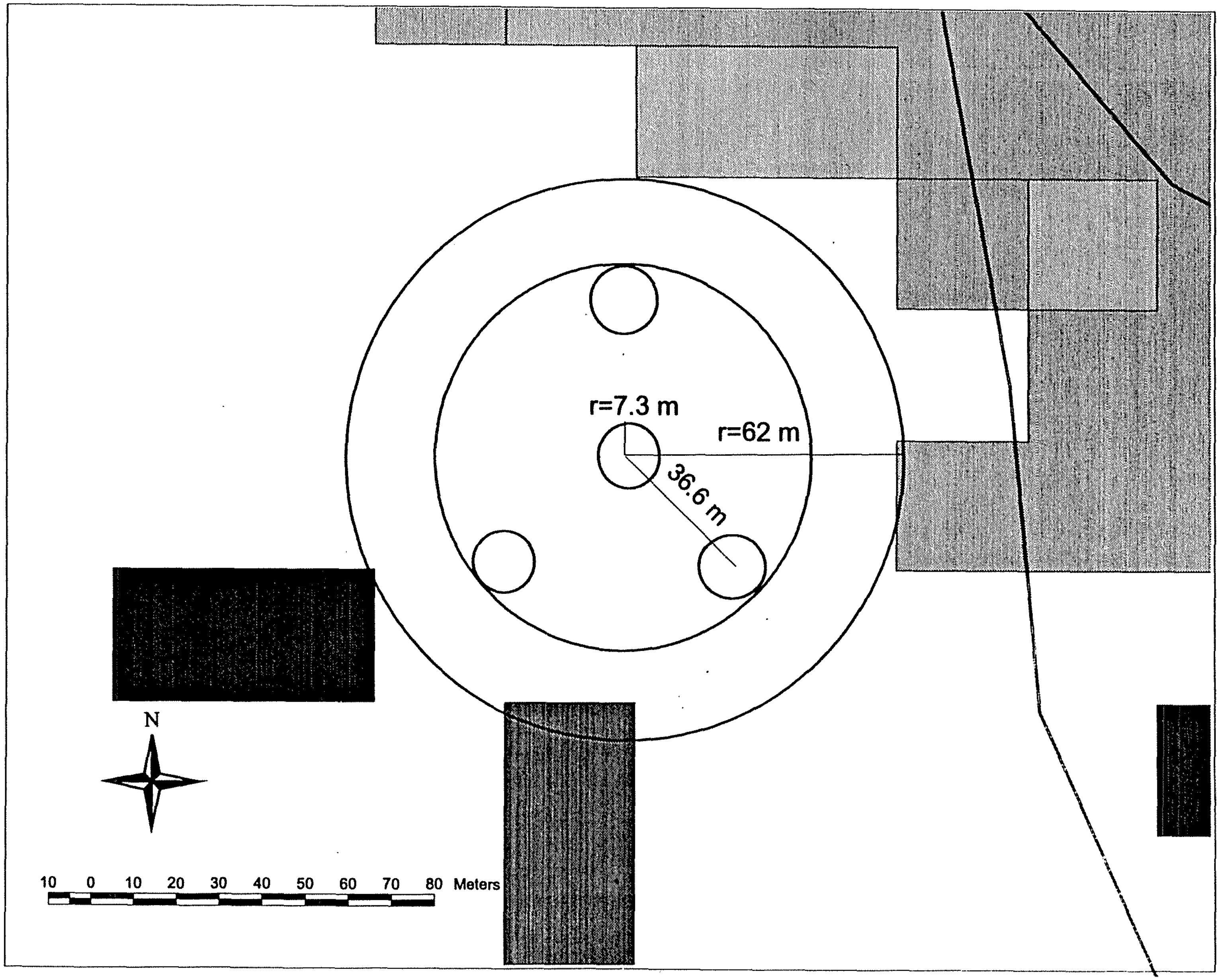


Figure 2 Plot design for field sampling. The outer circle (1.2 ha) established polygon. The cluster of 4 0.017-ha plots was used to describe habitat attributes of polygon

LANDSAT TM Plots

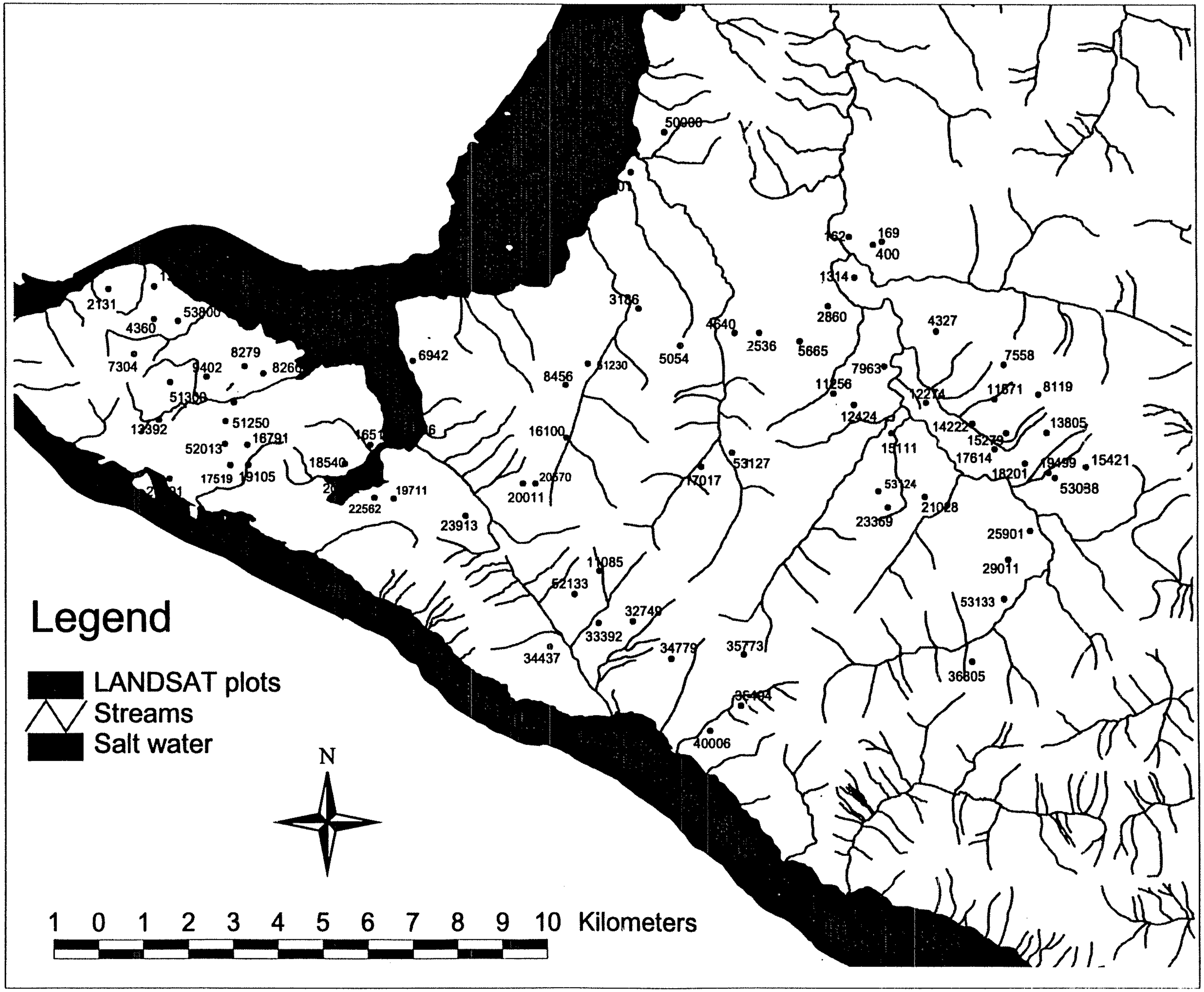


Figure 3 Locations of LANDSAT TM sites on northeast Chichagof Island, Southeast Alaska

Marten Den/rest Plots

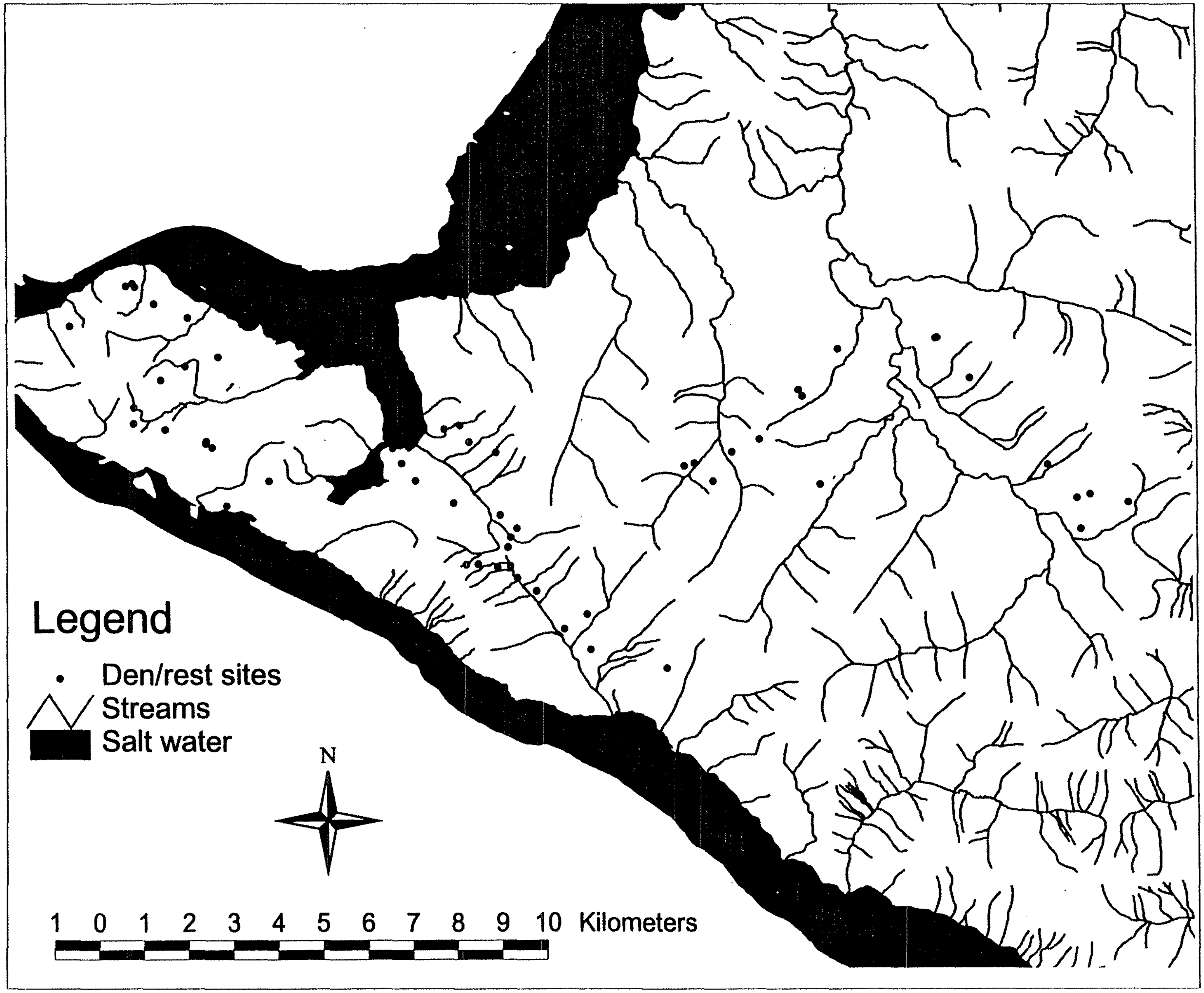


Figure 4 Locations of marten dens and resting sites on northeast Chichagof Island, Southeast Alaska

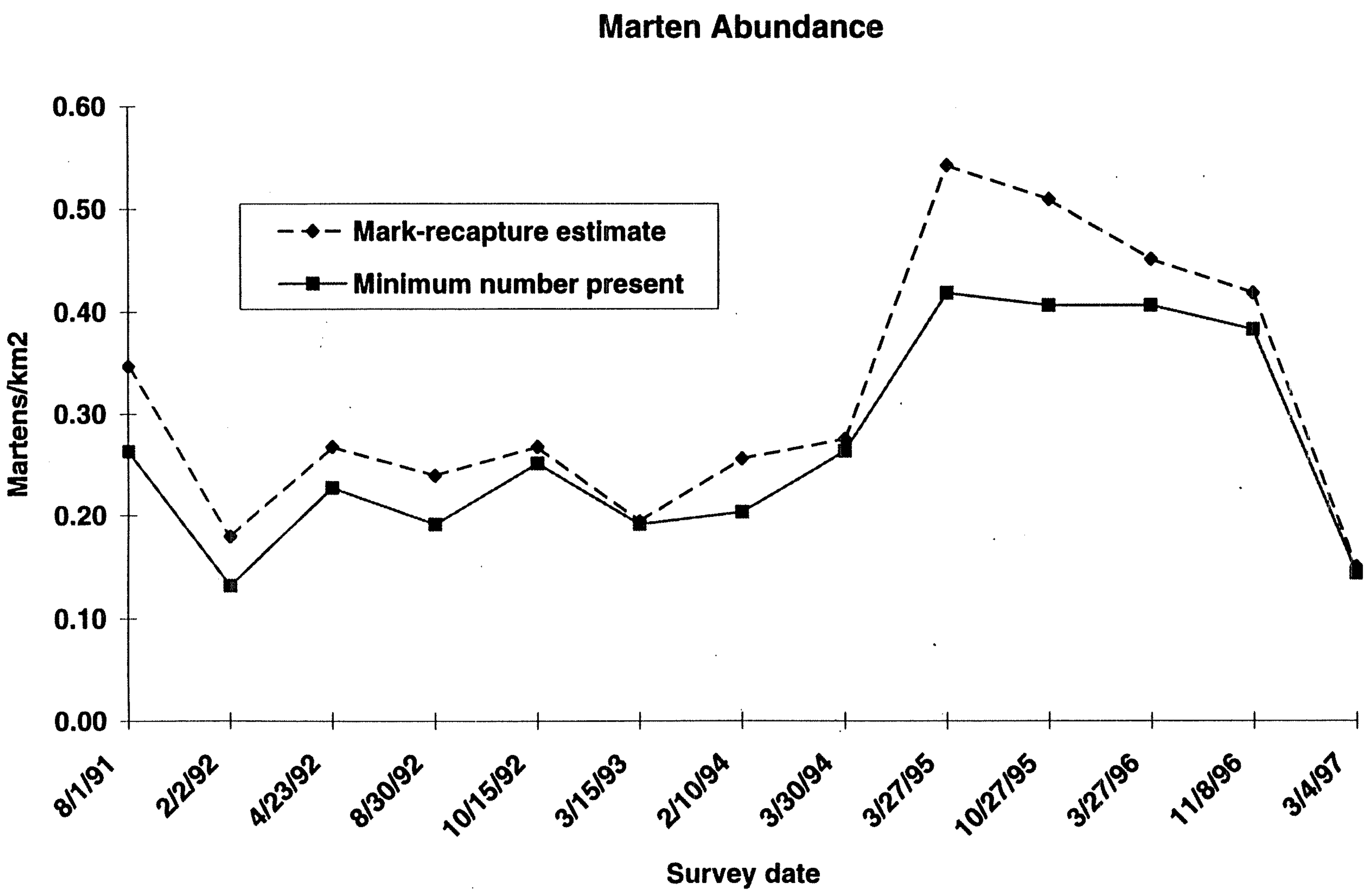


Figure 5 Marten abundance on the Salt Lake Bay study area, northern Chichagof Island, 1991-1997

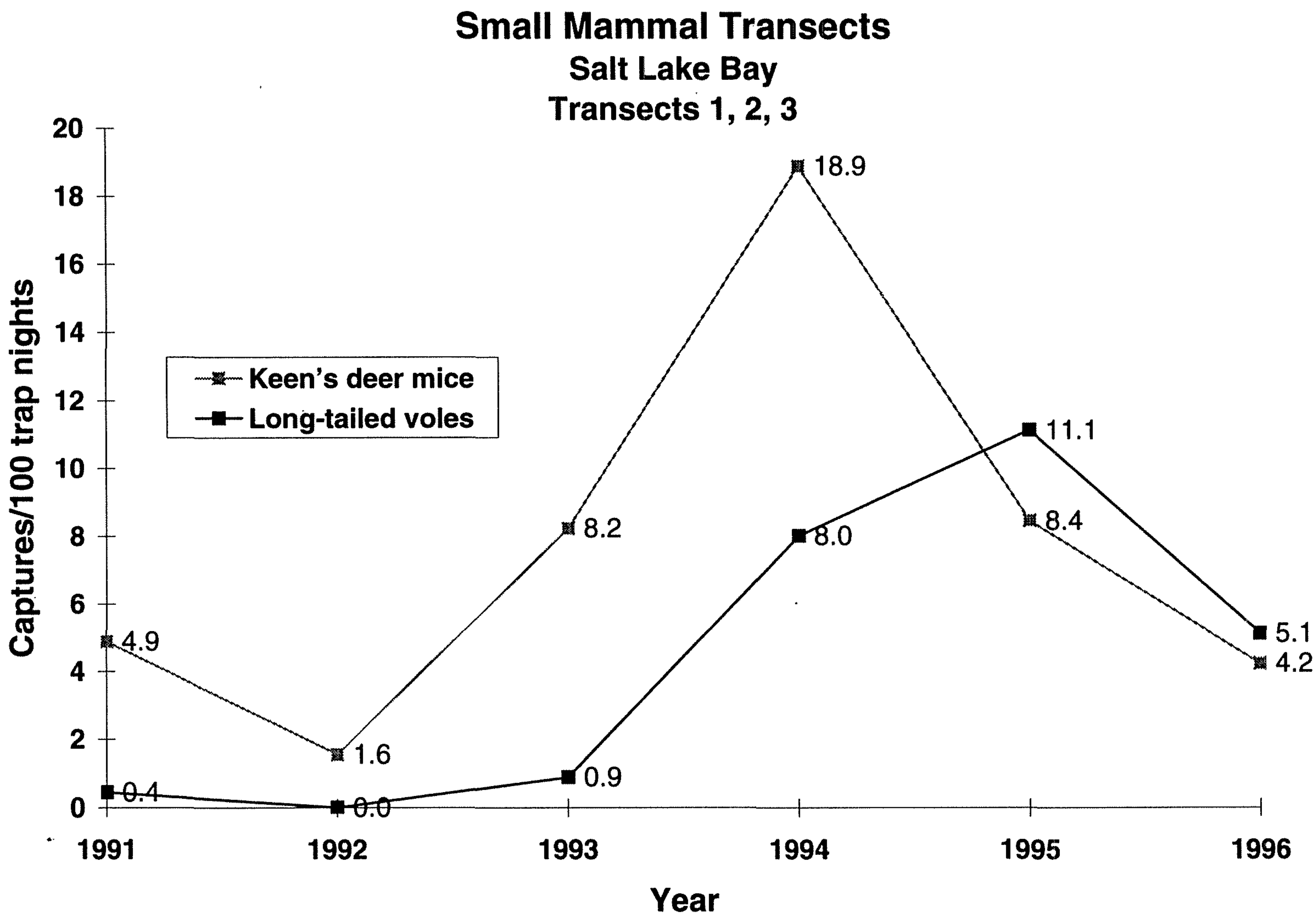


Figure 6 Rodent abundance on northeast Chichagof Island, Southeast Alaska, 1991-1996

Table 1 Current composition of the Salt Lake Bay-Game Creek study area by LANDSAT TM size/structure strata, northeast Chichagof Island, Southeast Alaska

Strata	MAP CODE	No. of polygons > 1.2 ha	Area (acres)	Area (km^2)	Percent (%)
Large/multistoried	13	291	5,939	23.8	11.9
Medium/multistoried	14	479	10,595	42.4	21.1
Intermediate/multistoried	15	327	7,736	30.9	15.4
Small-pole/multistoried	16,17	214	6,404	25.6	12.8
Singlestoried	6,7,8,9	46	1,776	7.1	3.5
Shrub	4	142	2,813	11.2	5.6
Other nonforest	2,3,5	155	11,592	46.4	23.1
Recent clearcuts[a]	18	89	3,244	13.1	6.5
Totals		1,743	50,098	202.7	99.9

[a] Derived from USFS GIS data files, a subset of Other nonforest (7.9%), Shrub (41.4%), Large/MS (14.1%), Medium/MS (23.0%), Intermediate/MS (7.9%), Small/MS (4.4%), and Singlestoried (1.3%) strata.

Table 2 Age, sex, and status of radiocollared martens monitored on northeast Chichagof Island, 1996-1997

Animal no.	Sex	Age class	Date first radiocollared	No. of captures	Study[a] area	Residency[b] status	Survival status[c]
4	M	7	06/13/90	2	SLB	R	Natural death – January
36	M	6	08/02/91	0	SLB	R	Censored - August
45	M	7	11/16/91	0	SLB	R	Trapped - December
48	F	5	02/02/92	1	SLB	R	Trapped - December
56	F	7	04/27/92	3	SLB	R	Natural death - May
84	F	5	04/27/93	1	SLB	R	Trapped - December
88	M	3	09/26/93	4	SLB	R	Trapped - December
89	F	3	09/26/93	1	SLB	R	Trapped - December
120	F	4	02/15/94	6	SLB	R	Survived
124	M	5	04/02/94	3	SLB	R	Survived
162	M	2	10/22/94	10	SLB	R	Survived
163	F	2	03/21/97	2	SLB	R	Survived
167	M	2	07/21/95	8	SLB	R	Trapped - December
179	M	2	12/12/94	3	SLB	R	Survived
183	M	3	10/30/95	2	SLB	R	Trapped - December
184	F	3	07/21/95	4	SLB	R	Survived
188	F	2	10/07/95	6	SLB	R	Survived
191	M	2	5/30/97	8	SLB	R	Survived
193	M	1	3/23/95	14	SLB	R	Survived
196	M	1	10/01/96	4	SLB	R	Trapped - December
199	M	1	10/06/95	1	SLB	R	Censored - November
200	M	1	10/27/95	4	SLB	R	Censored - March
202	M	1	10/03/95	11	SLB	R	Censored - November

Table 2 Continued

Animal no.	Sex	Age class	Date first radiocollared	No. of captures	Study[a] area	Residency[b] status	Survival status[c]
207	M	2	10/27/95	5	SLB	R	Trapped - December
213	M	3	10/27/95	2	SLB	R	Trapped - December
216	M	1	10/12/96	4	SLB	R	Survived
220	F	1	05/28/97	2	SLB	R	Survived
233	F	2	06/15/97	3	SLB	R	Survived
236	M	3	04/29/97	4	GC	R	Survived
274	M		03/01/97	4	SLB	T	Natural death - June
275	M		06/14/97	3	SLB	R	Survived
279	F		04/27/97	2	GC	R	Censured - June
282	M		05/30/97	2	SLB	R	Survived

[a] SLB = Salt Lake Bay and GC = Game Creek.
[b] R = resident or T = transient.
[c] The animal was considered censored for the survival analysis when the radio signal was not found after the month listed.

Table 3 Age and sex of other martens captured on northeast Chichagof Island, 1996-1997. These individuals were marked with only eartags.

Animal no.	Sex	Age class	Date first captured	No. of captures	Study[a] area	Status
41[b]	M	5	10/15/91	1	GC	Unknown
150[b]	M	2	10/02/94	1	GC	Trapped
151[b]	M	2	10/03/94	4	GC	Trapped
174	M	3	12/10/94	2	SLB	Unknown
209	M	1	10/07/95	1	SLB	Unknown
232	M	2	03/31/96	1	SLB	Unknown
234	M	1	05/08/96	1	GC	Unknown
241	M	5	05/11/96	1	GC	Trapped
246	F		07/27/96	1	SLB	Trapped
247	M		07/27/96	1	SLB	Trapped
248	M		07/27/96	4	GC	Unknown
249	M		07/31/96	2	SLB & GC	Unknown
250	M		08/09/96	1	GC	Unknown
251	F		08/10/96	1	GC	Unknown
252	F		08/16/96	1	GC	Unknown
253	F		08/16/96	1	GC	Unknown
254	M		10/02/96	3	SLB	Unknown
255	M		10/03/96	2	SLB & GC	Unknown
256	M		10/04/96	1	SLB	Unknown
257	F		10/12/96	2	SLB	Unknown
258	M		10/12/96	1	SLB	Unknown
259	F		10/18/96	1	GC	Unknown
260	M		10/18/96	3	GC	Trapped
261	M		10/18/96	1	GC	Trapped
262	M		10/18/96	1	GC	Unknown
263	M		10/21/96	1	GC	Trapped
264	M		10/22/96	1	GC	Unknown
265	M		10/22/96	1	GC	Unknown
266	M		11/13/96	2	SLB	Unknown
267	F		11/10/96	1	SLB	Trapped

Table 3 Continued

Animal no.	Sex	Age class	Date captured	No. of captures	Study[a] area	Status
268	F		11/11/96	1	SLB	Unknown
269	M		11/12/96	2	SLB	Trapped
270	F		11/13/96	1	SLB	Unknown
271	F		11/13/96	1	SLB	Unknown
272	M		02/28/97	4	SLB	Unknown
273	M		03/01/97	1	SLB	Unknown
276	F		03/22/97	1	SLB	Unknown
277	F		03/22/97	1	SLB	Unknown
278	F		04/27/97	2	GC	Unknown
280	F		05/02/97	2	GC	Unknown
281	F		05/01/97	1	GC	Unknown

[a] GC = Game Creek; SLB = Salt Lake Bay
[b] Animal had been radiocollared previously

Table 4 Number of random field plots and exact matches with LANDSAT TM size class map

Landcover strata	Code	No. of sites	Exact[a] matches	Acceptable matches	Percent acceptable
1. Shrub	4	8	8	8	100
2. Singlestoried	7,8	2	2	2	100
3. Large/MS	13	5	4	4	80
4. Medium/MS	14	6	2	4	67
5. Intermediate/MS	15	6	3	4	67
6. Small-pole/MS	16, 17	6	6	6	100
7. Recent clearcuts	18				
8. Other nonforest	2,3,5	8	7	8	100
Total		41	32	36	88

[a] The percentage of exact matches was 78% with an "acceptable" match of 88%. Considering only forested types, the exact match percentage would be 68% with an "acceptable" match of 80%.

Table 5 Number of trees/snags by size class by LANDSAT TM mapped size strata for random sites, northeast Chichagof Island, Southeast Alaska. Plots represent the aggregation of 4 0.017-ha subplots per site or 0.07 ha

Landcover strata	No. plots	No. large[a] trees		No. medium[b] trees		No. interm.[c] trees		No. small[d] trees		All[e] trees	
		$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
1. Shrub	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Singlestoried	2	0.5	0.5	1.0	1.0	7.0	4.0	30.0	4.0	38.5	9.5
3. Large/MS	5	2.4	0.7	3.0	1.3	4.6	0.6	9.0	2.5	19.0	2.0
4. Medium/MS	6	1.7	0.6	2.5	0.4	7.8	1.4	9.8	1.6	21.8	1.9
5. Intermediate/MS	6	1.2	1.0	3.0	0.9	6.5	1.4	8.3	1.9	19.0	1.8
6. Small-pole/MS	6	0.3	0.2	1.0	0.8	2.5	1.0	13.2	3.7	17.0	5.3
7. Recent clearcuts	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. Other nonforest	8	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.4	0.3

[a] Large trees > 820 mm diameter at breast height (dbh)
[b] Medium trees = 590 – 819 mm dbh
[c] Intermediate trees = 385 – 589 mm dbh
[d] Small trees = 230 – 384 mm dbh
[e] All trees > 230 mm dbh

Table 6 Number of trees/snags by size class by LANDSAT TM mapped size strata for marten den/rest sites, northeast Chichagof Island, Southeast Alaska. Plots represent the aggregation of 4 0.017-ha subplots per site or 0.07 ha

Landcover strata	No. plots	No. large[a] trees		No. medium[b] trees		No. interm.[c] trees		No. small[d] trees		All[e] trees	
		$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
1. Shrub	0										
2. Singlestoried	0										
3. Large/MS	6	2.5	0.9	2.5	0.5	3.1	0.9	4.5	1.2	12.7	1.2
4. Medium/MS	9	2.1	0.6	2.9	0.6	6.7	1.3	8.9	1.7	20.6	3.1
5. Intermediate/MS	17	1.1	0.4	2.4	0.4	6.1	0.8	10.9	1.7	20.5	2.0
6. Small-pole/MS	10	0.4	0.2	2.2	0.4	5.1	1.1	11.8	2.5	19.5	3.2
7. Recent clearcuts	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. Other nonforest	0										

[a] Large trees > 820 mm diameter at breast height (dbh)
[b] Medium trees = 590 – 819 mm dbh
[c] Intermediate trees = 385 – 589 mm dbh
[d] Small trees = 230 – 384 mm dbh
[e] All trees > 230 mm dbh

Table 7 Number of trees/snags by size class by LANDSAT TM mapped size strata for all sites, northeast Chichagof Island, Southeast Alaska. Plots represent the aggregation of 4 0.017-ha subplots per site or 0.07 ha

Landcover strata	No. plots	No. large[a] trees		No. medium[b] trees		No. interm.[c] trees		No. small[d] trees		All[e] trees	
		$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
1. Shrub	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Singlestoried	2	0.5	0.5	1.0	1.0	7.0	4.0	30.0	4.0	38.5	9.5
3. Large/MS	11	2.5	0.6	2.7	0.6	3.8	0.6	6.5	1.4	15.5	1.4
4. Medium/MS	15	1.9	0.4	2.7	0.4	7.1	1.0	9.3	1.1	21.1	2.0
5. Intermediate/MS	23	1.1	0.4	2.5	0.4	6.2	0.7	10.3	1.4	20.1	1.6
6. Small-pole/MS	16	0.4	0.2	1.8	0.4	4.1	0.8	12.3	2.1	18.6	2.8
7. Recent clearcuts	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. Other nonforest	8	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.4	0.3

[a] Large trees > 820 mm diameter at breast height (dbh)
[b] Medium trees = 590 – 819 mm dbh
[c] Intermediate trees = 385 – 589 mm dbh
[d] Small trees = 230 – 384 mm dbh
[e] All trees > 230 mm dbh

Table 8 Mean numbers of trees/plot by tree size class for each map strata. All map strata differed significantly for at least one tree-class variable (ANOVA, alpha = 0.01)

Tree class variable[1]			Strata means[2]			
Large trees						
	Large/MS	Medium/MS	Intermediate/MS	SS	Small/MS	NF
	2.5^{a}	1.9^{ab}	1.1^{bc}	0.5^{abcd}	0.4^{c}	0.0^{d}
Medium trees						
	Large/MS	Medium/MS	Intermediate/MS	Small/MS	SS	NF
	2.7^{a}	2.7^{a}	2.5^{a}	1.8^{a}	1.0^{ab}	0.0^{b}
Intermediate trees						
	Medium/MS	SS	Intermediate/MS	Small/MS	Large/MS	NF
	7.1^{a}	7.0^{ab}	6.2^{ab}	4.1^{b}	3.8^{b}	0.1
Small trees						
	SS	Small/MS	Intermediate/MS	Medium/MS	Large/MS	NF
	30.0	12.3^{a}	10.3^{ab}	9.3^{ac}	6.5^{bc}	0.3
All trees						
	SS	Medium/MS	Intermediate/MS	Small/MS	Large/MS	NF
	38.5	21.1^{a}	20.1^{a}	18.6^{a}	15.5^{a}	0.4

[1] Tree classes defined are as follows: Large trees = number of trees > 820 mm diameter at breast height (dbh); Medium trees = number of trees 590 – 819 mm dbh; Intermediate trees = number of trees = 385 – 589 mm dbh; Small trees = number of trees 230 – 384 mm dbh; All trees = number of trees > 230 mm dbh

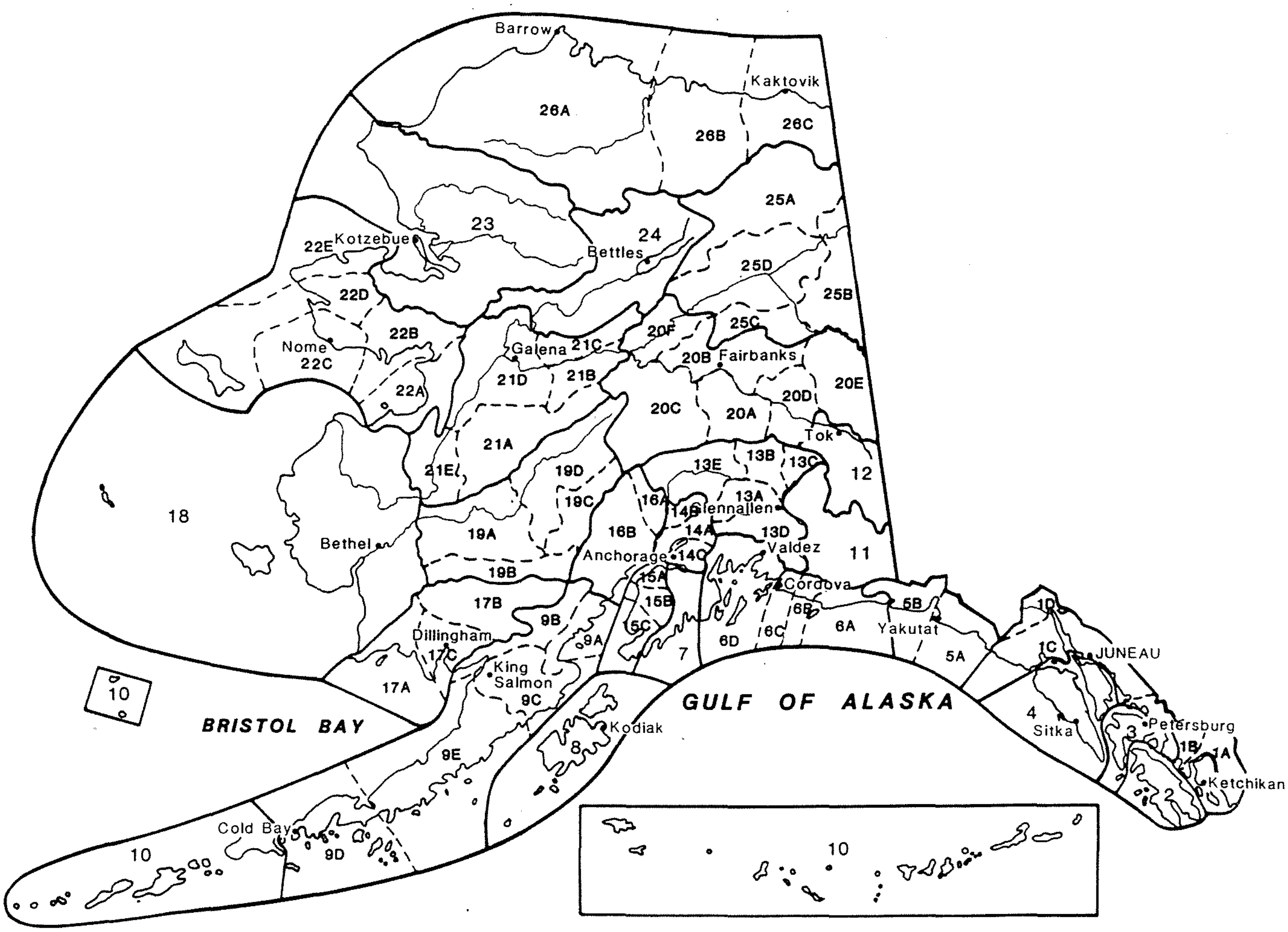
[2] Strata means with the same letter were not significantly different (Tukey's Studentized Range test, alpha = 0.1). SS = singlestoried and NF = nonforest strata.

Table 9 Age, sex, and location of marked martens that were taken by trappers during December 1996

Animal no.	Sex	Age class	Date first captured	Mark	Original capture[a] site	Trapped location
0[b]				Radio[c]		Tenakee Springs
0[b]				Radio[c]		Lower Game Cr.
45	M	7	11/16/91	Radio	SLB	SLB
48	F	5	02/02/92	Radio	SLB	SLB
79	M	6	12/20/92	Radio[c]	SLB	Freshwater Bay
80	M	7	01/15/93	Radio	SLB	SLB
84	F	5	04/27/93	Radio	SLB	Lower Game Cr.
88	M	3	09/26/93	Radio	SLB	SLB
89	F	3	09/26/93	Radio	SLB	SLB
121	M	3	03/29/94	Radio[c]	SLB	Flynn Cove
126	M	3	04/29/94	Eartag	Upper Game Cr.	Lower Game Cr.
138	F	2	07/19/94	Radio[c]	Freshwater Bay	Lower Game Cr.
150	M	2	10/02/94	Eartag[d]	Upper Game Cr.	Lower Game Cr.
151	M	2	10/03/94	Eartag[d]	Upper Game Cr.	Lower Game Cr.
167	M	2	07/21/95	Radio	SLB	SLB
183	M	3	10/30/95	Radio	SLB	SLB
196	M	1	10/01/96	Radio	SLB	SLB
203	M	1	10/03/95	Eartag	SLB	Lower Game Cr.
213	M	3	10/27/95	Radio	SLB	SLB
225	M	2	03/28/96	Eartag	SLB	South Chichagof
226	M	2	03/28/96	Eartag	SLB	Lower Game Cr.
229	M	3	03/30/96	Eartag	SLB	SLB
230	M	3	03/30/96	Eartag	SLB	South Chichagof
241	M	5	05/11/96	Eartag	Upper Game Cr.	Lower Game Cr.
246	F		07/27/96	Eartag	SLB	Freshwater Bay
247	M		07/27/96	Eartag	SLB	Spaski Cr.
260	M		10/18/96	Eartag	Upper Game Cr.	Lower Game Cr.
261	M		10/18/96	Eartag	Upper Game Cr.	Lower Game Cr.
263	M		10/21/96	Eartag	Upper Game Cr.	Lower Game Cr.
267	F		11/10/96	Eartag	Upper Game Cr.	Lower Game Cr.
269	M		11/12/96	Eartag	SLB	Tenakee Springs
271	F		11/13/96	Eartag	SLB	Southwest Chichagof I.

[a] GC = Game Creek; SLB = Salt Lake Bay
[b] Unable to determine animal number
[c] Radiocollar not working at death
[d] Previously radiocollared, collar had been removed before death

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.

Tom Schumacher