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Stikine River Moose Study

Wildlife Evaluation of Stikine-Iskut Dams

by

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SUMMARY

Twenty-four moose (Alces alces andersoni) were marked with numbered collars and fitted with radio transmitters in the Stikine River valley and were monitored between 14 March 1982 and 6 April 1983. Home range size of cows ranged from 446 ha to 4,936 ha. Bull home range sizes varied from 1,593 ha to 4,688 ha.

Vegetation surveys, use transects, and telemetry data indicated that Salix spp. and Cornus stolonifera were the primary browse species, while other plants used were Vaccinium spp., Populus balsamifera trichocarpa, Ribes bracteosum, Viburnum edule, and Malus fusca. Alnus-Salix ecotone was used more often than Picea, Populus, and Tsuga habitats in winter. Alnus-Salix habitat adjacent to or interspersed with Populus was used early in the winter and Picea ecotones were used later. Habitats in which Salix and/or Cornus comprised less than 25% cover received little use.

Proposed dam construction on the Stikine and Iskut Rivers is expected to eventually reduce the amount of moose browse and wintering habitat in the Alaska portion of the river. After dam construction, moose numbers and harvest success are expected to increase temporarily, then decline over an extended period as early successional stages of vegetation are replaced by climax vegetation.

BACKGROUND

This study was initiated in 1982 to provide data on Alaska's Stikine moose population and its habitat requirements, and to help predict impacts that may result from changes in the hydrological regime. Moose are the major big game species along this section of the Stikine; this is the largest Alaskan moose herd south of Juneau, and there is considerable local interest and concern for Stikine moose.

The British Columbia Hydro and Power Authority (B.C. Hydro) has proposed construction of 5 hydroelectric dams on the Stikine and Iskut River drainages in British Columbia. Most of B.C. Hydro's environmental impact studies have been carried out in British Columbia (McCourt Management Limited 1982, B.C. Hydro 1982, and others), although some studies have been done in Alaska by Beak Consultants Ltd. (1982).

Two of the 5 dams are proposed for the Grand Canyon of the Stikine; the closest to Alaska is 230 km (142.9 mi) upstream from the U.S. border. The remaining 3 dams are proposed for the Iskut River, a tributary of the Stikine; the closest to Alaska is 78 km (48.8 mi) upstream from the U.S. border. Among the expected hydrological effects on the Alaska portions of the Stikine are

changes in mean water levels, sediment loads, flood magnitude and duration, mean water temperature, and stream morphology. Changes in these physical factors can result in changes in vegetative succession (Gill 1973, Teversham and Slaymaker 1976, Church and Rood 1982) potentially affecting moose habitat.

We studied several aspects of the moose population, including moose population status and productivity, habitat availability and utilization, relative use of vegetation successional stages, seasonal movements and distribution, winter food habits and preferences, winter range conditions, and winter habitat utilization and preferences.

OBJECTIVES

To assess condition, productivity, and status of the Stikine moose population.

To determine seasonal habitat selection, movements, and distribution of Stikine moose.

To describe winter food habits, food availability and utilization, and winter range conditions.

To determine critical habitat types and areas during late winter and early spring.

To predict, if possible, impacts of the proposed B.C. Hydro dams on moose populations and habitat along the Stikine River in Alaska.

STUDY AREA

The Alaska portion of the Stikine River flows through a steep valley 2-3 km wide. The study area encompassed the Stikine drainage and delta in Alaska and parts of adjacent drainages (Fig. 1). The central study area consisted of about 142 km^2 (55 mi^2) of moose range at latitude 56° 41'N, longitude 132° W. The Stikine delta is the largest intertidal wetland in southeast Alaska and consists of 200 km^2 (77 mi^2) of marsh and tidal flats.

Important moose winter range consists of the following plant communities in successional order. Newly exposed riverbanks are colonized by Equisetum variegatum, E. arvense, and E. fluviatile with Salix alaxensis and S. interior as the predominant willows. S. sitchensis and S. barclayi colonize older pioneer stands as do Alnus rubra and Populus balsamifera trichocarpa seedlings. As Alnus and Populus develop, S. alaxensis is less common although S. sitchensis and S. barclayi often remain in more open habitats. Mature Populus stands develop on elevated river terraces with Malus fusca occasionally invading these stands. In shrub stands

without an overstory and in Populus stands, major species include Rubus spectabilis, Cornus stolonifera, Echinopanax horridum, Sambucus racemosa, Viburnum edule, Ribes bracteosum, and Picea sitchensis seedlings. In well-drained areas with favorable conditions, mature P. sitchensis stands develop with an understory of Rubus, Echinopanax, Viburnum, and some Cornus and Vaccinium sp. Mixed Picea/Populus stands occur in well-drained sites. At higher elevations along the valley wall, Picea is interspersed with Tsuga heterophylla with increasing amounts of Vaccinium in the understory. Numerous slide areas along the valley wall are dominated by stands of Alnus, Salix, and Cornus.

Near the delta, annual precipitation is between 200 and 400 cm. The study area is at an interface between 2 weather systems: a maritime climate with saturated air masses, and drier air masses funneling down the Stikine valley from the Canadian interior. This movement of drier air creates winds up to 50 knots in the study area. In winter, when high pressure areas predominate along the coast, the wind blows downstream and warm coastal air encounters the colder interior air creating snow or rain. In summer, high pressure areas occur over the interior and wind direction is often upriver. The wind affects patterns of precipitation and the drifting of silt loess and snow.

During winter 1981-82, river ice did not break up until 28 April. Winter 1982-83 was milder and breakup occurred on 7 April. Bud break on Cornus and Salix on the lower sections of the river began in mid-May 1982 and mid-April 1983. The upper sections of the river (above Kakwan Point) were phenologically later than the lower portion by 1 week in both years. The river froze by 24 November 1982.

PROCEDURES

A sample of 20 moose (16 cows and 4 bulls) were immobilized and radio-collared on wintering areas from 11-13 March 1982. An additional 4 cows were radio-collared on 15 and 16 January 1983. Moose were located and darted from a Hughes 500 helicopter. Darts for adult moose contained 8 cc of 1 mg/cc etorphine hydrochloride (M-99, D-M Pharmaceuticals, Rockville, MD) and 2 cc of 100 mg/cc xylazine hydrochloride (Rompun, Chemagro, Kansas City, MO); this was reduced to about 7 cc total mixture for subadult moose. Darts were delivered with a Cap-Chur gun (Palmer Equipment Company, Douglasville, GA).

When possible, blood and hair samples were collected, body measurements (total length, chest girth, and hind foot length) were taken, an incisor tooth was removed, and body condition was evaluated. Tests for hemoglobin content (Hb) and packed cell volume (PCV) were run within 30 hours of collection, and serum samples were frozen for blood chemistry analysis (Franzmann and LeResche 1978) and disease diagnosis. Moose were fitted with a radio-transmitter (Telonics, Mesa, AZ) and a numbered visual collar (Denver Tent and Awning, Denver, CO). Numbered monel eartags were placed in each ear.

Population Estimation and Composition

Population estimates were derived using the Lincoln-Peterson Index method. Counts were conducted on 3 occasions in key wintering areas using a Hughes 500 helicopter and 2 or 3 observers.

Sex and age composition counts were made during flights on 11-13 March, 4 November, and 4 December 1982. Males were sexed by presence of antlers or absence of white vulva patch.

Movements and Distribution of Radio-collared Moose

A total of 32 radio-location flights were made in fixed-wing aircraft at approximately 2-week intervals between 14 March 1982 and 6 April 1983 except during the hunting season (15 September to 15 October). In addition, moose were occasionally radio-located from the ground. Locations were plotted on USGS 1:63,360 topographic maps (Appendix A).

Winter Habitat Use, Availability, and Preference

Habitat use by radio-collared moose was estimated during aerial and ground surveys as the percent cover of overstory and percent cover of understory within an area about 50 m in radius around each moose. Overstory classifications were cottonwood (Populus), spruce (Picea), hemlock (Tsuga), or percent cover of each. Understory was classified as alder-willow (Alnus-Salix), open alder-willow, open, or muskeg.

Documentation of habitat use in late winter was further refined by counting moose tracks and bedding sites along 17 winter transects from 23 February to 13 March 1983. Three initial transects were situated from the river to the valley wall in 3 key wintering areas (Fig. 2). The remaining 14 transects were established parallel to the first 3 at 0.4 km (0.25 mi) intervals. Transect length varied from 180-3,220 m. Two observers walked transects: one pulled a 20 m cable and recorded snow depth at each station, while the other recorded habitat type and number of tracks and bedding sites in a plot 5 m on both sides of the 20 m transect (10 x 20 m). We used records of habitat type in these 10 x 20 m plots (n = 1,453) to calculate habitat availability.

We further documented relative habitat use in key wintering areas by counting pellet groups in 10, 0.001-acre (0.0004-ha) plots along each of 40 late winter and early spring browse transects. For 6 successional stages, we weighted relative habitat use by dividing the number of pellet groups by the number of transects in each successional stage, and expressed the value on a percent basis.

We calculated indices to habitat preference by dividing percent use of habitat types by percent availability, and expressed indices on a percent basis. This resulted in indices of habitat preference based upon radio locations, tracks, bedding sites, and pellet groups.

An additional survey of plant community composition was made during spring transects in May 1983 (Appendix B).

Winter Food Habits and Utilization

We established 17 browse transects in May and June 1982 representing the major successional stages in key winter areas (Boertje and Young 1982). Replicate data from these transects were gathered in April and May 1983, and 6 additional transects were established.

Transect design followed that described by Doerr et al. (1980), with transects 300 steps (100 stations) in length. We located the nearest shrub species and closest browse species in a 180° arc in front of each station. We recorded availability class, form class, utilization class, and number of twigs browsed out of 10 randomly selected twigs for the closest browse species (Boertje and Young 1982). At 10-station intervals along each transect, we established milacre (0.0004 ha) plots to estimate percent cover of overstory and understory species.

RESULTS AND DISCUSSION

Population Estimation, Composition, and Status

The post-hunting season moose population estimate for the survey area (Fig. 2) ranged from 160-301 using the Lincoln-Peterson Index (Table 1). Factors responsible for the variation in population estimates included variable flying conditions, visibility, number of observers, areas surveyed (Fig. 2), and pilot expertise. We feel the best estimate is 300 moose.

Composition counts indicated a low post-season bull/cow ratio of 3 to 5 bulls/100 cows (Table 2), primarily due to the high harvest of yearling bulls (Young 1981, Boertje and Young 1982). Rausch and Bratlie (1965) found a similar ratio of 5 bulls/100 cows in the Matanuska Valley with no deleterious effects on herd productivity. Composition counts indicated a winter calf/cow ratio of 23-38 calves/100 cows including 14-23 twins/100 cows (Table 2). Doerr (pers. comm.) found 50 calves/100 adults on the Stikine in March 1981.

We feel the Stikine moose population is stable, or more likely, increasing slightly. This is substantiated by consistent harvest levels from 1952-82 (Boertje and Young 1982) and by increased moose sightings in adjacent drainages and on nearby islands in recent years indicating an expanding population (Young 1981).

We used a population estimate of 300 moose (Table 1) and December 1982 composition data (Table 2) to derive a conservative winter population model of 225 cows, 63 calves, and 12 bulls. If the annual calf recruitment consists of about 31 bulls and 31 cows, then 43 legal bulls would be present prior to the hunting season (assuming no natural mortality). Since the herd sustained an annual harvest level of 32 to 33 bulls from 1980 to 1982, the minimum population must be at least 300 moose. While emigration and immigration undoubtedly occur, this study indicates that it is fairly low (Appendix A), and movement across the International Boundary was discounted in the population model.

Mortality

The neonatal calf population could not be accurately assessed, since dense understory precluded calf observations in late May through October. Of 16 marked cows with 9 calves in 1982, 15 cows and at least 7 calves survived until March 1983. The oldest marked cow was 14.5 years old, while 2 cows were 2.5 years old (Table 3).

We found 2 unmarked moose dead during winter 1981-82 from unknown causes, possibly wolf predation. During winter 1982-83, at least 2 cows died of unknown causes, 1 with pink bone marrow indicating poor health. Wolves utilized the carcasses, but there was no evidence of wolf-caused mortality. We received unsubstantiated reports of 2 additional cow deaths during winter 1982-83. Captured moose were found to be in healthy condition according to blood parameters (Table 4). Serum samples were found to be free of indications of infectious bovine rhinotracheitis, bovine viral diarrhea, or parainfluenza III (R. Zarnke, pers. comm.). Two of 4 collared bulls were killed during the 1982 hunting season, and a third was shot illegally after the season. The remaining bull was taken by hunters in September 1983.

Density and Group Size

Total year-round moose range in the study area consists of about 142 km^2 (55 mi^2). We estimated density at 2.2 moose/km^2. Doerr (1983) estimated a similar density (2.3 moose/km^2) for the Stikine, while Peek et al. (1976) considered 1.96 moose/km^2 as a high on a Minnesota study area and Gasaway et al. (1983) reported a peak population of 1.5 moose/km^2 on an interior Alaska range. We considered 74 km^2 (28.6 mi^2) to be winter moose habitat (see Winter Habitat Use, Availability and Preference) and calculated a winter habitat density of 4.0 moose/km^2.

During the period 4 November-22 March, we found mean group sizes of 2.2 (+ 0.2) for marked moose and 2.3 (+ 0.1) for unmarked moose. Rolley and Keith (1980) found winter aggregations in Alberta of 1.8 moose/group to be independent of population density. Group sizes on the Stikine varied with season: winter,

2.7 moose/group (n = 180); late winter, 2.4 (n = 176); spring, 1.6 (n = 46); summer, 1.4 (n = 34); and fall, 2.5 moose/group (n = 80). Smaller group sizes during spring and summer may have resulted from poor sightability.

Movements and Distribution of Radio-collared Moose

We plotted year-round home ranges for 20 radio-collared moose and winter ranges alone for 4 others (Appendix A). Six moose had separate summer and winter home ranges (Table 3). Total home range sizes of cows (n = 16) varied from 466 hectares (1.8 mi^2) to 4,936 hectares (19.1 mi^2). Bull home range sizes (n = 4) ranged from 1,593 ha (6.7 mi^2) to 4,688 ha (18.1 mi^2).

Moose were most often found at lower elevations. Maximum elevations used by moose ranged from less than 100 feet to 2,000 feet. Sixty percent of the cows were always located at 100 feet or less, while the remaining 40% were sometimes found above 500 feet but always below 2,000 feet (Table 3).

Several moose left the Stikine from late April to early June, moving into tributary or adjacent drainages. One moose left the lower winter range (Fig. 3) via Andrew Creek and summered in adjacent Horseshoe Basin in the Porterfield Creek drainage. Five animals moved via North Arm Creek to the Thunder Creek drainage of LeConte Bay. Moose wintering above the mouth of Ketili River did not have separate winter and summer home ranges. Sergief Island and the adjacent portion of Farm Island are known to have been used as wintering areas in past years, but very few moose were observed there during winters 1981-82 and 1982-83.

Winter Habitat Use, Availability, and Preference

Aerial observations of radio-collared moose indicated that they were more often associated with early successional stages and ecotones than with more advanced successional stages throughout the year (Table 5). Counts of tracks, bedding sites, and pellet groups (Table 6) provided a more refined assessment of habitat use. Our data show that alder-willow ecotones were used most frequently.

Radio locations and pellet group surveys indicated a winter preference for mixed Picea-Populus stands or pure Populus stands (Table 7). Late winter track and bed counts showed a declining use of Populus but increased use of Alnus-Salix-Picea ecotones. This late winter affinity for Picea is likely associated with increasing snow accumulation in Populus stands which provide little snow interception. Picea stands were much preferred as bedding areas. Stikine moose obviously thrive where there is a diverse mix of habitat types.

Winter track and bedding observations indicated that moose sought shelter in mature spruce stands during rain, heavy snow, and strong winds. Peek et al. (1976), VanBallenberghe and Peek (1971), and others also reported moose use of conifers for shelter during heavy snowfall.

In studies by Nasimovich (1955), Kelsall and Prescott (1971), and Coady (1974), snow depths greater than 76 cm were found to restrict moose movements. Average snow depth on the Stikine study area was 161 cm during winter 1982-83 (Table 8). Since snow in the study area was generally wet and heavy, thick crusts often formed which could support moose. Even though snows exceeded 76 cm (Table 8), moose track depth was usually less than 70 cm. Spruce stands, with their associated shallower snow depths, showed increased moose use following heavy snowfall.

Winter Food Habits and Utilization

Analysis of data from 23 browse utilization transects in early to late successional stages on key wintering areas (Fig. 3, Table 9) allowed the following generalizations:

1. Salix spp. and Cornus stolonifera were the primary browse species.

2. Habitats in which Salix and/or Cornus comprised less than 25% cover received little use by moose (Table 9).

3. The majority (77-100%) of key browse plant species were in vigorous condition.

4. Percent utilization of available browse averaged only about 60% in the most highly utilized stands of young and mature alder-willow without overstory (Table 9), indicating a healthy range condition with an abundant food supply.

5. Secondary food plants constituted less than 10% of the observed use and included Vaccinium spp., Populus balsamifera trichocarpa, Ribes bracteosum, Viburnum edule, and Malus fusca.

PREDICTABLE EFFECTS OF HYDROELECTRIC DEVELOPMENTS

Hydrological Changes

Hydrologists (B.C. Hydro 1981) predict that during construction there will be little change in water level. As the reservoirs are filled (approximately 1 spring and summer for each dam), there will be reduced flows, although minimum flow amounts have not been decided. During operation, mean water levels will be

approximately 0.8 m lower during summer (a 25% reduction), and 0.8 m higher during winter (a 100% increase). The magnitude and duration of flood events will be affected more in spring than in fall. Water temperatures may be 1°C (about 2°F) higher than normal during winter. Stikine winter water temperatures currently range between 0° and 1°C (B.C. Hydro 1981).

Because the mean water level during summer will be reduced 0.8 m, floods will be up to 0.8 m lower than usual at their peak. Depending upon the volume of flood waters and the area flooded, peak flood events will be some fraction of 0.8 m lower than normal after regulation. Water volumes above 120,000 cfs influence most side channels and sloughs (M. Horton, pers. comm. 1983). At lesser flows, water is restricted primarily to the main channel. Andrew Slough, for instance, dries up when river stage drops below 14.9 ft (4.5 m) (M. McCorison, unpubl. data).

Vegetation Changes

The lower water levels in spring will encourage colonizing of bare areas by *Equisetum*, *Salix*, *Alnus*, and *Populus*. Wind-dispersed seeds of *Salix* and *Populus* will quickly colonize open moist areas unless seedlings are inhibited by spring flooding which deposits silt (L. Walker, pers. comm.). Sediment surface is a controlling factor in establishment of plant communities as well (Church and Rood 1982, Teversham and Slaymaker 1976).

Reduction of flood will encourage *Picea* encroachment on river terraces, where it is now inhibited by periodic flooding. Spruce now occur in areas that are seldom flooded. Flooding for 29 days or more in early summer has been found to kill most small white spruce (*P. glauca*) and black spruce (*P. mariana*) trees (Ahlgren and Hansen 1957). Lees (1964) found that flooding killed most older spruce seedlings and all younger ones. On the Peace River in British Columbia, *Populus balsamifera trichocarpa* forests with *Cornus stolonifera* were flooded an average of less than 6 days a year, conifer stands were rarely inundated, and unforested areas were generally flooded between 30 and 84 days per year (Teversham and Slaymaker 1976).

Comparisons of 1948 and 1979 plant community maps (Beak Consultants 1982) show that *Picea* coverage increased in the study area, replacing cottonwood and shrubs, while *Populus* coverage also increased, replacing former shrub communities (Table 10). In the Barnes Lake and Dry Wash areas, successional trends have been reversed, probably attributable to a rising water table caused by increased glacier melting. The area lost to erosion on the river was offset by comparable gains in newly vegetated area (ca. 250 ha). The Stikine Delta gained 522 ha during the 31-year interval.

In an extreme-case scenario, Picea stands will continue to expand (but at a much faster rate) as areas become better drained. Guerin Slough will probably be reduced to 1/4-1/3 its present width. Ketili River (Warm Springs Slough) and Andrew Slough will be invaded by xeric plant communities, and the upstream ends will eventually be blocked off. The islands between Limb Island and Kakwan will eventually be vegetated and consolidated into a single island. The area known as the Desert will be vegetated at a slower rate because of wind erosion. Elbow Slough will be invaded by Equisetum and Salix and will be blocked. The North Arm of the Stikine River will be reduced in size and may be closed off at the upper end.

Moose Population and Distribution Changes

Fifteen of 20 collared cows had home ranges which were within 3.2 km (2 mi) of the waters of the Stikine River. Doerr (1983) found that only 2 of 246 telemetry locations were over 0.4 km (.25 mi) from the floodplain of the Stikine or from the stream courses of Andrew, Thunder, or North Arm Creek. The importance of riparian wintering habitat cannot be overstated, since late winter and early spring are the critical periods for Alaskan moose (Gasaway and Coady 1974, Gasaway et al. 1983), especially following winters of heavy snowfall. Snow depths during both winters exceeded 2 m (6.6 ft) in some areas (Table 8).

The replacement of alder-willow by cottonwood and eventually spruce will redistribute wintering habitat and eventually reduce it. Moose distribution will be altered, and as winter carrying capacity is reduced, the population will decline to an unknown extent. We cannot accurately predict the amount of spruce ecotone and alder-willow wintering habitat which will be succeeded by xeric vegetation. Such predictions would necessitate detailed hydrological forecasts and topographic maps with contour intervals of 1 ft or less. Based on available hydrological data, it is possible that all of the existing alder-willow habitat will be replaced by cottonwood and/or conifer overstory. Areas which are more dependent on groundwater levels than river stage (Barnes Lake, North Arm Creek) may be less affected by regulation, although the effects of the project on groundwater levels have not been adequately addressed in available hydrology reports.

Moose carrying capacity would likely increase over the first decade of regulation as newly dried areas are invaded by alder-willow communities and spruce ecotones which provide winter food and shelter. Over the long term, however, channelization of the river and shading of alder-willow by overstory species can be expected to reduce carrying capacity and populations. This reduction is not quantifiable.

The predicted 1°C increase in water temperature will probably leave the lower river ice free during most winters. After dam construction and water regulation, the Peace River in British Columbia remained ice free in "normal" winters to a point 120 km (68.3 mi) below the dam. Similar effects have been noted in Russian hydroelectric projects where the temperature regimes are similar to those of the Stikine (B.C. Hydro 1981).

Stikine moose use the river ice frequently as a movement corridor. Open water combined with shorefast ice could tend to limit winter moose movement. The effect of this factor on winter distribution cannot be predicted. Although recreational snow machine use would be reduced, boat traffic would increase, and winter disturbance of moose would continue to occur. Since boats are more widely used than snowmachines, there could be an increase in winter disturbance of moose. Hunting in the study area is associated with preferred moose habitat and ease of access. Most hunters confine their activities to the riverbank and the banks of the larger sloughs and creeks. Moose carcasses are dragged or winched to canoes or skiffs for transport to town. Andrew Slough, Ketili River (often called Warm Springs Slough), Government Slough, and the North Arm of the Stikine are heavily hunted. After dam construction, it is likely that these areas and many others now hunted will not be accessible by boat during the fall moose season. Camping sites would then be restricted to the banks of the main river channel. Boat access to the Forest Service bathing facilities at Chief Shakes Hot Springs may no longer be feasible. This facility is extremely popular with moose hunters, fishermen, and recreational boaters.

Changes in access will be evident within a short time and will lower moose harvest levels. The expected decline in the moose population will occur gradually as carrying capacity declines with habitat degradation.

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LITERATURE CITED

Ahlgren, C. E., and H. L. Hansen. 1957. Some effects of temporary flooding on coniferous trees. J. For. 55:647-650.

B.C. Hydro. 1981. Stikine-Iskut hydroelectric development feasibility study: hydrology, river regime and morphology. Hydroelectric Generation Projects Div. Report No. H 1110. Vancouver.

B.C. Hydro. 1982. Habitat utilization by ungulates and other wildlife in the proposed reservoir areas on the Stikine and Iskut Rivers. Unpubl. Vancouver.

Beak Consultants Ltd. 1982. Analyses of the potential impacts of hydroelectric development of the Stikine River system in Alaska. Unpublished report to B.C. Hydro and Power Authority, Vancouver, B.C.

Boertje, R. D., and E. L. Young. 1982. Stikine River moose study; wildlife evaluation of Stikine-Iskut dams. Progress report, Vol. I, Alaska Dep't Fish and Game, Juneau.

Church, M., and K. M. Rood. 1982. Peace River Surveys; 1979 and 1981. Department of Geography, University of British Columbia. Unpublished manuscript.

Coady, J. 1974. Influence of snow on behavior of moose. Nat. Can. 101:417-436.

Doerr, J. G. 1983. Home range size, movements and habitat use in two moose, Alces alces, populations in southeastern Alaska. Can. Field Nat. 97(1):79-88.

Doerr, J. G., E. L. Young, and A. W. Franzmann. 1980. Ecological and physiological aspects of a moose population in Thomas Bay, southeast Alaska. Proc. 16th N. Am. Moose Conf. Workshop.

Franzmann, A. W., and R. E. LeResche. 1978. Alaskan moose blood studies with emphasis on condition evaluation. J. Wildl. Manage. 42:334-351.

Gasaway, W. C., and J. W. Coady. 1974. Review of energy requirements and rumen fermentation in moose and other ruminants. Nat. Can. (Que.) 101:227-262.

Gasaway, W. C., R. O. Stephenson, J. L. Davis, P. E. K. Shepherd, and O. E. Burris. 1983. Interrelationships of wolves, prey and man in Interior Alaska. Wildl. Monogr. 84. 50 pp.

Gill, D. 1973. Floristics of a plant succession sequence in the MacKenzie Delta, Northwest Territories. Polarforschung, 43(1/2):55-65.

Hulten, E. 1968. Flora of Alaska and neighboring territories. Stanford Univ. Press, Stanford, Calif. 1,008 pp.

Kelsall, J. P., and W. Prescott. 1971. Moose and deer behavior in snow. Can. Wildl. Ser. Rept. Series No. 15. 25 pp.

Lees, J. C. 1964. Tolerance of white spruce seedlings to flooding. For. Chron. 40:221-225.

McCourt Management Limited. 1982. Studies on furbearing animals in the Stikine River Drainages. Unpublished report to B.C. Hydro.

Nasimovich, A. A. 1955. The role of the regime of snow cover in the life of ungulates in the USSR (Trans. from Russian). Moskua. Akad. Nauk USSR. 403 pp.

Peek, J. M., D. L. Urich, and R. J. Mackie. 1976. Moose habitat selection and relationships to forest management in northeastern Minnesota. Wildl. Monogr. 48. 65 pp.

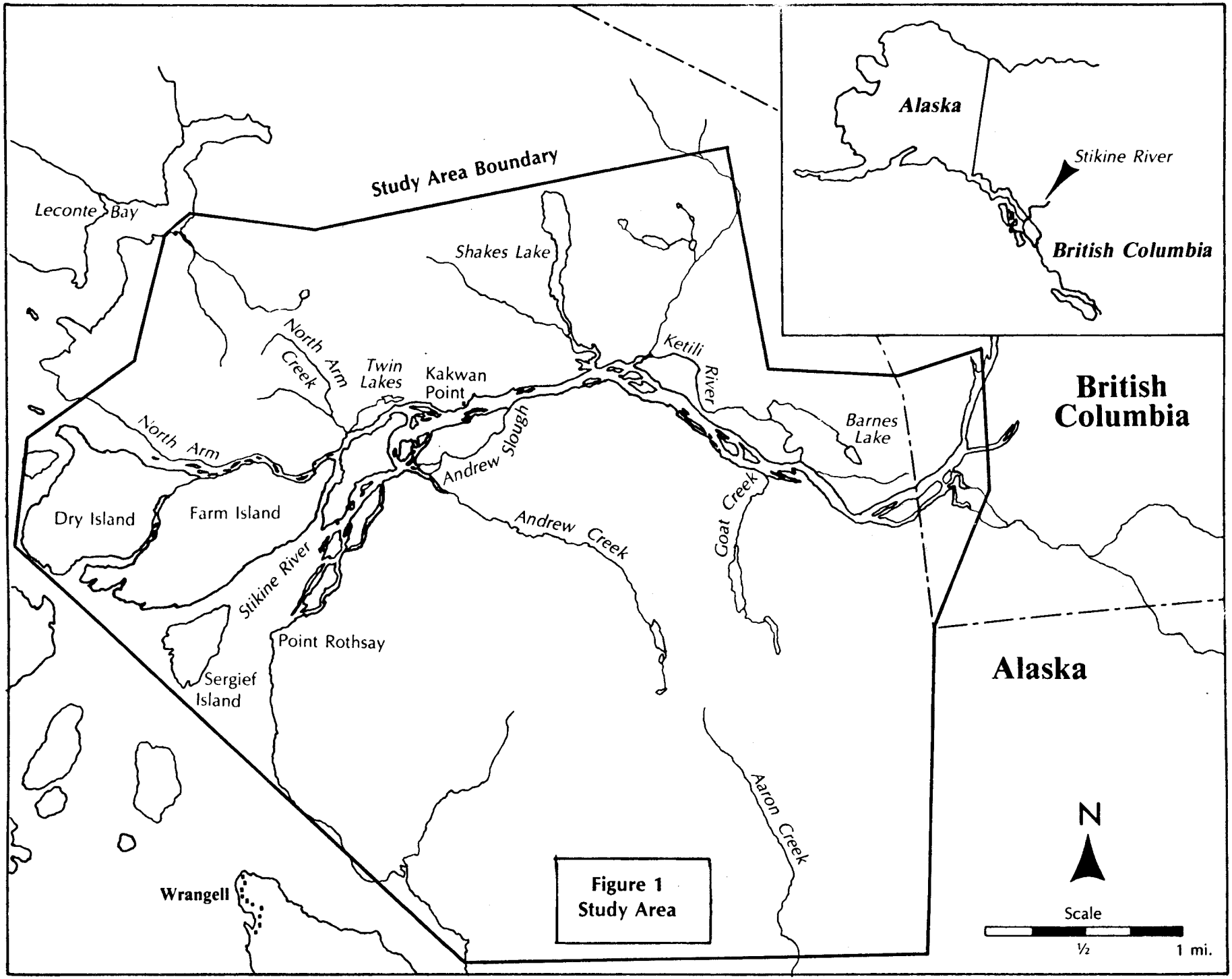
Rausch, R. A., and A. Bratlie. 1965. Annual assessment of moose calf production and mortality in southcentral Alaska. Presentation at 45th annual conference of Western Association, State Fish and Game Commissioners, Anchorage, Alaska.

Rolley, R. E., and L. B. Keith. 1980. Moose population dynamics and winter habitat use at Rochester, Alberta. 1965-1969. Can. Field-Nat. 94(1):9-18.

Teversham, J. M., and O. Slaymaker. 1976. Vegetation composition in relation to flood frequency in Lillooet River valley, British Columbia. Catena 3:191-201.

VanBallenberghe, V., and J. M. Peek. 1971. Radiotelemetry studies of moose in northeastern Minnesota. J. Wildl. Manage. 35(1):63-71.

Young, E. L. 1981. Moose survey-inventory progress report, Game Management Units 1B and 3 in Annual Report of Survey Inventory Activities. Part III. Moose. R. A. Hinman, Ed. Alaska Dep't Fish and Game. Juneau.



This map taken from Petersburg quad and Bradfield quad 1:250,000.

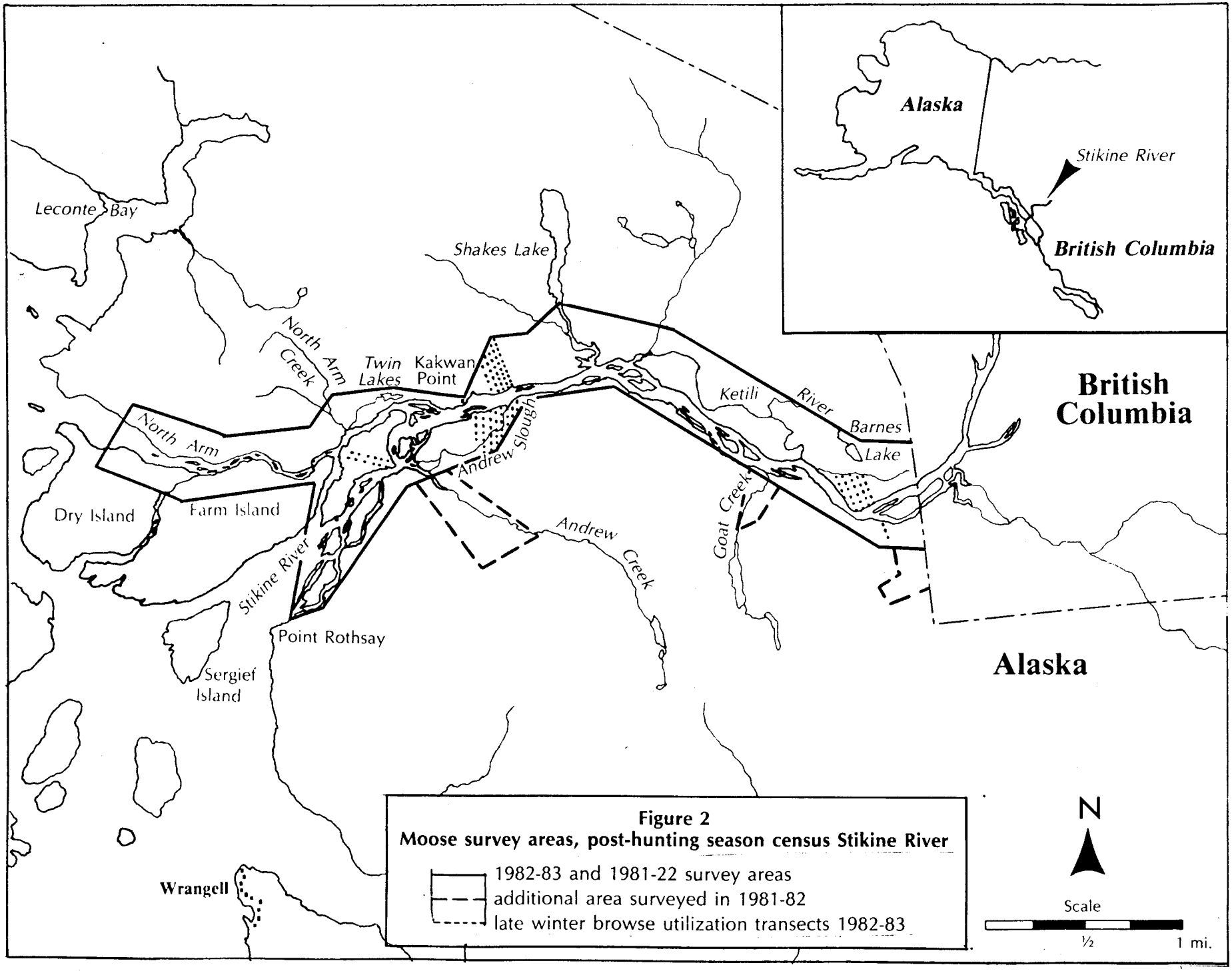


Figure 2
Moose survey areas, post-hunting season census Stikine River

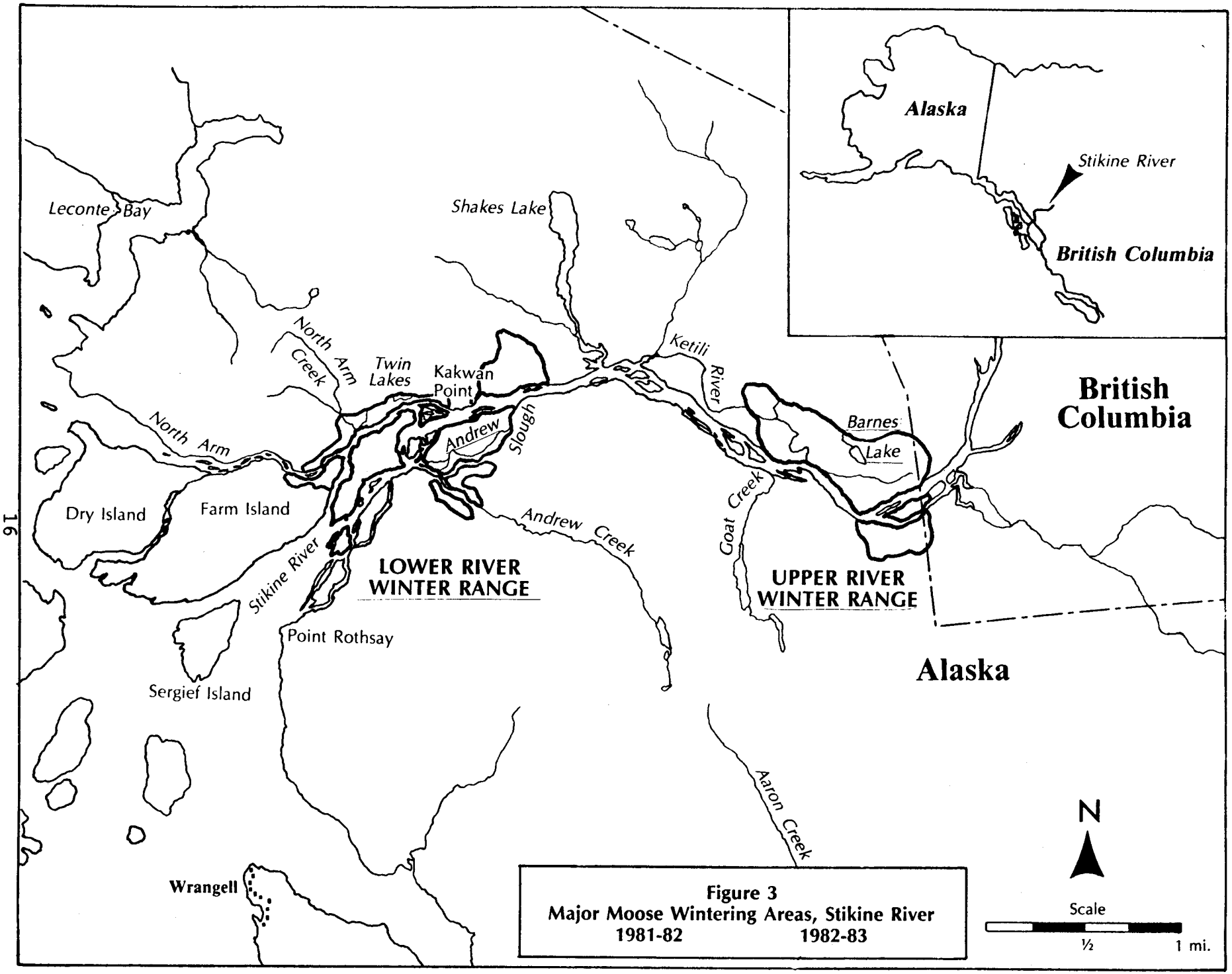


Figure 3
Major Moose Wintering Areas, Stikine River
1981-82 1982-83

Table 1. Moose population estimates using Lincoln-Peterson Index, Stikine River, 1982.

Date	Total Moose Observed	Moose Observed/ Hour	Marked Moose (no. marked)	Observation Efficiency	Population Estimate
3/22/82	88	23	11(20)	.55	160
11/4/82	39	10	2(15)	.13	293
12/4/82	113	40	6(16)	.38	301

Table 2. Moose composition counts, Stikine River, 1982.

Date	Bulls per 100 Cows	Calves per 100 Cows	Twins per 100 Cows with Calves	Total Sample
3/11-14/82	5.0	38	--	56
11/04/82	3.0	23	14	39
12/04/82	5.0	28	33	113

Table 3. Sex, age, home range, elevation, and calf production of Stikine River radio-collared moose.[a]

Appended Map No.	Collar No.	Sex	1983 Age (yr)	Total Home Range	Summer (ha,mi^2)	Winter (ha,mi^2)	Maximum[b] Elevation (ft)	No. Calves 1982	No. Calves 1983
A1	00	F	11.5	3,400 ha(13.1 mi^2)	1,303(5.0)	432 (1.7)	100	0	2
A-2/A3	0	F	10.5	4,155 ha(16.0 mi^2)	267(1.0)	3,888(15.0)	1,400	0	1
A4/A5	1	F	2.5	4,936 ha(19.1 mi^2)	1,600(6.2)	3,336(12.9)	2,000	0	1
A6	22	F	7.5	2,137 ha (8.3 mi^2)	--	--	1,400	1	2
A7	X	F	5.5	2,380 ha (9.2 mi^2)	--	--	100	0	1
A8	11	F	10.5	3,183 ha(12.3 mi^2)	--	--	100	1	0
A9	8	F	10.5	1,456 ha (5.6 mi^2)	--	--	100	0	0
A10	9	F	?	1,632 ha (6.3 mi^2)	--	--	100	1	0
A11	7	F	4.5	1,575 ha (6.1 mi^2)	1,088(4.2)	487 (1.9)	1,200	1	0
A12	4	F	2.5	1,955 ha (7.6 mi^2)	--	--	100	0	0
A-13	6	F	7.5	1,256 ha (4.9 mi^2)	--	--	600	1	0
A14	44	F	14.5	1,059 ha (4.1 mi^2)	--	--	100	1	0
A15	33	F	6.5	901 ha (3.5 mi^2)	--	--	100	0	1
A16	3	F	4.5	1,072 ha (4.1 mi^2)	--	--	600	0	1
A17	5	F	5.5	466 ha (1.8 mi^2)	383(1.5)	83 (0.3)	1,100	0	0
A-18/A-19	2	F	6.5	1,803 ha (6.9 mi^2)	109(0.4)	1,694 (6.5)	900	1	0
A20	82	F	?	--[c]	--	505 (2.0)	100	--	0
A21	000	F	?	--[c]	--	728 (2.8)	100	--	0
A22	111	F	?	--[c]	--	300 (1.2)	100	1	1
A23	6B	F	?	--[c]	--	334 (1.3)	100	--	0
A24	66	M	3.5[d]	1,735 ha (6.7 mi^2)	--	--	400	--	--
A25	8B	M	1.5[d]	1,593 ha (6.2 mi^2)	--	--	100	--	--
A26	88	M	2.5[d]	4,688 ha (18.1 mi^2)	--	--	100	--	--
A27	77	M	2.5[e]	1,352 ha (5.2 mi^2)	526(2.0)	826 (3.2)	900	--	--

[a] Individual home range maps are found in Appendix A.
[b] Maximum observed elevation plotted on USGS topographic map to nearest 100 foot contour interval.
[c] Collared in January 1983; summer range not monitored.
[d] Age at death in 1982.
[e] Age at death in 1983.

Table 4. Characteristics of 24 Stikine River moose, March 1982 and January 1983.

Collar Frequency	Collar Number[a]	Sex	With Calf	Age (yr)	Body Condition	Blood Parameters		Body Measurements (cm)		
						Hb[b]	PCVC	Total Length	Chest Girth	Hind Ft Length
151.500	0	F	No	9.8	6	14.0	44.0	285	193	--
151.510	1	F	No	1.8	6	16.5	41.0	265	202	79
151.520	2	F	Yes	5.8	6	12.8	35.5	287	204	79
151.530	3	F	No	3.8	7	15.0	41.0	266	--	--
151.540	4	F	No	1.8	5	12.0	30.5	267	174	98
151.550	5	F	No	4.8	6	14.5	36.0	266	168	84
151.560	6	F	Yes	6.8	7	14.2	41.5	268	193	--
151.570	7	F	Yes	3.8	7	16.5	42.0	306	208	86
151.580	8	F	No	9.8	6	15.0	42.0	292	202	83
151.590	X	F	No	4.8	7	17.0	46.0	312	240	80
151.610	00	F	No	10.8	6	13.0	41.5	292	193	80
151.620	11	F	Yes	9.8	6	17.0	46.0	316	185	90
151.630	22	F	Yes	6.8	6	15.0	40.5	294	199	87
151.640	33	F	No	5.8	5	16.5	55.0	284	206	--
151.650	44	F	No	13.8	4	12.0	37.5	279	218	79
151.660	8	M	--	0.8	5	14.5	36.0	217	164	71
151.680	9	F	Yes	Adult	5	14.0	32.0	292	204	83
151.690	66	M	--	2.8	5	15.0	38.0	279	178	86
151.710	77	M	--	0.8	6	16.0	39.5	228	160	76
151.720[d]	88	M	--	1.8	6	13.0	34.5	259	202	79
151.660[d]	000	F	No	--	8	16.8	47.0	249	194	--
151.390[d]	111	F	Yes	--	8	14.7	42.0	257	189	--
151.720[d]	82	F	No	--	7	15.6	45.5	216	150	--
151.690[d]	6B	F	No	--	9	16.6	46.0	255	194	--
Mean ($\bar{x}$)					6.2	14.84	40.58	272.1	192.2	82.5
Standard Deviation of the Mean (SD)					1.1	1.55	5.42	26.8	20.0	6.6
Standard Error (SE)					.2	.32	1.11	5.5	4.2	1.6

[a] The 1st 15 collars listed are yellow with black numbers; the last 5 are blue with yellow numbers.
[b] Hb = hemoglobin.
[c] PCV = Packed-cell volume.
[d] Collared on 15 and 16 January 1983; others collared 11-13 March 1982.

Table 5. Percent use of successional stages by radio-collared moose by season, Stikine River, 1982-83.

Season	# of Locations	Percent Use by Successional Stage		
		Early[a]	Mid-climax[b]	Climax[c]
Winter (1 Jan-14 Mar)	124	47	30	23
Late Winter (15 Mar-1 May)	106	53	18	29
Spring (2 May-15 June)	78	49	29	22
Summer (16 June-31 Aug)	100	43	33	24
Fall, Early Winter (15 Oct-31 Dec)	64	47	19	34

[a] 0-30% overstory.
[b] 31-69% overstory.
[c] 70-100% overstory.

Table 6. Indices of winter (1 Jan-14 Mar) habitat use by moose, Stikine River, 1982-83.

Habitat Types	Radio Locations (n = 472)	Percent Occurrence: Track Counts (n = 760)	Beds (n = 57)	Pellet Groups (n = 398)
Open	1	7	5	--
Alnus-Salix	14	66	46	63
Populus	14	2	2	27
Picea-Populus	10	1	--	--
Picea	60	22	47	7
Picea-Tsuga	1	2	--	3
Totals	100	100	100	100

Table 7. Habitat availability and preference during winter, Stikine River, 1982-83.

Habitat Type	Availability[a] %	Preference Indices			
		Radio Locations	Tracks	Beds	Pellet Groups
Open	10	1	17	13	--
Alnus-Salix	56	2	28	21	19
Populus	7	19	7	8	64[b]
Picea-Populus	2	48	12	0	--
Picea	21	27	25	58	5
Picea-Tsuga	4	2	12	0	12
Totals	100	99	101	100	100

[a] Measured in late winter.
[b] No distinction was made between pure Populus stands and mixed Picea-Populus stands in pellet group counts.

Table 8. Snow depth by habitat type on the Stikine River, winter 1982-83.

Habitat	Snow Depth
Open habitat	168 cm ± 2.1 (n = 787)
Cottonwood overstory	166 cm ± 4.9 (n = 61)
Spruce-cottonwood overstory	156 cm ± 4.7 (n = 14)
Spruce overstory	146 cm ± 3.1 (n = 299)
Hemlock-spruce overstory	165 cm ± 7.5 (n = 38)
Mature spruce	128 cm ± 4.6 (n = 99)

Table 9. Vegetative characteristics of spring moose browse transects, Stikine River, 26 April-20 May 1983.

Habitat Type	Transect #	% Cover Overstory	% Cover *Salix*	% Cover *Cornus*	% Foods in Diet	% Available Browse Utilized	% Key Foods Vigorous	No. Pellet Groups 0.004 hectare (0.01 acre)
Young alder-willow	1	0	80	0	100 *Salix*	89 *Salix*	99	17
	2	0	81	0	95 *Salix* 5 *Populus*	21 *Salix* 15 *Populus* 20 Total	100	11
Mature alder-willow	3	0	39	40	88 *Salix* 10 *Cornus* 2 *Malus*	88 *Salix* 84 *Cornus* 23 *Malus* 83 Total	94	21
	4	9 *Alnus* 3 *Picea*	46	54	66 *Cornus* 34 *Salix*	45 *Salix* 38 *Cornus* 40 Total	99	11
	5	2 *Picea*	69	55	64 *Salix* 36 *Cornus*	57 *Salix* 42 *Cornus* 50 Total	100	22
	6	9 *Picea*	36	39	81 *Cornus*	87 *Cornus*	96	34
	7	7 *Picea*	55	21	58 *Cornus* 42 *Salix*	40 *Cornus* 34 *Salix* 37 Total	98	20

Table 9. Continued.

Habitat Type	Transect #	% Cover Overstory	% Cover Salix	% Cover Cornus	% Foods in Diet	% Available Browse Utilized	% Key Foods Vigorous	No. Pellet Groups 0.004 hectare (0.01 acre)
	8	1 Picea	30	9	83 Salix 15 Cornus 2 Malus	90 Salix 86 Cornus 14 Malus 84 Total	94	16
Mature alder-willow	9	2 Picea	55	43	71 Cornus 22 Salix 7 Ribes	82 Salix 68 Cornus 33 Ribes 66 Total	99	22
	10	0	56	3	81 Salix 16 Cornus 3 Ribes	86 Salix 79 Cornus 100 Ribes 81 Total	100	13
	11	0	61	0	99 Salix 1 Sorbus	31 Salix 33 Sorbus 31 Total	99	5
Young cottonwood	12	25 Populus 1 Alnus	1	19	96 Cornus 4 Salix	77 Cornus 52 Salix 68 Total	93	8
	13	56 Populus	0	58	100 Cornus	23 Cornus	100	0
Mature cottonwood	14	21 Populus	39	39	91 Cornus 9 Salix	37 Cornus 70 Salix 39 Total	93	2
	15	26 Populus	0	41	98 Cornus 1 Ribes 1 Sambucus	69 Cornus 50 Ribes 69 Total	100	12

Table 9. Continued.

Habitat Type	Transect #	% Cover Overstory	% Cover Salix	% Cover Cornus	% Foods in Diet	% Available Browse Utilized	% Key Foods Vigorous	No. Pellet Groups 0.004 hectare (0.01 acre)
	16	33 Populus	14	38	89 Cornus 6 Ribes 5 Salix	64 Cornus 63 Salix 60 Ribes 64 Total	100	13
Mature cottonwood	17	21 Populus 23 Picea	0	10	100 Cornus	59 Cornus	98	5
Mature spruce	18	62 Picea 9 Populus	0	2	97 Cornus 3 Viburnum	46 Cornus 6 Viburnum 39 Total	97	0
	19	33 Picea 1 Alnus	8	11	86 Cornus 9 Salix 3 Ribes 2 Viburnum	57 Cornus 56 Salix 27 Viburnum 26 Ribes 54 Total	96	9
	20	56 Picea	2	1	89 Salix 9 Cornus 2 Viburnum	74 Salix 54 Cornus 5 Viburnum 57 Total	95	2
	21	56 Picea 3 Tsuga	0	20	98 Cornus 1 Viburnum 1 Ribes	39 Cornus 10 Ribes 8 Viburnum 37 Total	98	8

Table 9. Continued.

Habitat Type	Transect #	% Cover Overstory	% Cover Salix	% Cover Cornus	% Foods in Diet	% Available Browse Utilized	% Key Foods Vigorous	No. Pellet Groups 0.004 hectare (0.01 acre)
Mature spruce-hemlock	22	61 Tsuga 9 Picea	0 Vaccinium parvifolium 4	17	93 Cornus 4 Viburnum 3 Alnus	28 Cornus 7 Viburnum 26 Total	98	2
	23	33 Tsuga 29 Picea	0 Vaccinium ovalifolium 38	1	68 Vaccinium 13 Cornus 10 Viburnum 9 Ribes	70 Cornus 30 Ribes 18 Viburnum 9 Vaccinium 23 Total	100	1

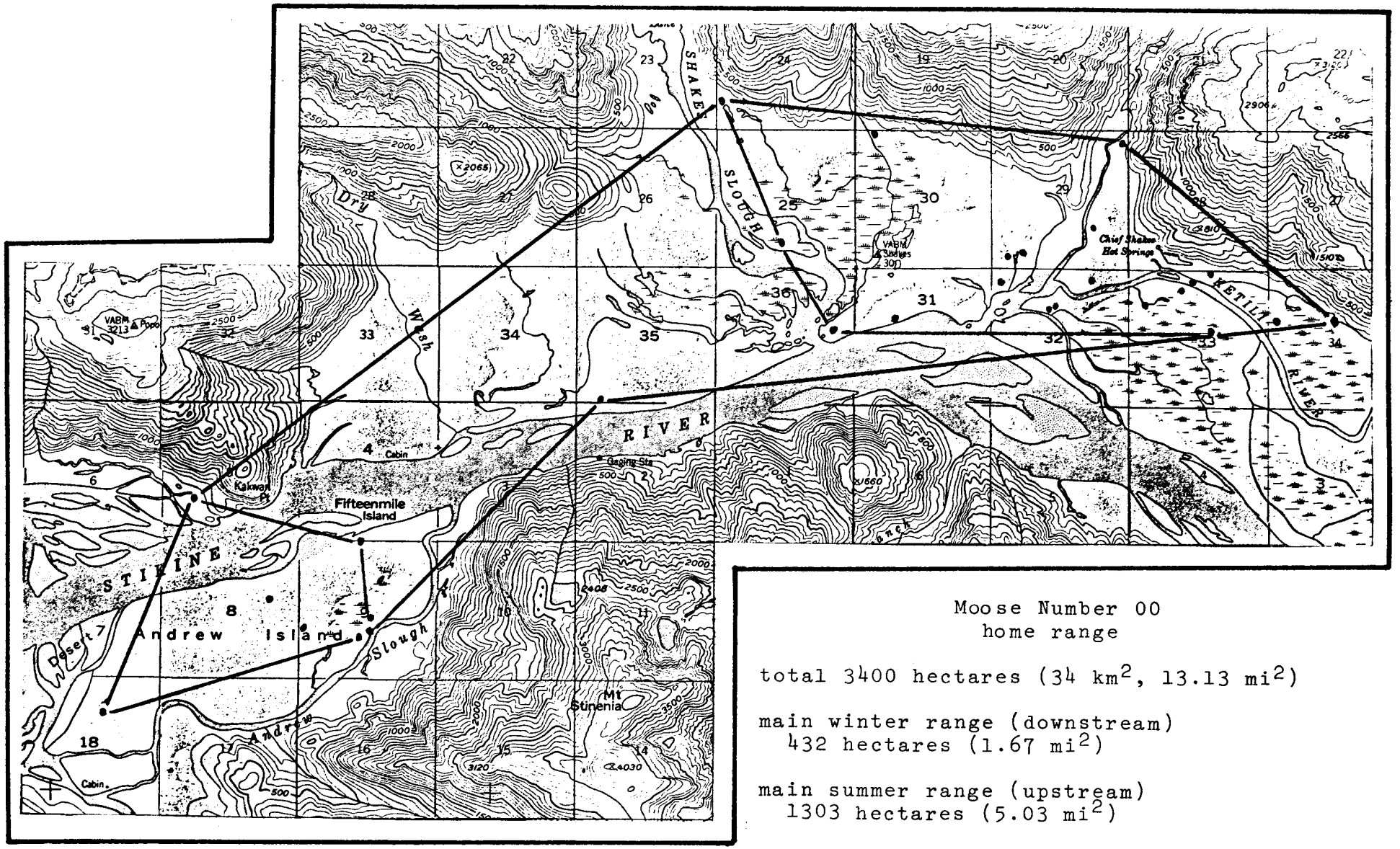
Table 10. Hectares of Stikine River moose habitat, 1948 and 1979[a].

Habitat	1948		1979		Change
Bog	474	(1.83 mi^2)	484	(1.87 mi^2)	+10 ha
Marsh	1,070	(4.13 mi^2)	1,411	(5.44 mi^2)	+341 ha
Shrub	3,564	(13.75 mi^2)	2,355	(9.09 mi^2)	1,209 ha
Spruce	565	(2.18 mi^2)	1,317	(5.08 mi^2)	+752 ha
Alder-cottonwood	2,887	(11.14 mi^2)	2,615	(10.09 mi^2)	+272 ha

[a] Adapted from Beak Consultants (1982).

Appendix A

MOOSE HOME RANGES



Moose Number 00
home range

total 3400 hectares (34 km^2, 13.13 mi^2)

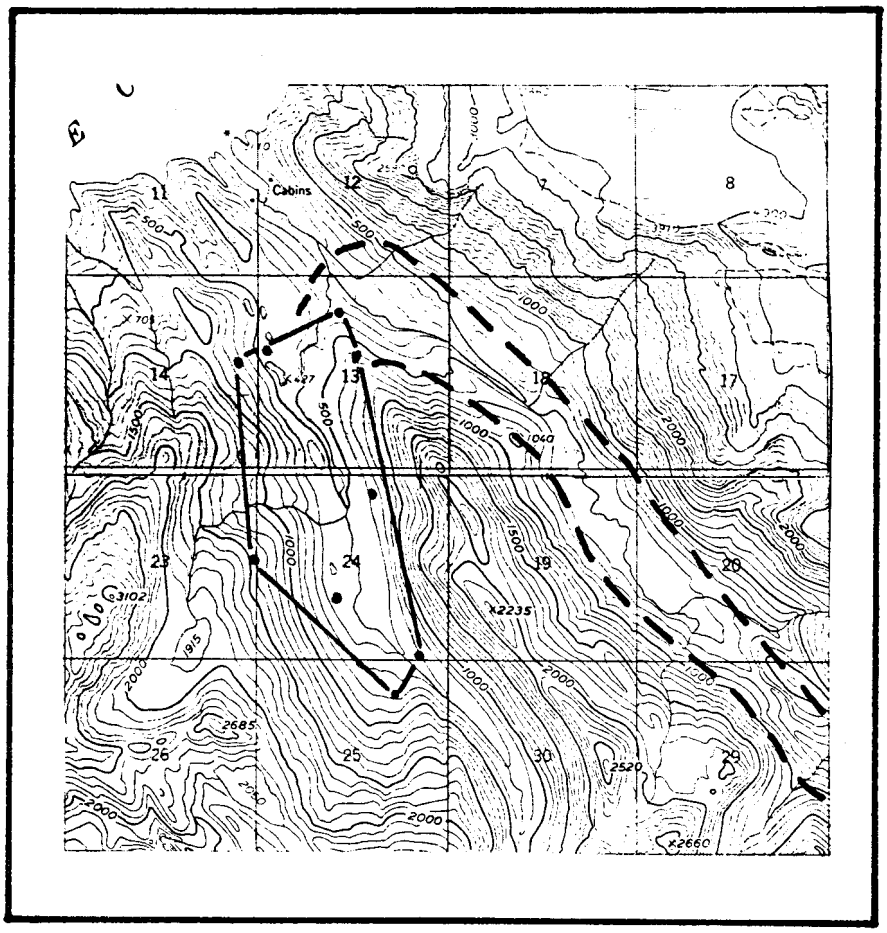
main winter range (downstream)
432 hectares (1.67 mi^2)

main summer range (upstream)
1303 hectares (5.03 mi^2)

some overlap between summer and winter range

female 11 1/2 years in 1983
no calf in 1982
2 calves in 1983

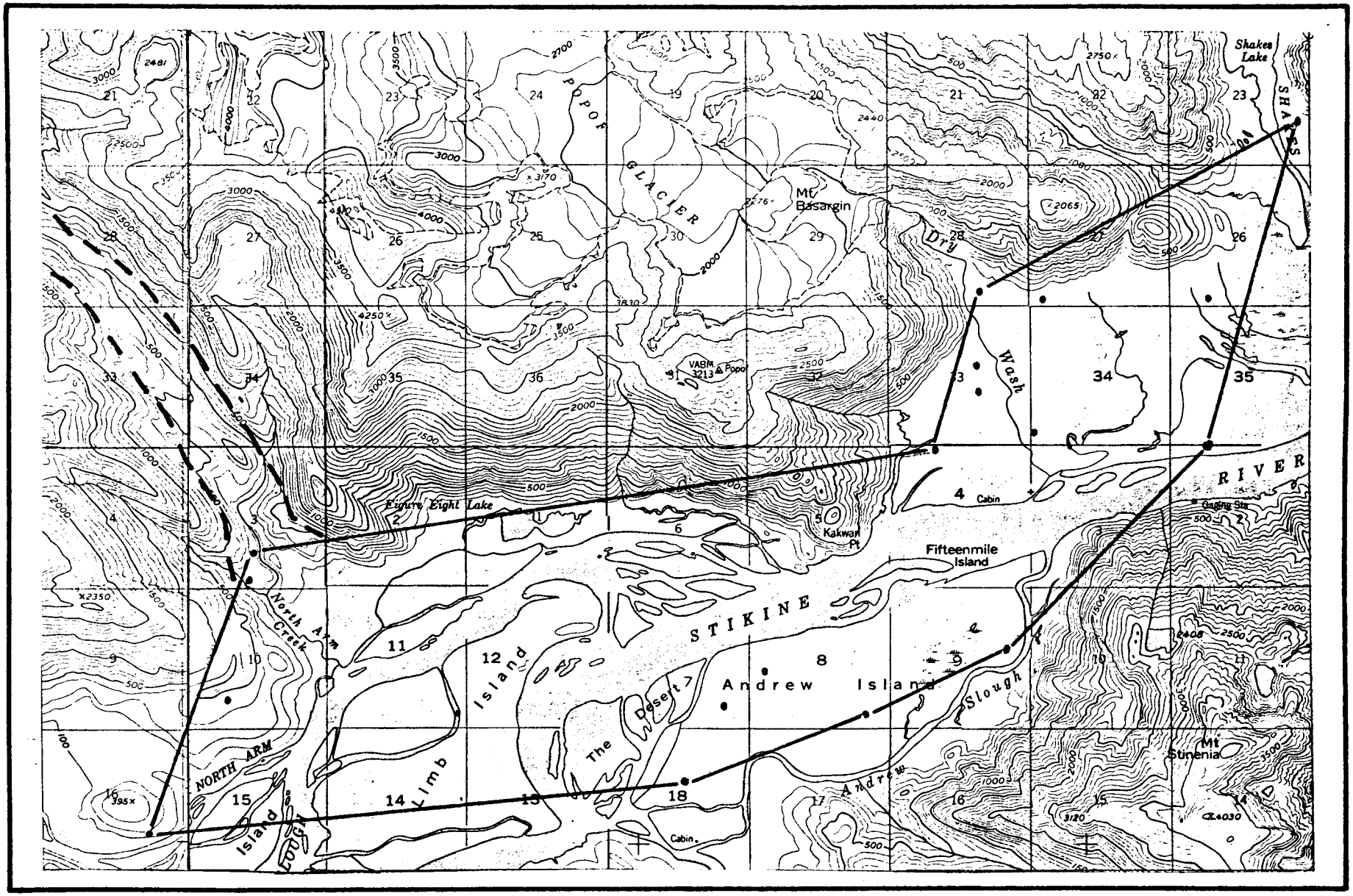
Appendix A-2



Moose Number 0
summer range

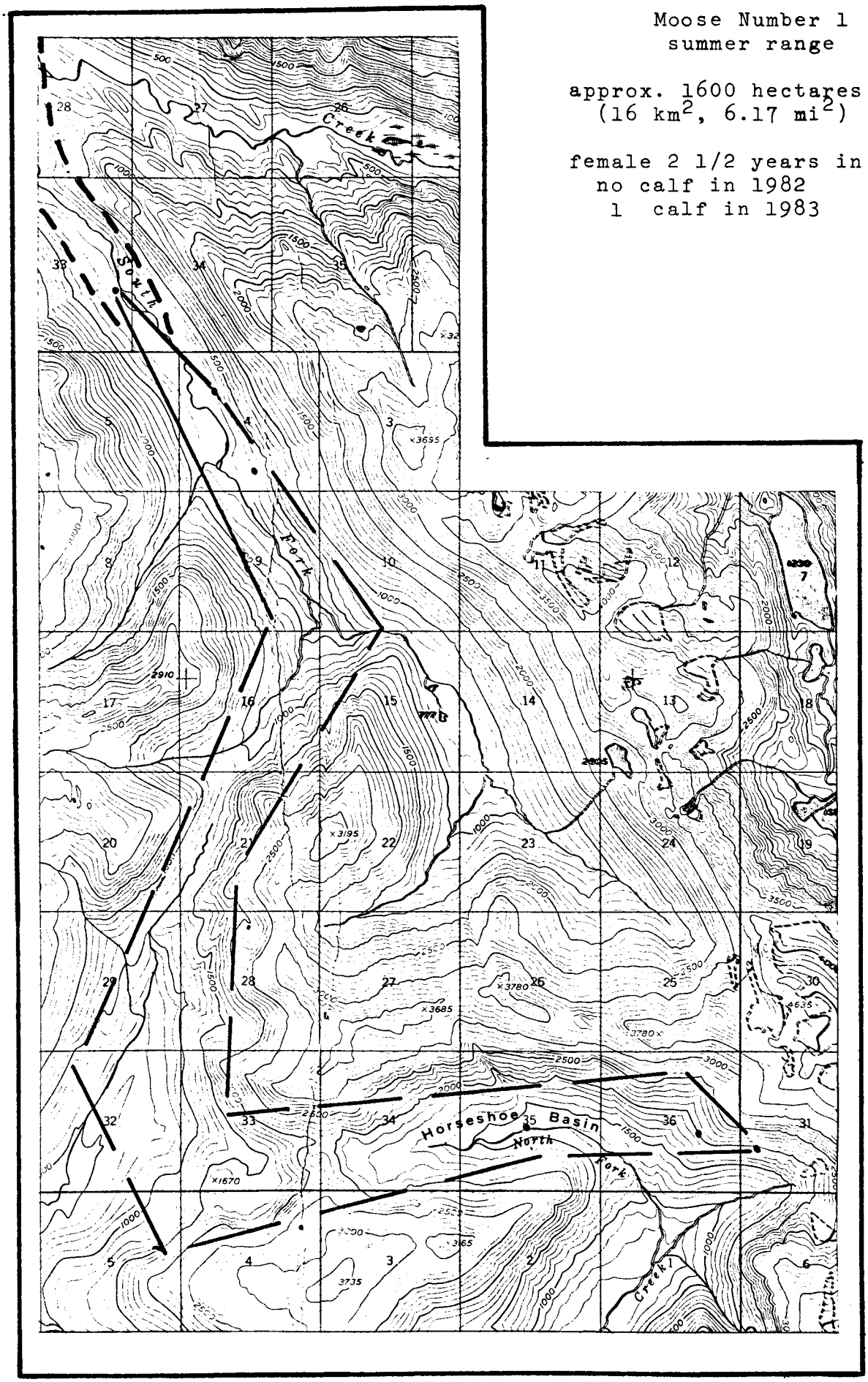
267 hectares (2.67 km^2, 1.03 mi^2)

female 10 1/2 years in 1983
no calf in 1982
1 calf in 1983



Moose Number 0
winter range
3888 hectares (38.88 km^2, 15.01 mi^2)
female 10 1/2 years in 1983

Appendix A-4



Moose Number 1
summer range

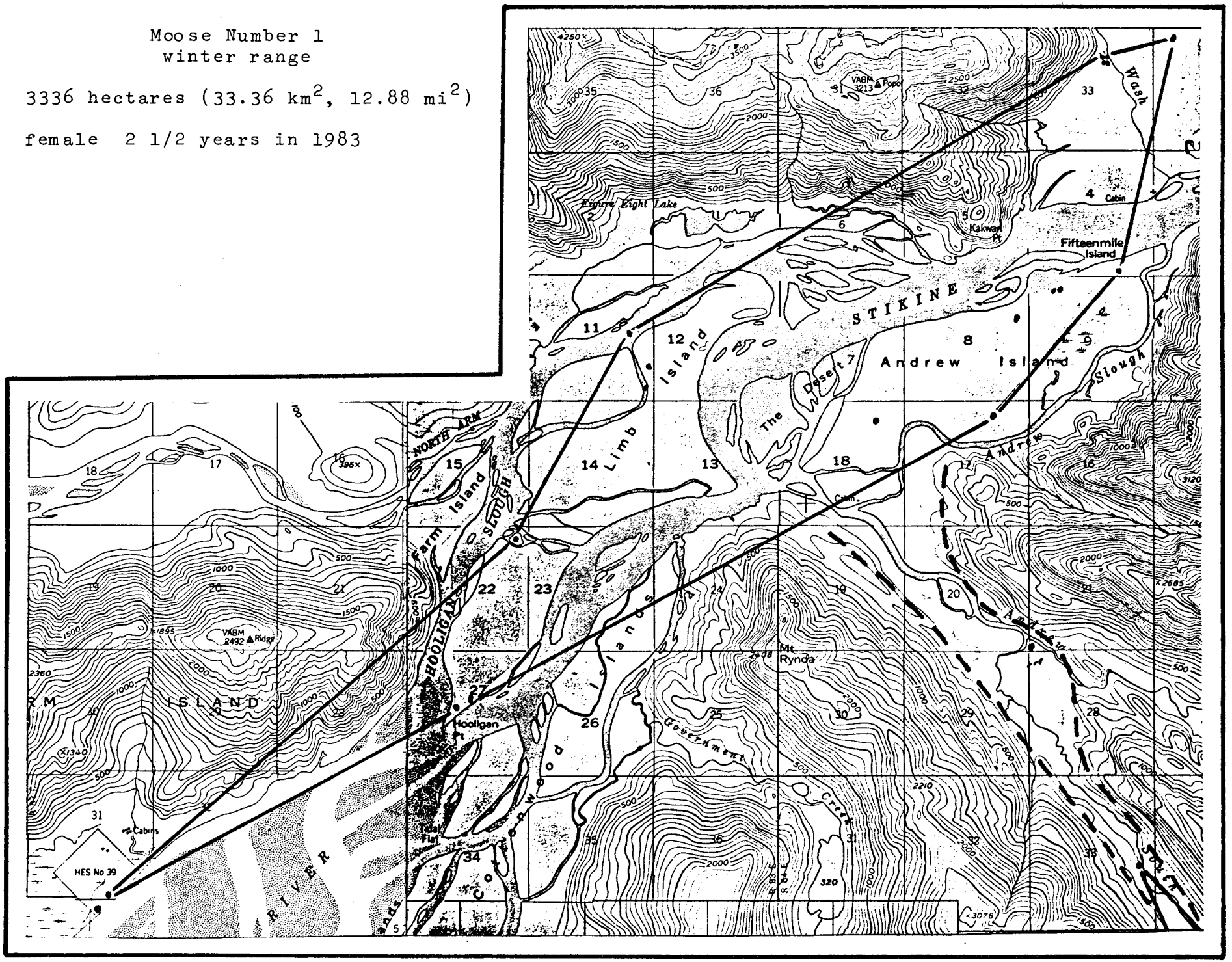
approx. 1600 hectares
(16 km^2, 6.17 mi^2)

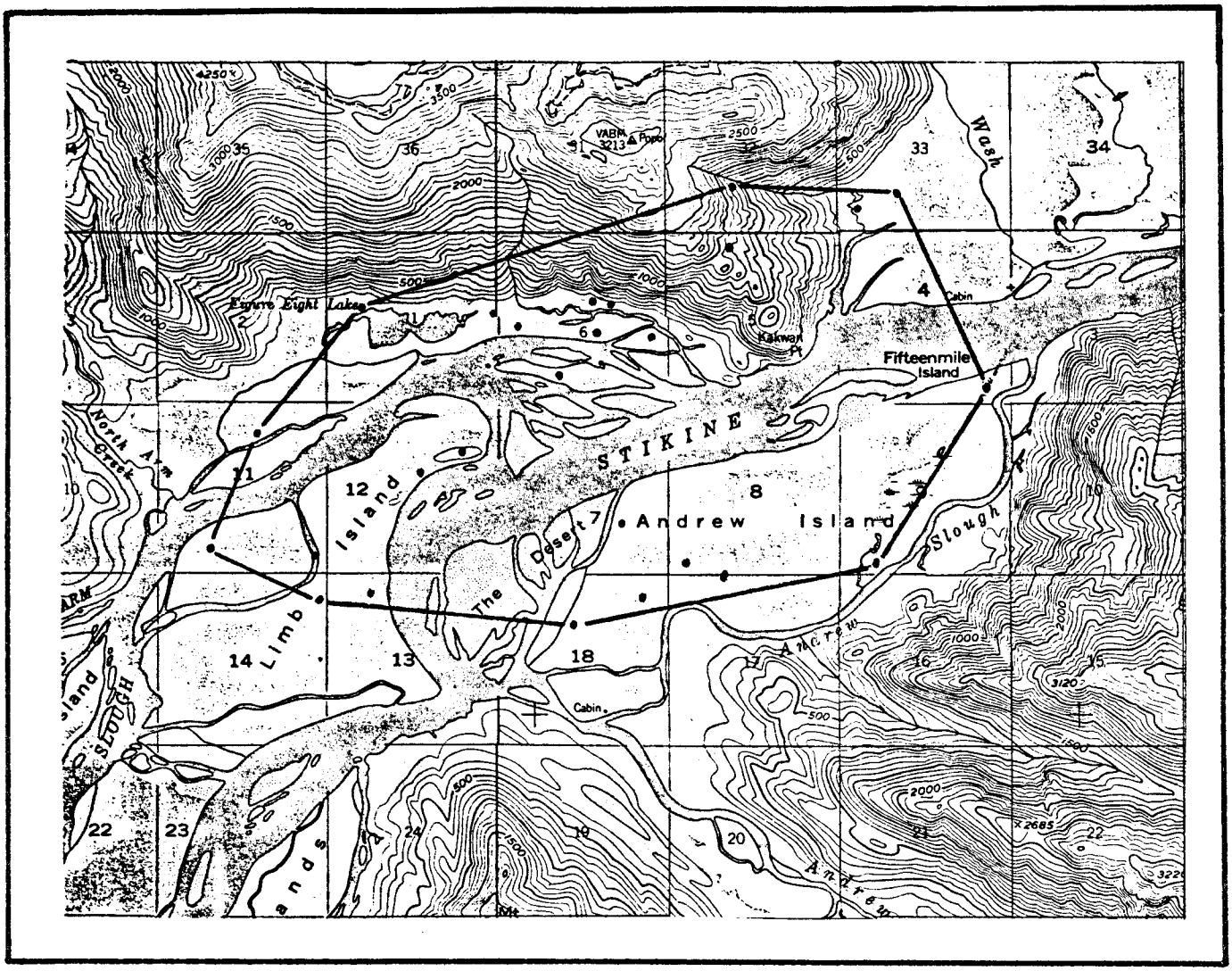
female 2 1/2 years in 1983
no calf in 1982
1 calf in 1983

Moose Number 1
winter range

3336 hectares (33.36 km^2, 12.88 mi^2)

female 2 1/2 years in 1983

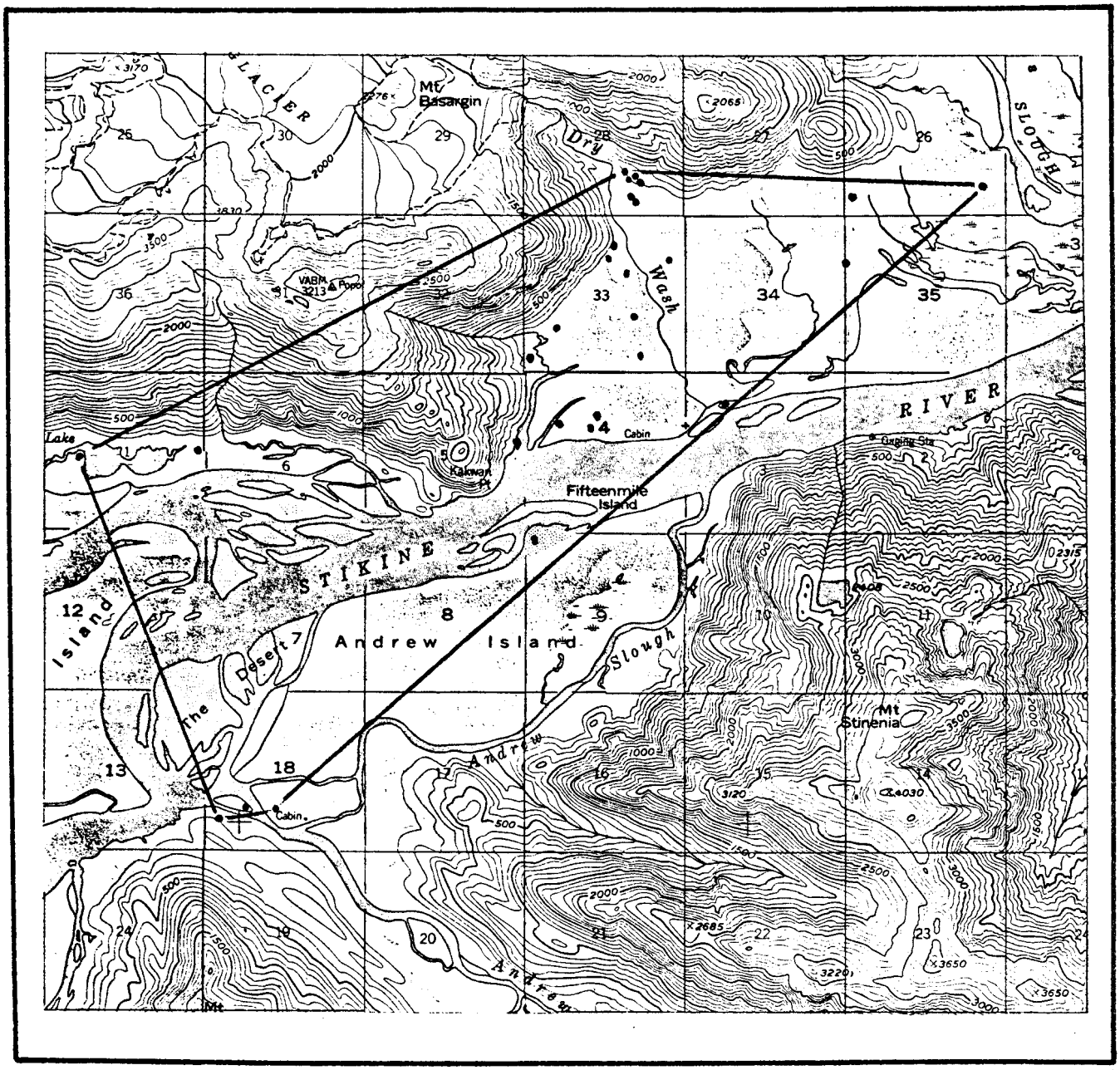




Moose Number 22
home range

2137 hectares (21.37 km^2, 8.25 mi^2)

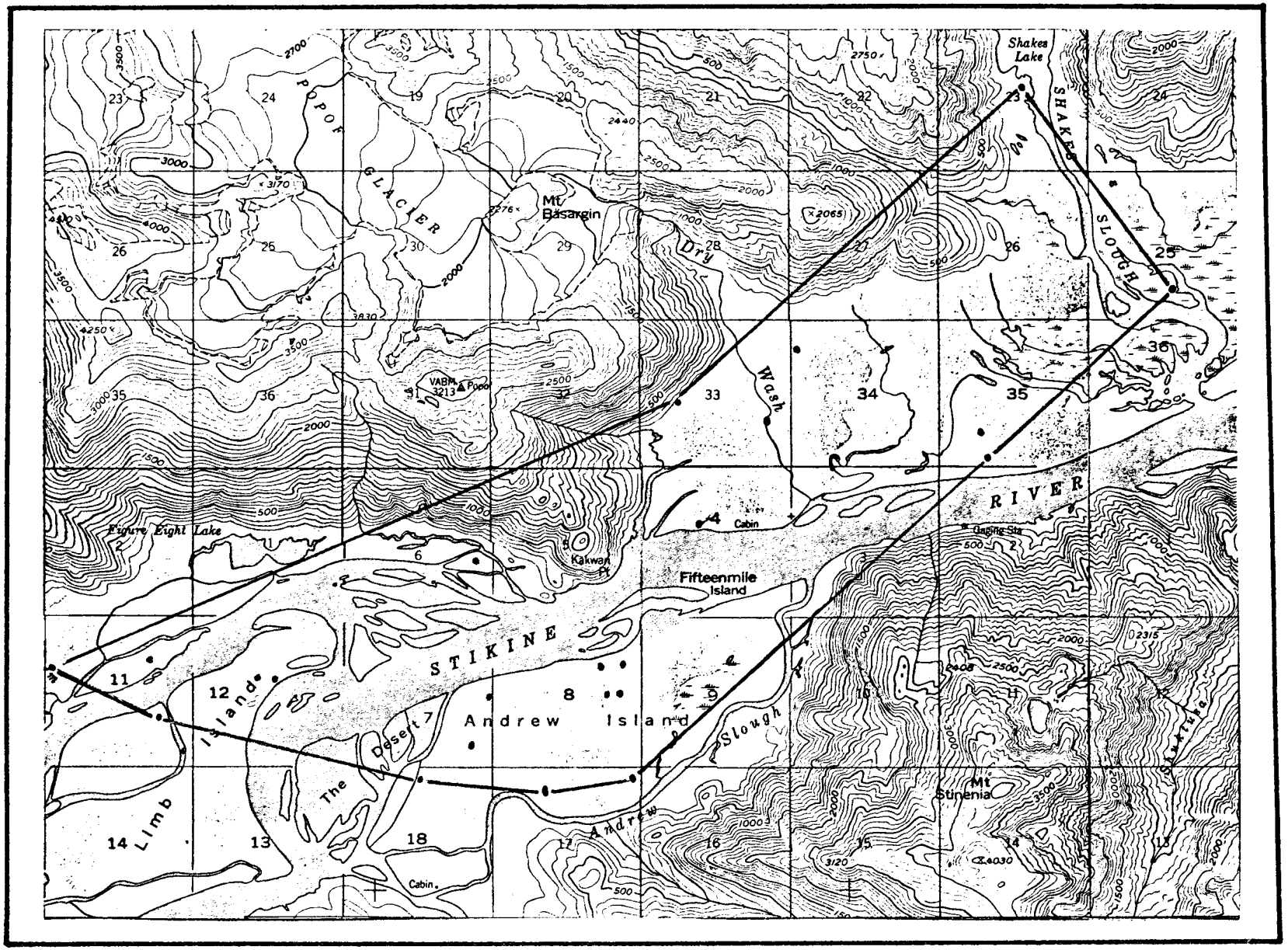
female 7 1/2 years in 1983
1 calf in 1982
2 calves in 1983 (one died)



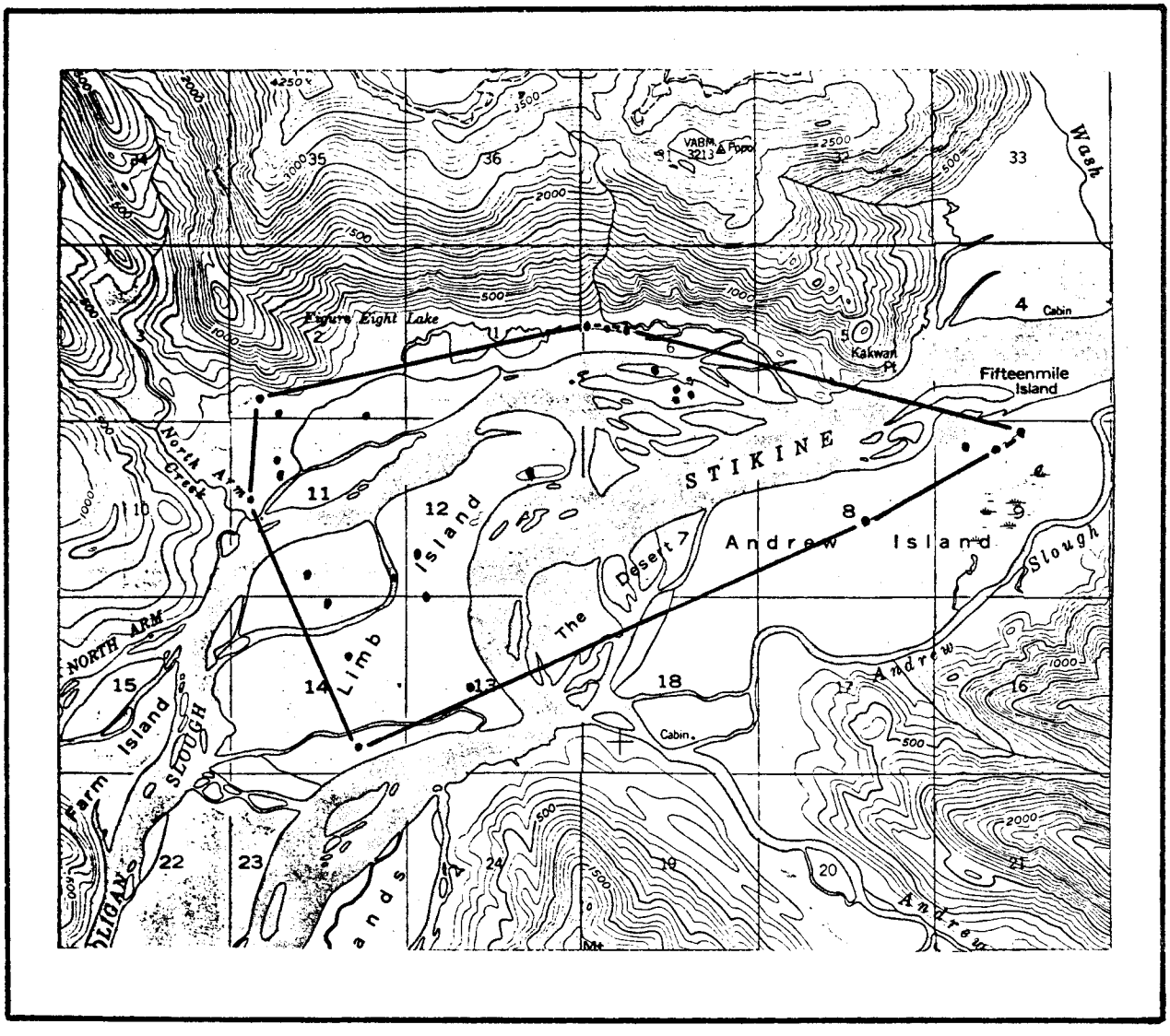
Moose Number X
home range

2380 hectares (23.8 km^2, 9.19 mi^2)

female 5 1/2 years in 1983
no calf in 1982
1 calf in 1983



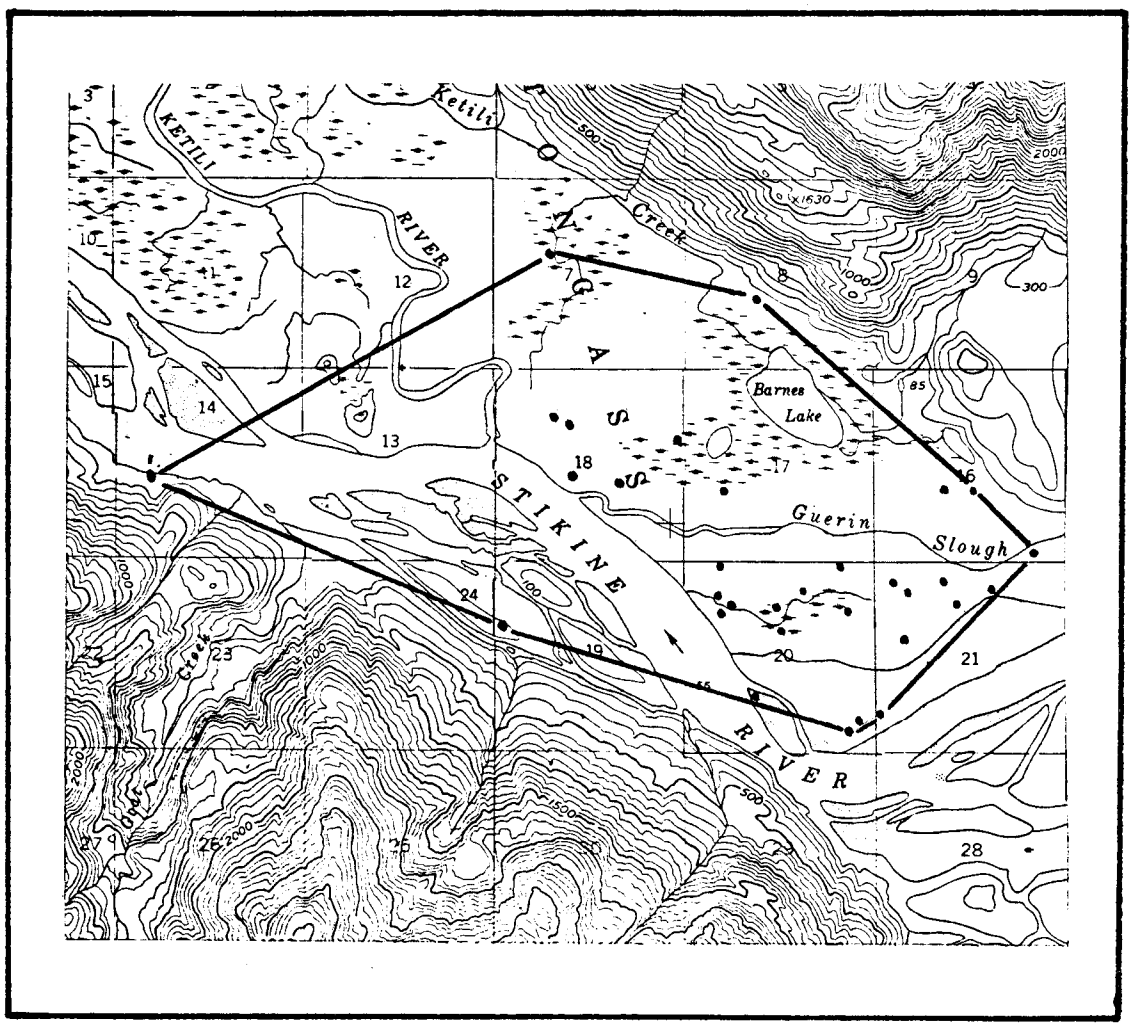
Moose Number 11
home range
3183 hectares (31.83 km^2, 12.29 mi^2)
female 10 1/2 years in 1983
1 calf in 1982, no calf in 1983



Moose Number 8
home range

1456 hectares (14.56 km^2, 5.62 mi^2)

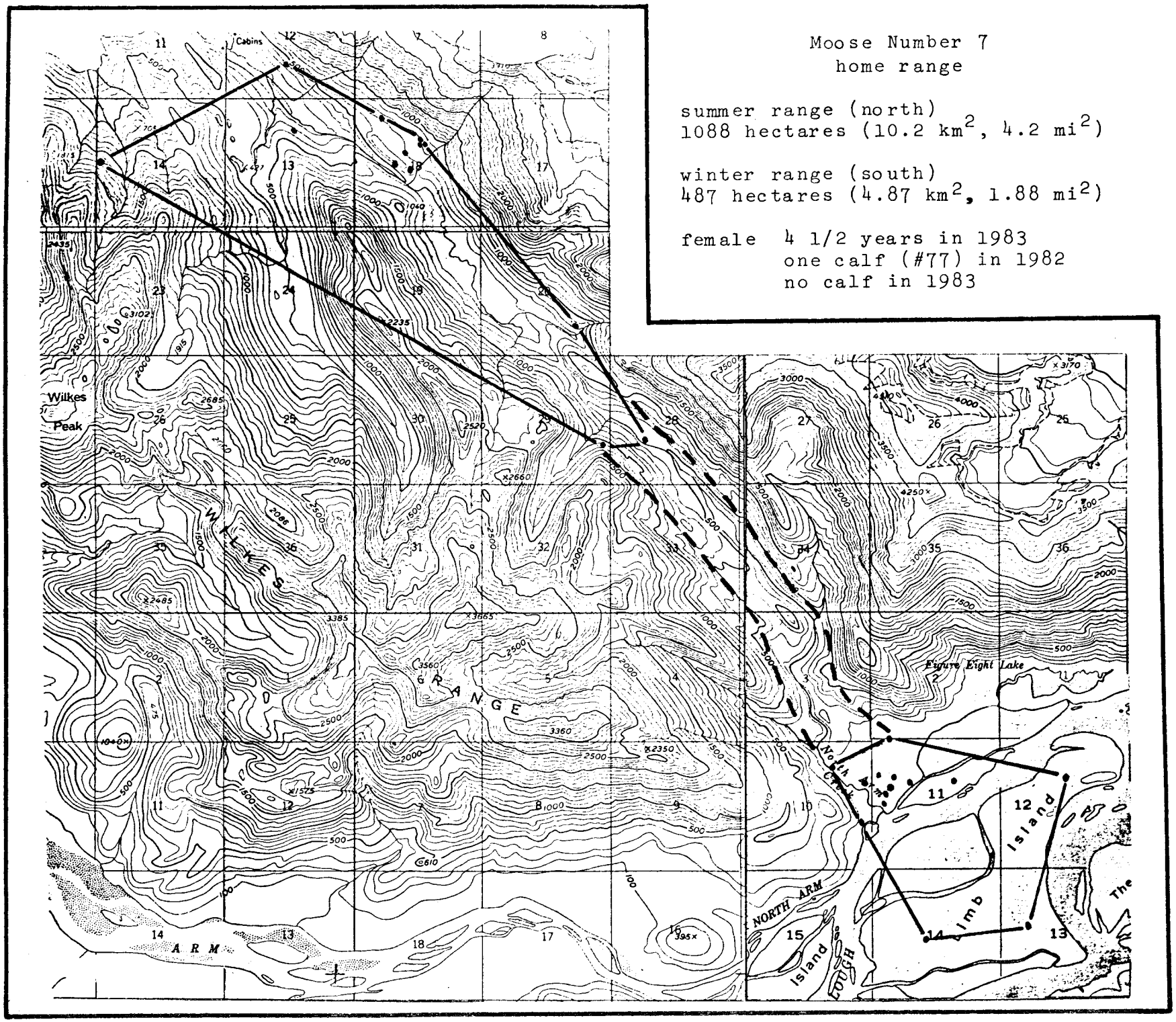
female 10 1/2 years in 1983
no calf in 1982
no calf in 1983

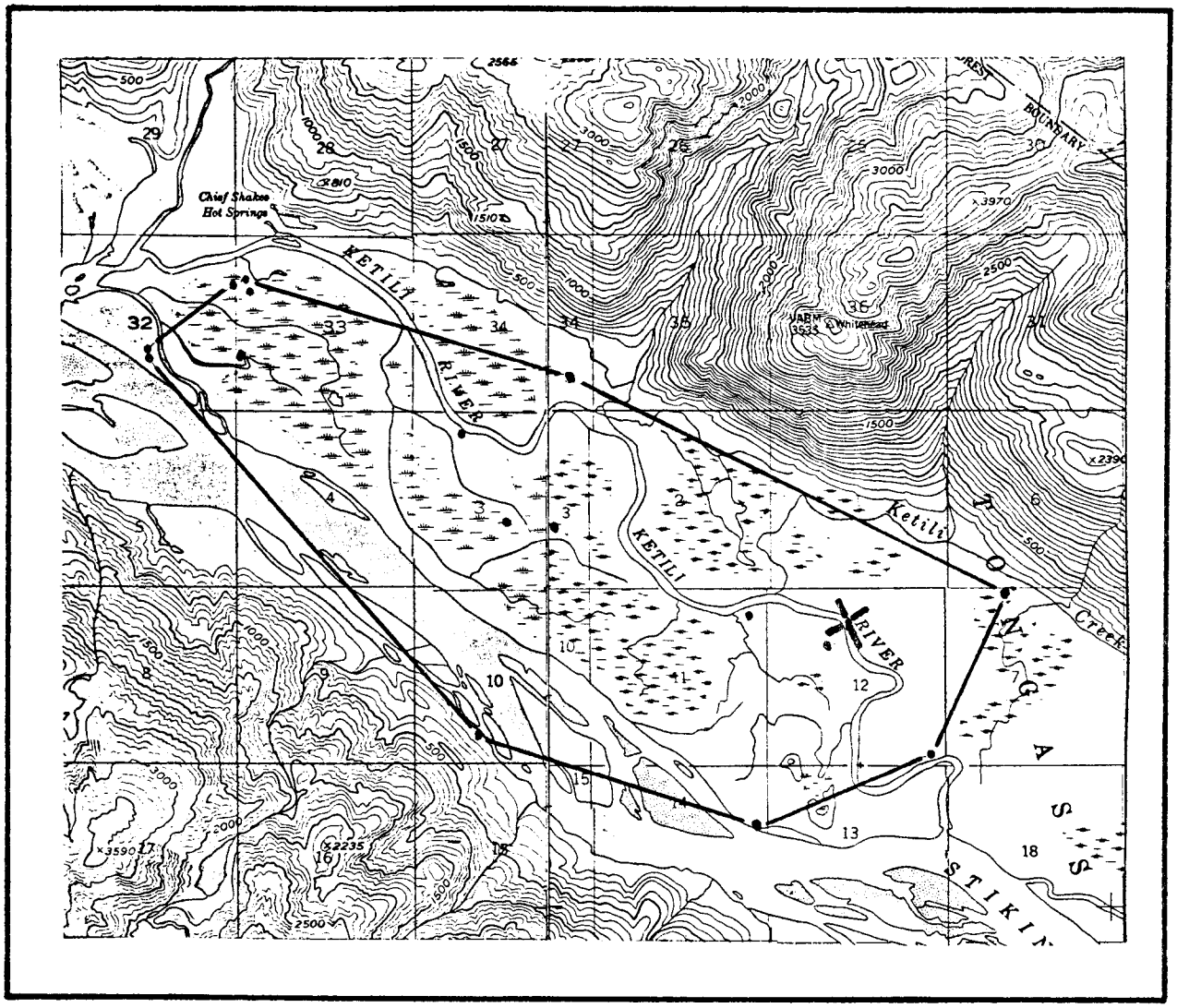


Moose Number 9
home range

1632 hectares (16.32 km^2, 6.30 mi^2)

adult female, one calf (#8) in 1982
no calf in 1983

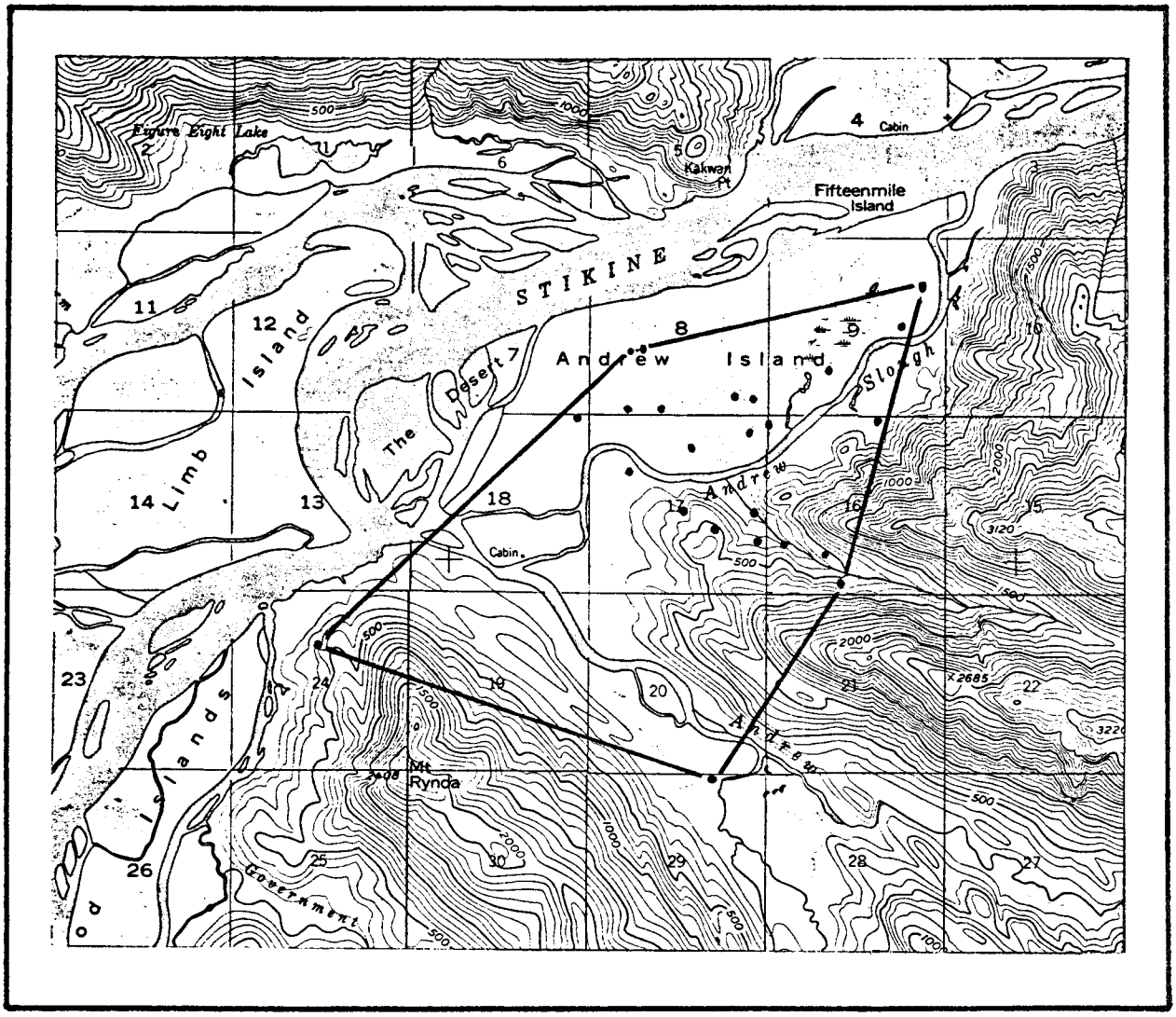

Moose Number 7
home range
summer range (north)
1088 hectares (10.2 km², 4.2 mi²)
winter range (south)
487 hectares (4.87 km², 1.88 mi²)
female 4 1/2 years in 1983
one calf (#77) in 1982
no calf in 1983
Cabins
Wilkes Peak
WILKES RANGE
ARM
Figure Eight Lake
North Creek
NORTH ARM
Island
Limb
Island



Moose Number 4
home range

1955 hectares (19.55 km^2, 7.55 mi^2)

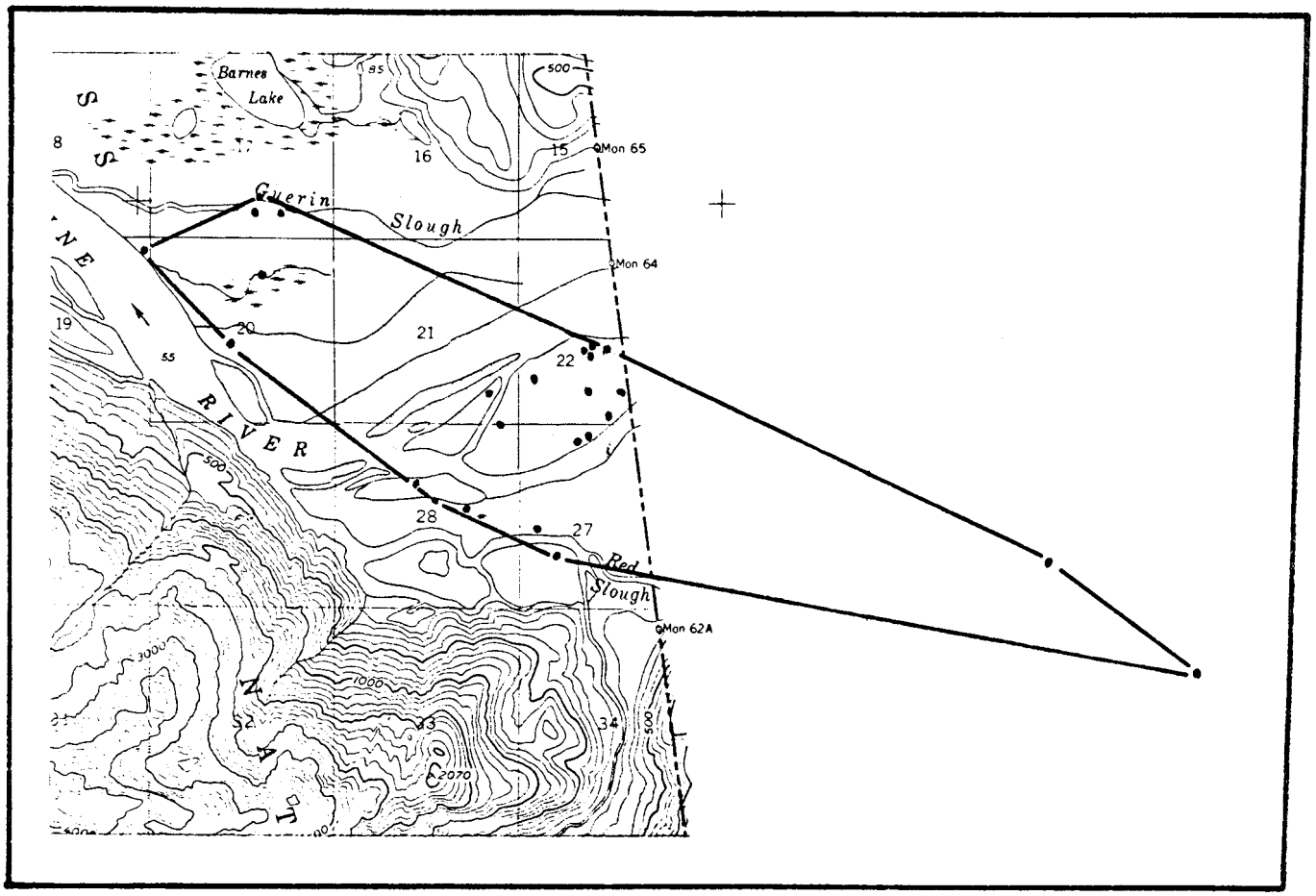
female 2 1/2 years when died about 8 Jan. 1983
no calf in 1982
no calf in 1983



Moose Number 6
home range

1256 hectares (12.56 km^2, 4.85 mi^2)

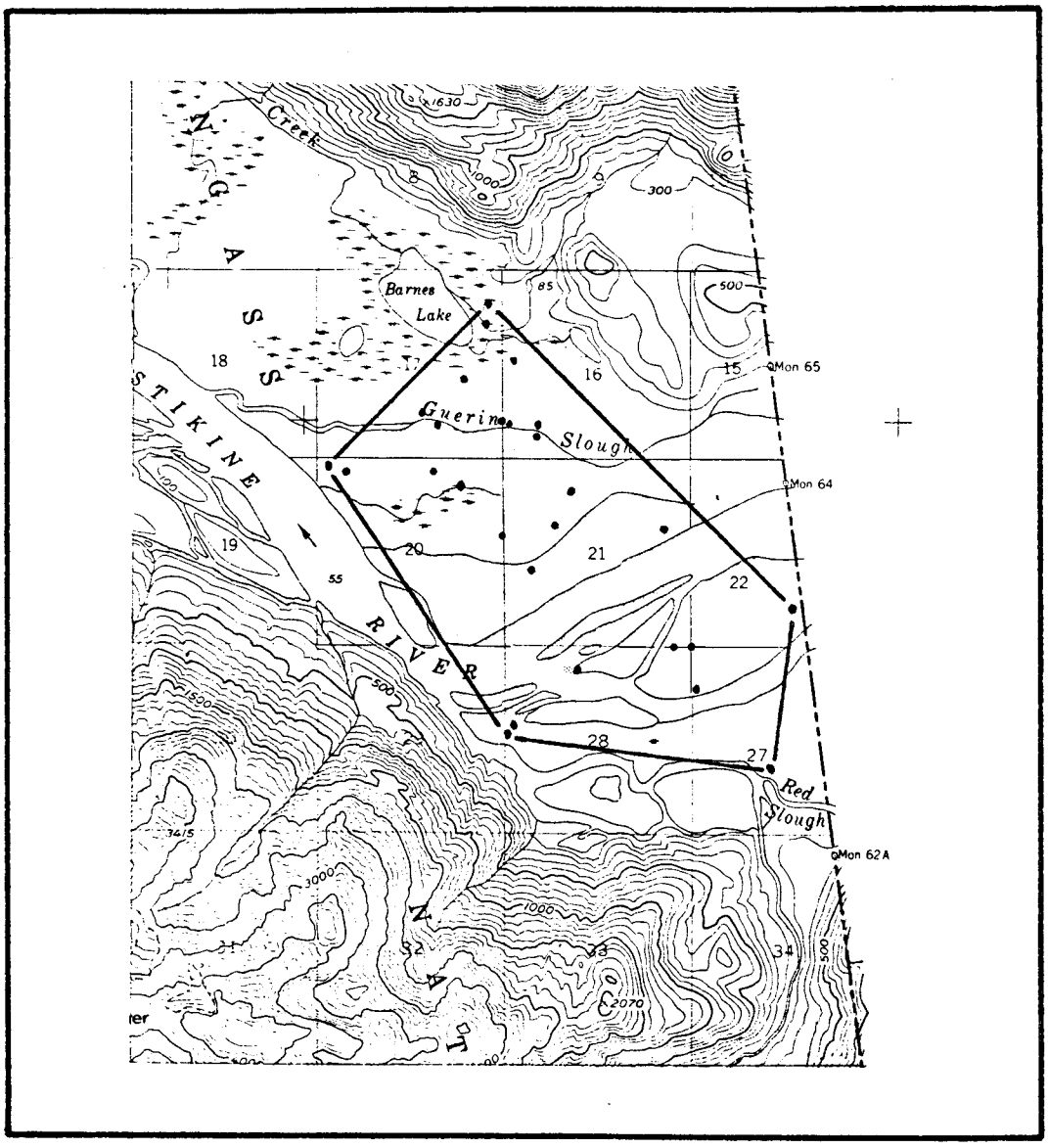
female 7 1/2 years in 1983
1 calf in 1982
no calf in 1983



Moose Number 44
home range

1059 hectares (10.59 km^2, 4.09 mi^2)

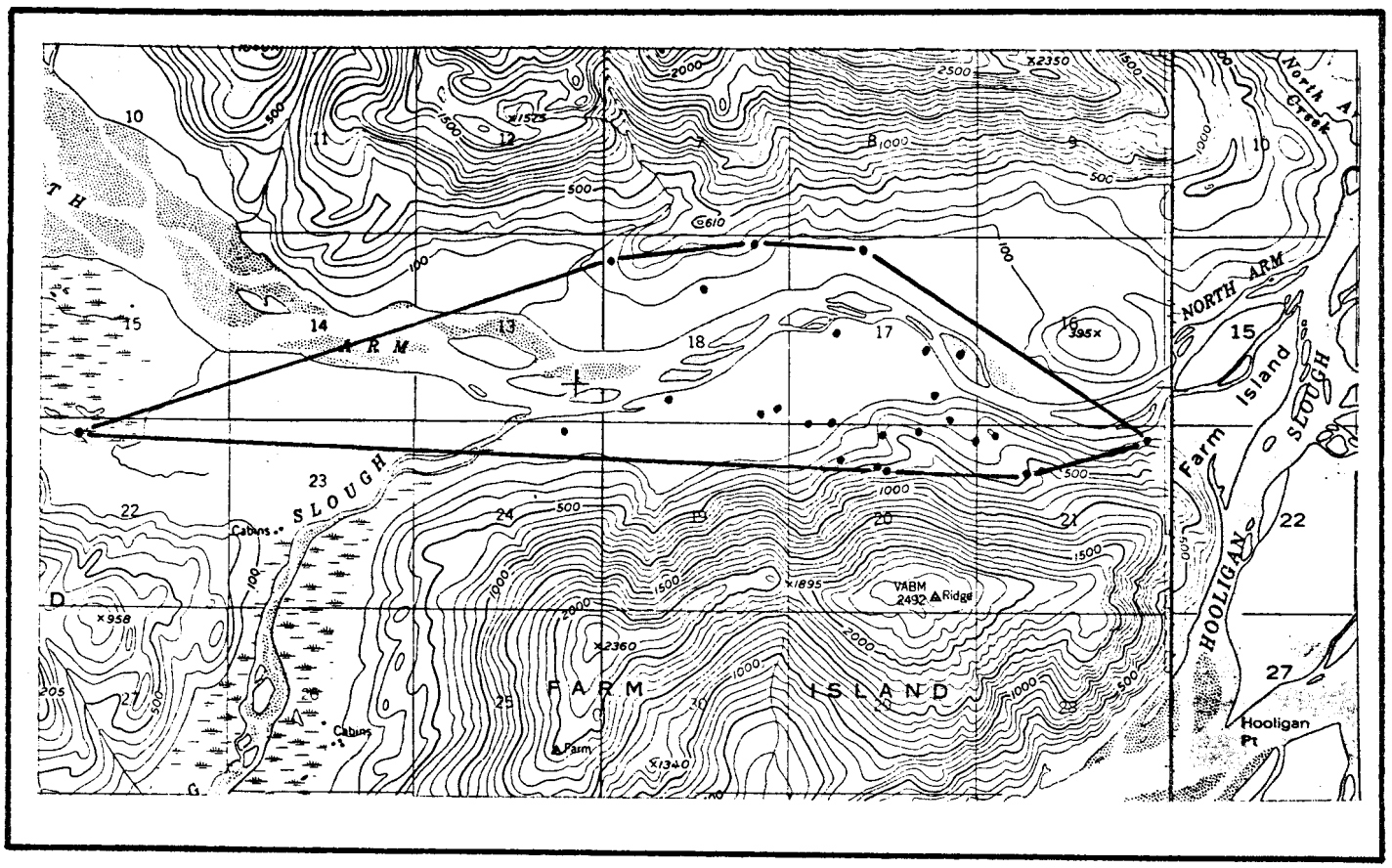
female 14 1/2 years in 1983
no calf in 1982
no calf in 1983



Moose Number 33
home range

901 hectares (9.01 km^2, 3.48 mi^2)

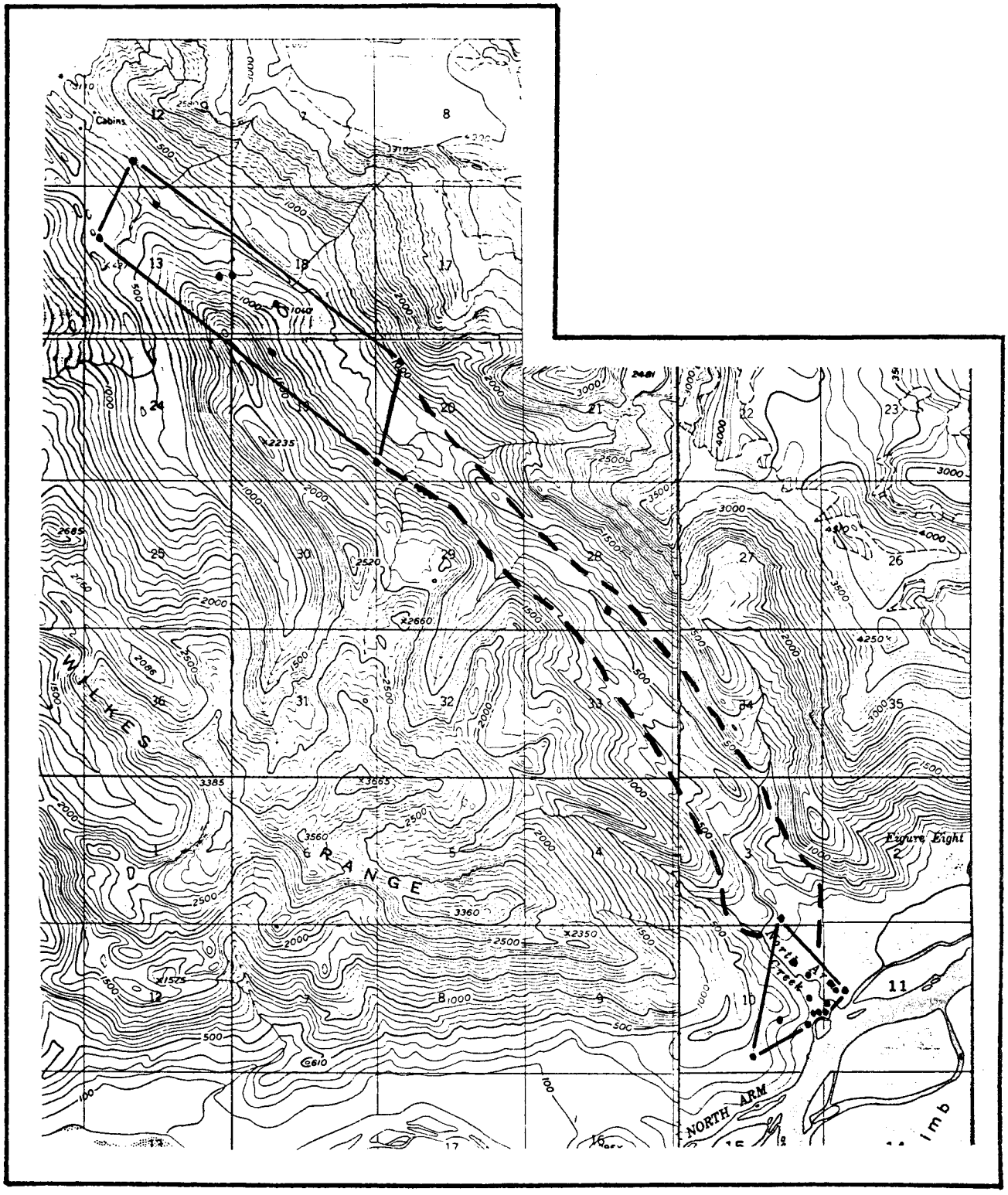
female 6 1/2 years in 1983
no calf in 1982
1 calf in 1983



Moose Number 3
home range

1072 hectares (10.72 km^2, 4.14 mi^2)

female 4 1/2 years in 1983
no calf in 1982
1 calf in 1983

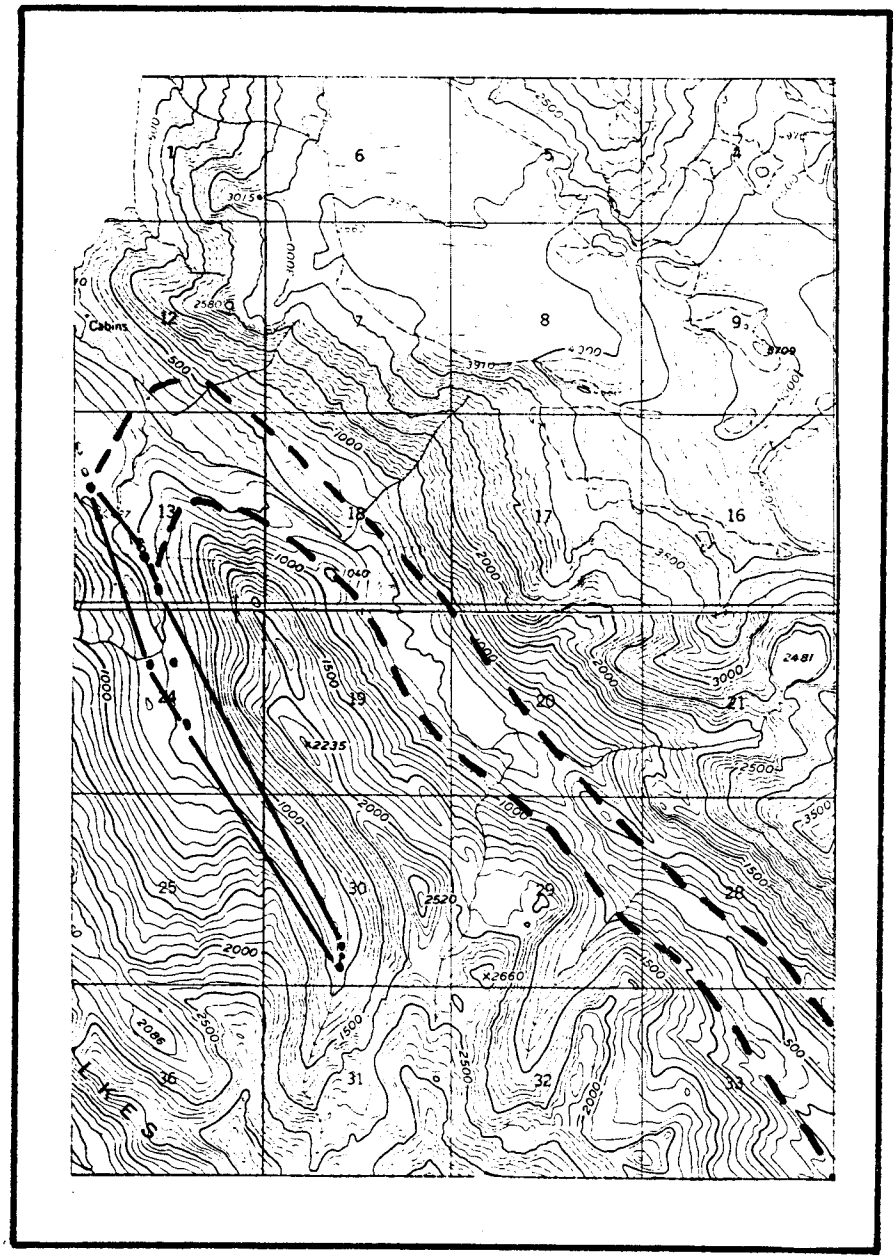


Moose Number 5
home range

summer range (north) 383 hectares (3.83 km^2, 1.48 mi^2)

winter range (south) 83 hectares (0.83 km^2, 0.32 mi^2)

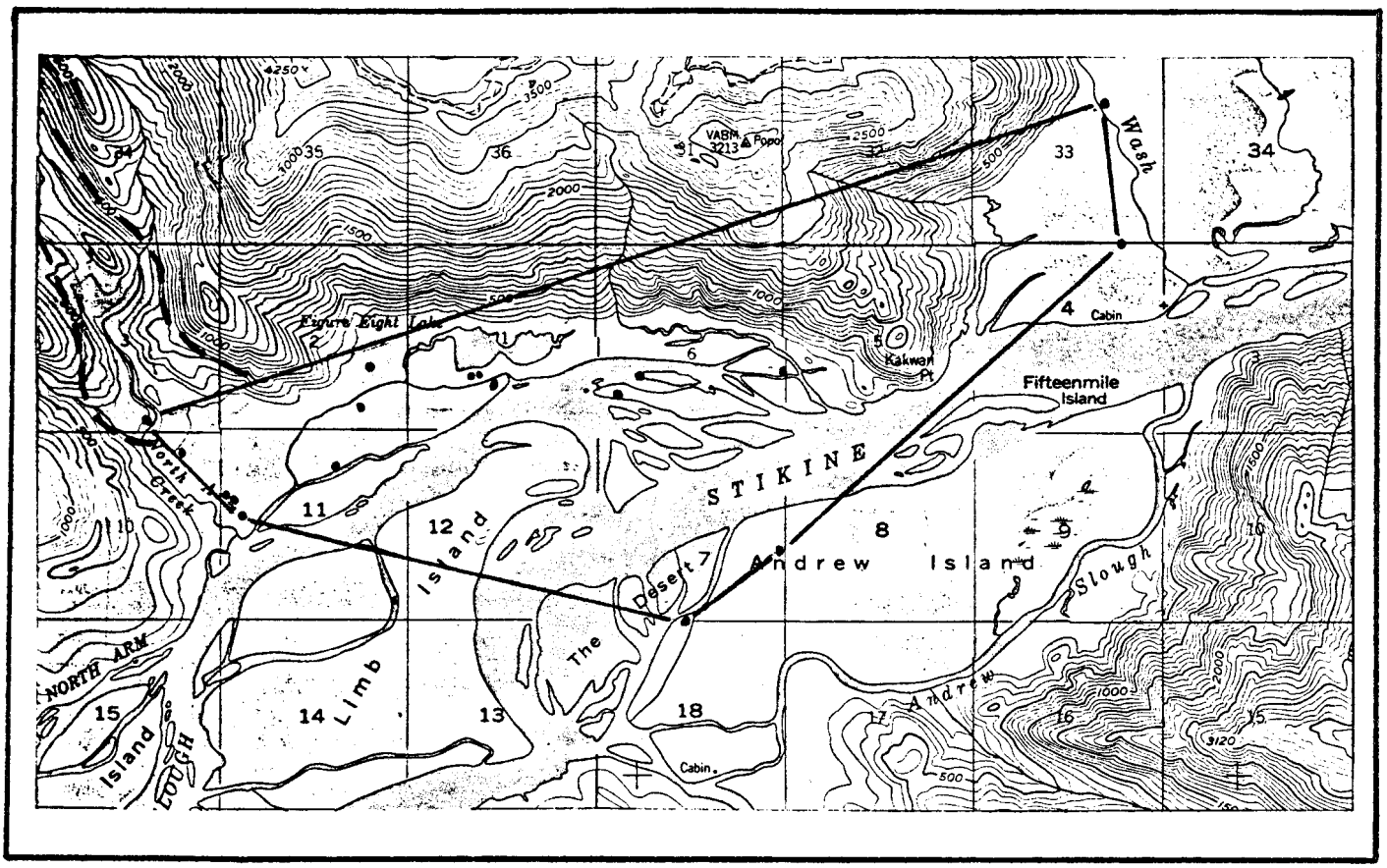
female 5 1/2 years in 1983, no calf in 1982
no calf in 1983



Moose Number 2
summer range

109 hectares (1.09 km^2, 0.42 mi^2)

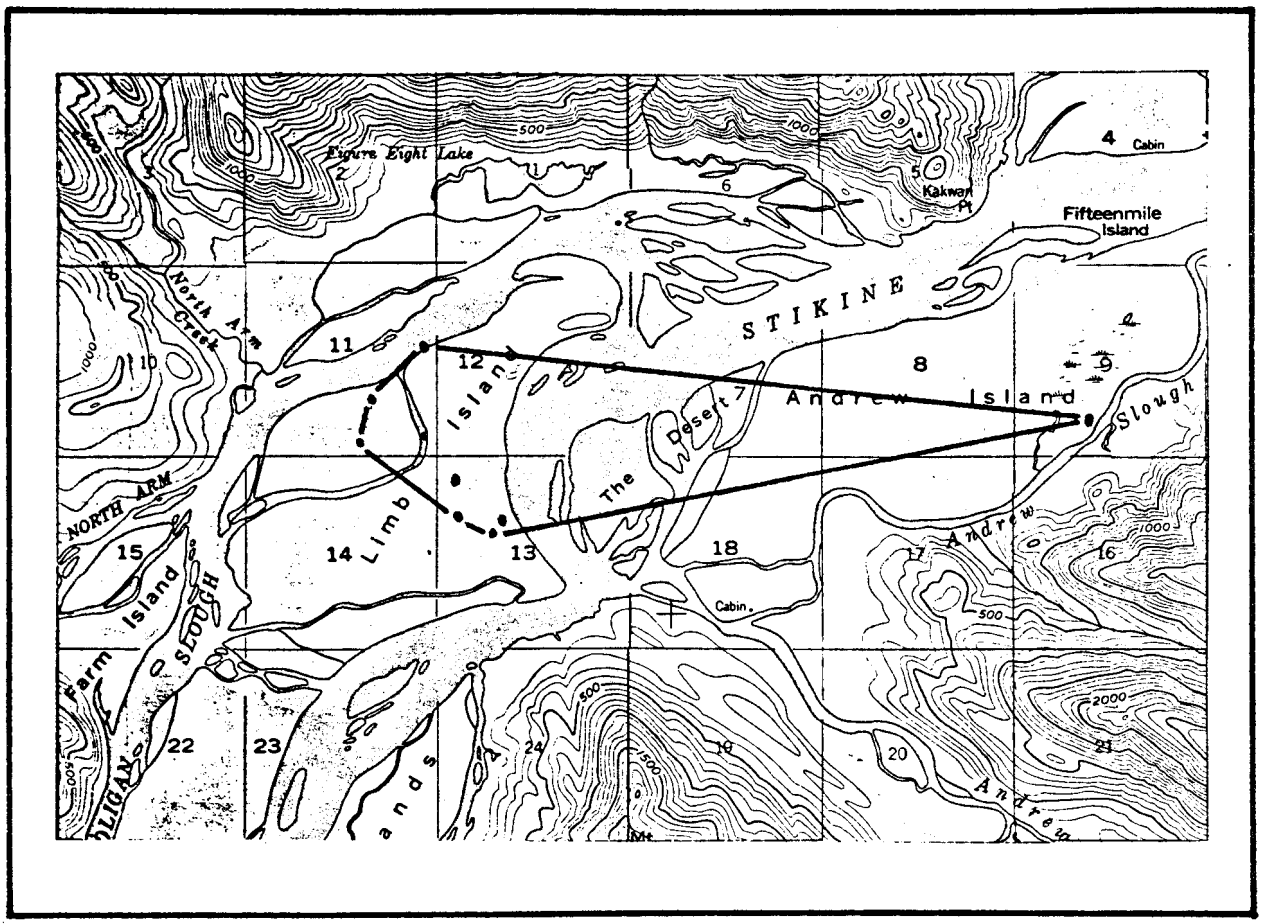
female 6 1/2 years in 1983
1 calf in 1982
no calf in 1983



Moose Number 2
winter range

1694 hectares (16.94 km^2, 6.54 mi^2)

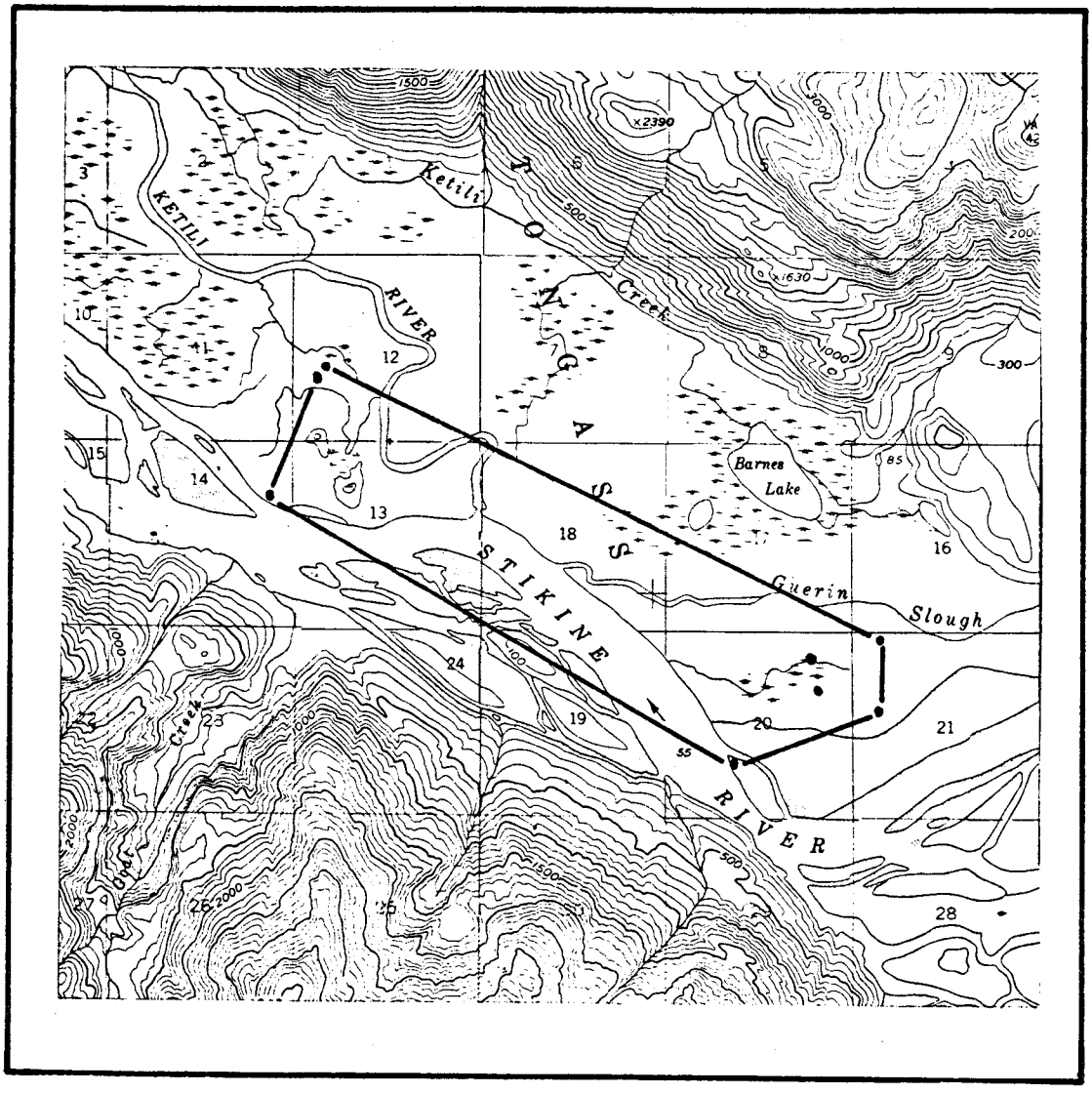
female 6 1/2 years in 1983



Moose Number 82
winter range

505 hectares (5.05 km^2, 1.95 mi^2)

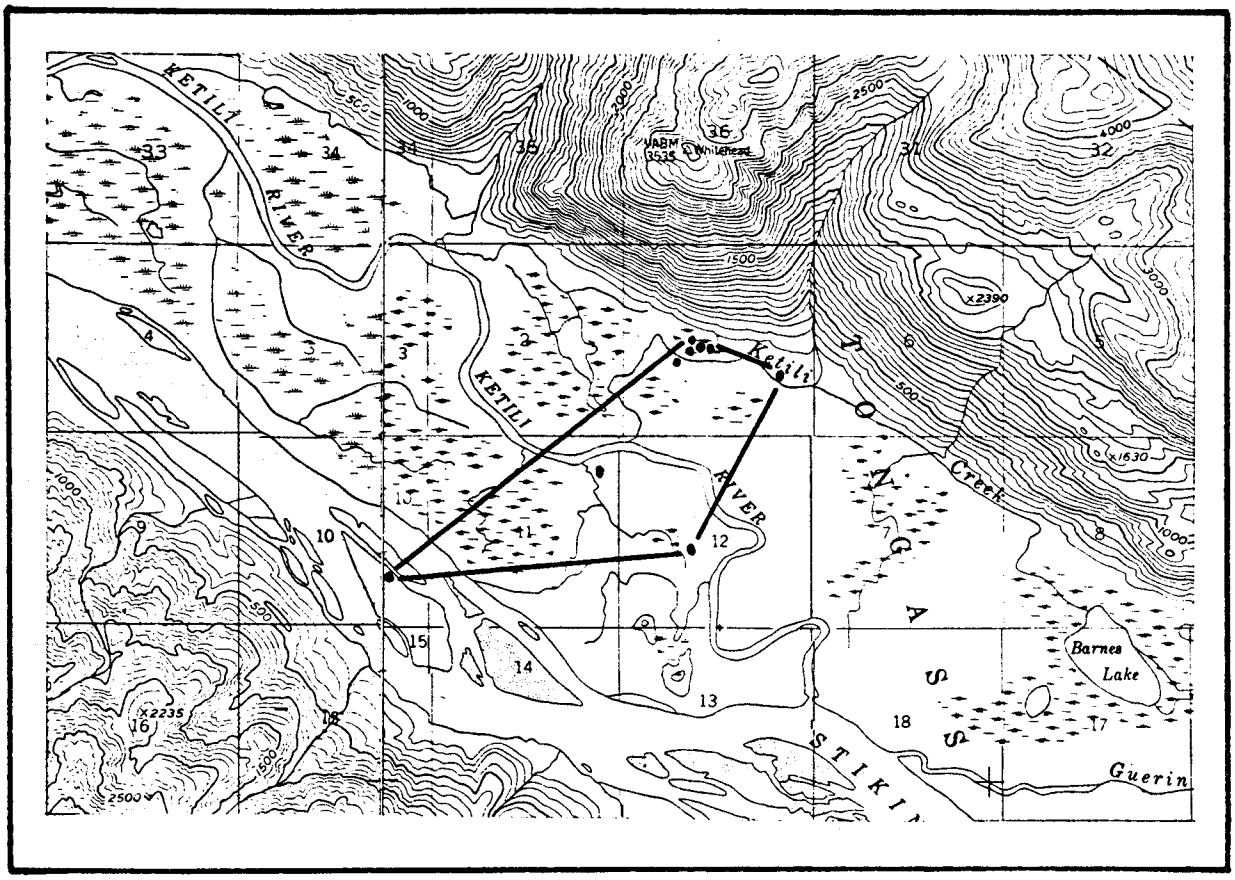
adult female no calf in 1983



Moose Number 000
winter range

728 hectares (7.28 km^2, 2.81 mi^2)

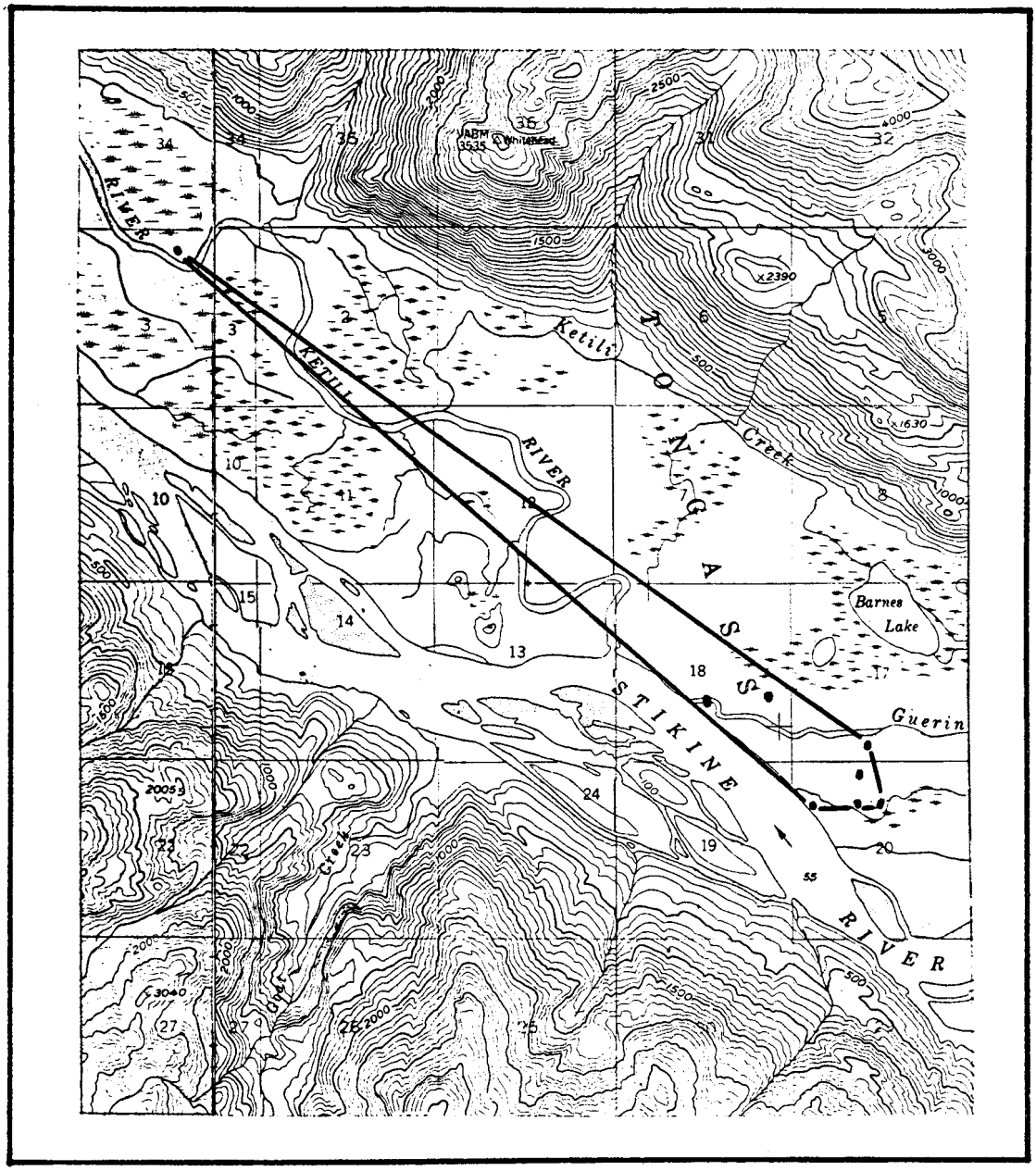
adult female no calf in 1983



Moose Number 111
winter range

300 hectares (3 km^2, 1.16 mi^2)

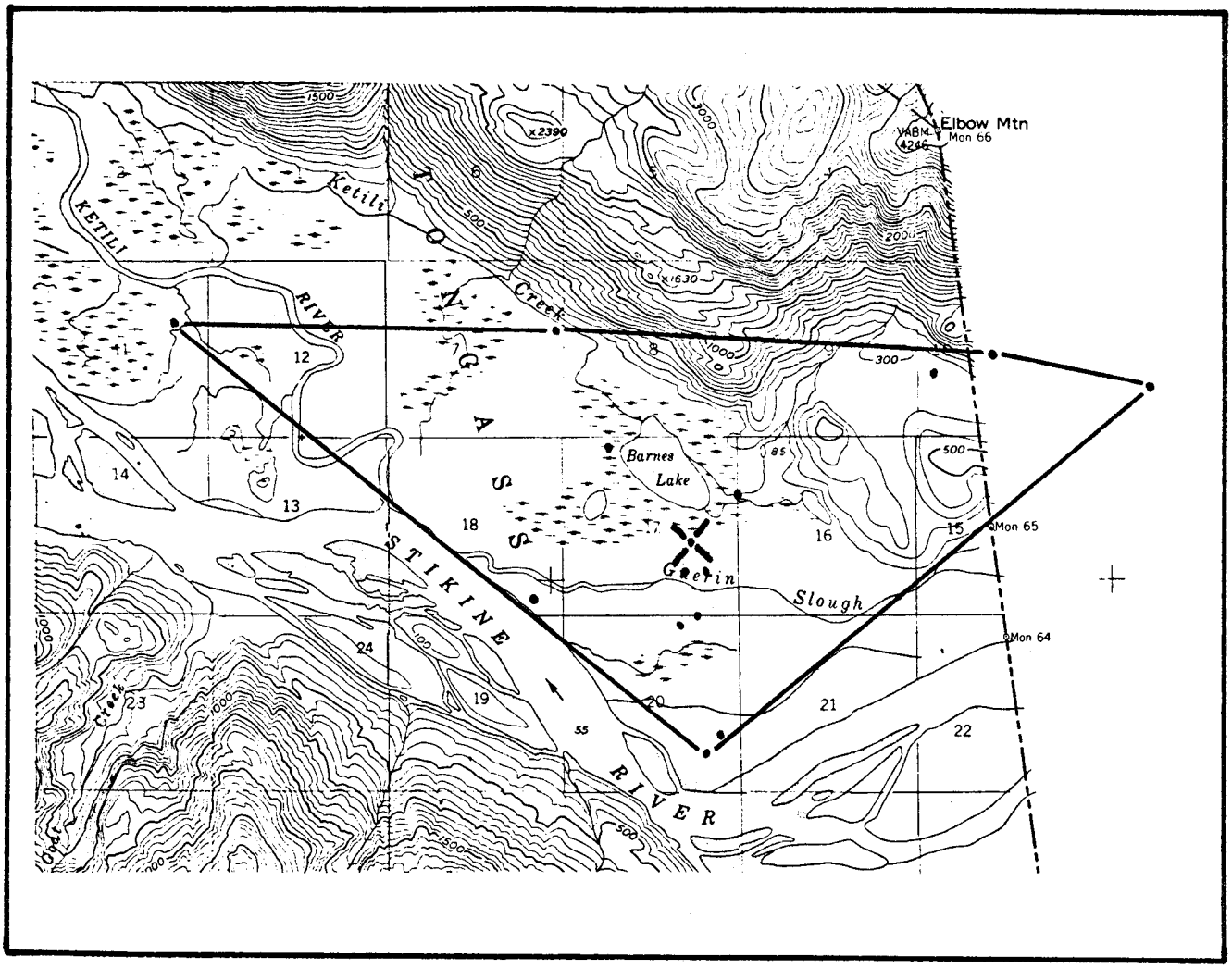
adult female 1 calf in 1982
1 calf and 1 yearling in 1983



Moose Number 6B
winter range

334 hectares (3.34 km^2, 1.29 mi^2)

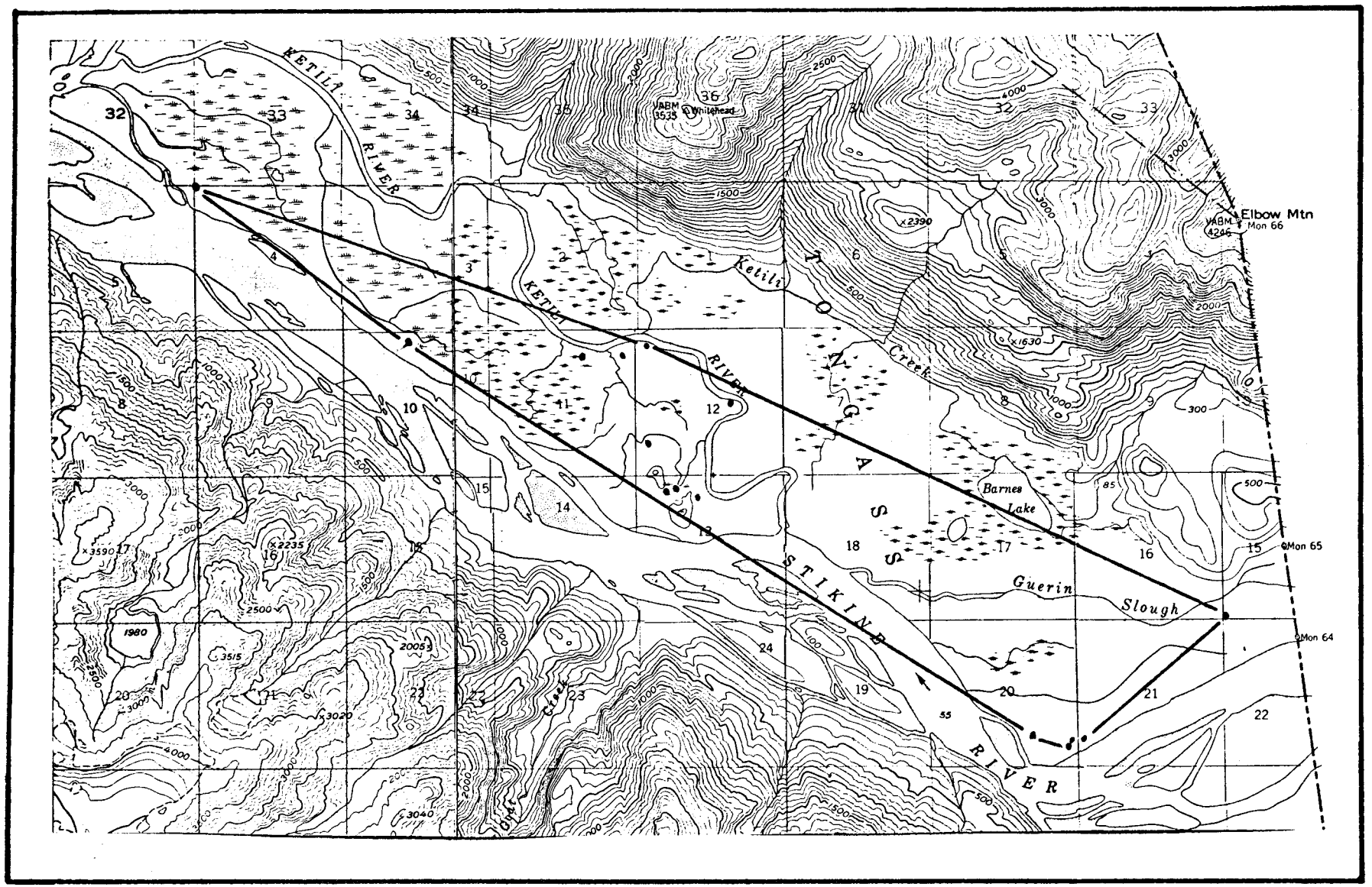
adult female no calf in 1983



Moose Number 66
home range

1735 hectares (17.35 km^2, 6.7 mi^2)

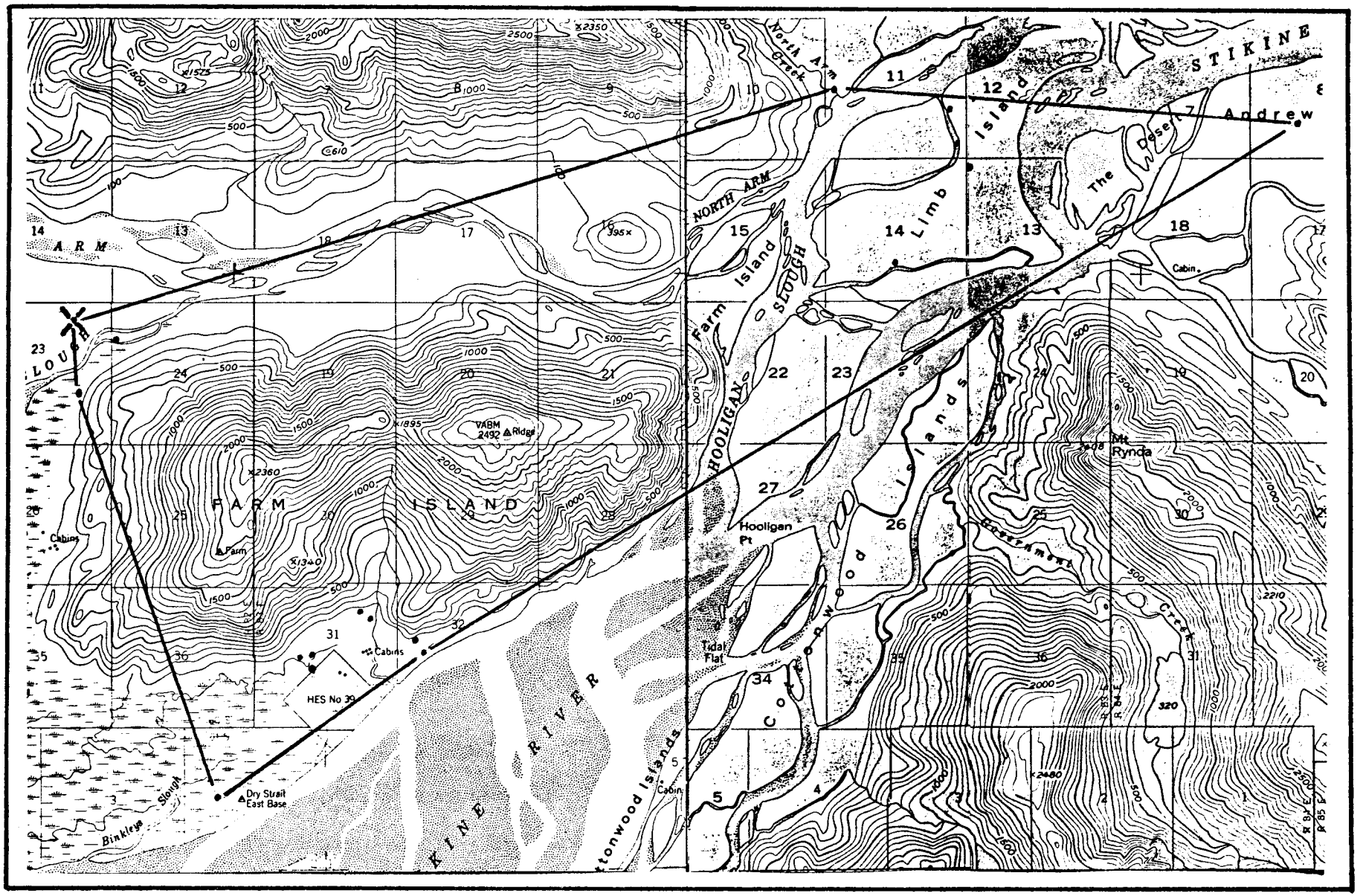
male 3 1/2 years when shot (X) 16 Oct. 1982



Moose Number 8B
home range

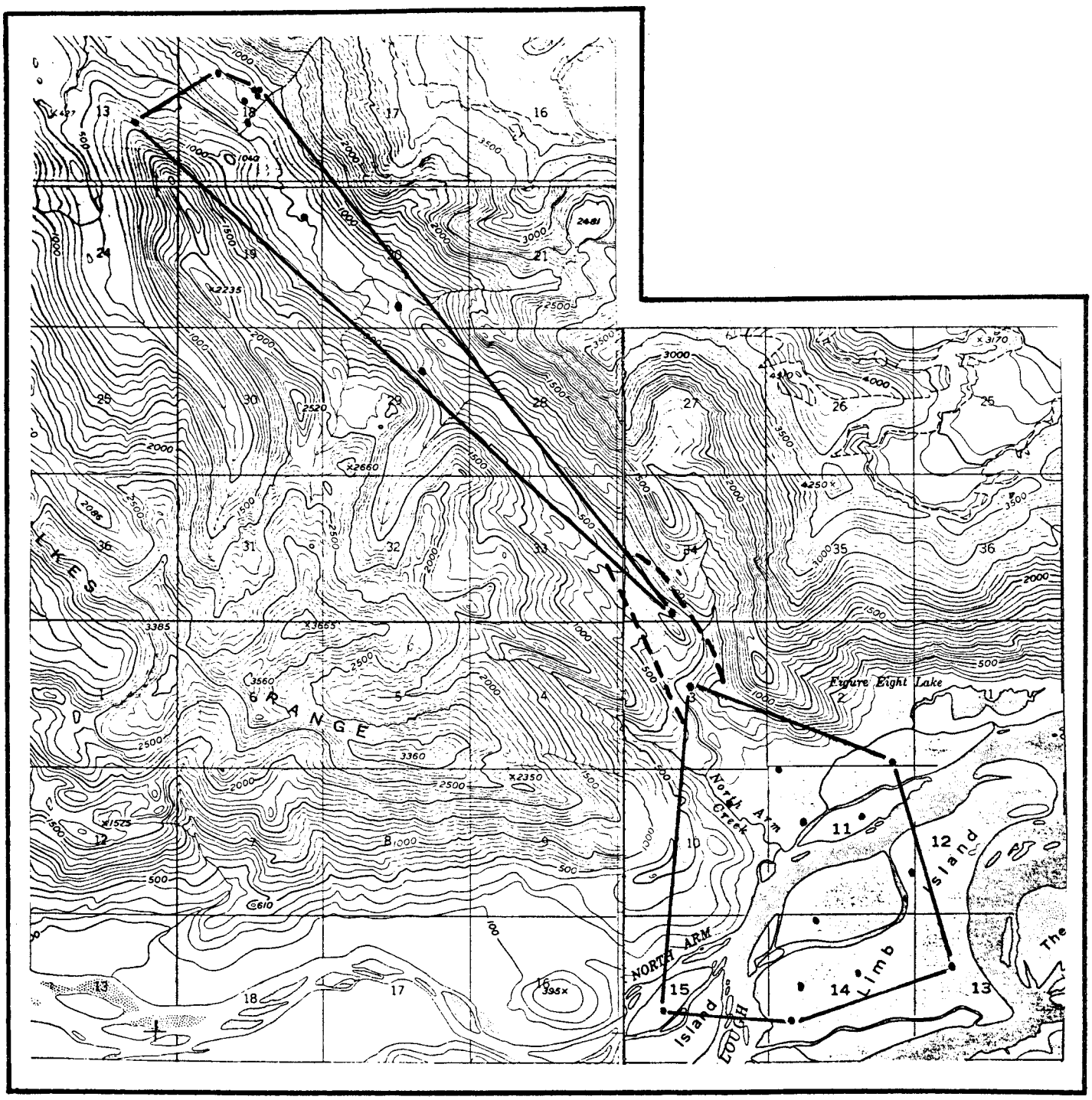
1593+ hectares (15.93 km^2, 6.15 mi^2)

male 1 1/2 years when shot on 5 Oct. 1982 behind Petersburg cabin; about 5 1/2 mile downstream from nearest home range location.



Moose Number 88
home range

4688 hectares (46.88 km^2, 18.10 mi^2)
male 2 1/2 years when shot (X) in November 1982



Moose Number 77
home range

summer range (north) 526 hectares (5.26 km^2, 2.03 mi^2)

winter range (south) 826 hectares (8.26 km^2, 3.19 mi^2)

male 2 1/2 years in 1983

Appendix B

PLANT OBSERVATIONS AND CHECKLIST

by

Jean Siddall

DRAFT

HABITATS identified during the
STIKINE RIVER MOOSE STUDY
May 1983

Jean L. Siddall

Coastal

Carex meadows above high tide
Knig Slough "tideflats"

Riparian

pioneer Salix interior-Equisetum varietagum communities colonizing sand and gravelbars.
Kakwan "gravels", dry sloughs on Andrew Is., "cottonwood" beach

mature cottonwood/willow spp./Equisetum
Andrew Is.

mature cottonwood/diverse shrub/herb communities on river levees and "islands" of higher ground.
Kakwan "gravels", Limb Is., #14-POTR bench

Carex meadows in low areas behind river levees and along sloughs
Twin Lakes, Kakwan "gravels", Guerin Slough, Small Slough meadow

willow-alder community invading Carex meadows
#15-E.of Twin Lakes, #23-Dry Wash SASI

Sphagnum bogs
Kakwan "gravels" bog, Dry Wash Cr. bog

Upland

mature spruce/OPHO/Polystichum braunii
#17 & #19-Guerin PISI

mature spruce/RIBR-MEFE-OPHO-MAFU/MADI-fern
Kakwan cabin/pt.

mature spruce/VAPA-RUSP/RUPE-COCA
Flemer cabin, #22-Dry Wash PISI

mature spruce-western hemlock/ferns
#18-Guerin TSHE, Banana Pt.

dense willow-alder thickets/ sparse understory
#20-Guerin, #21-Twin Lakes, #16-Small Slough

Appendix B

PLANTS seen during
STIKINE RIVER MOOSE STUDY
May 8 to 20, 1983

by Lance Craighead
Jean L. Siddall
Sue Yamamoto

TREES	Upper river-Flemer area: Flemer cabin	Cottonwood beach	#14-POTR bench	Small Slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Lower river-Kakwan area: Dry Wash Cr. bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E. of Twin Lks.	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Island beach	Knig tideflats	Mitkof Is.: Banana Point	Petersburg
Chamaecyparis nootkatensis (Alaska yellow cedar)																								X
Picea sitchensis (Sitka spruce)	X+		X+	X++	X	X++	X++	X++	X++	X-	X	X	X++	X-	X++				X				X++	
Pinus contorta (shore pine)																								X
Tsuga heterophylla (western hemlock)	X					X	X--	X-R	X-R			X	X+	X-									X	
Tsuga menziesii (mountain hemlock)												X		X+-										X
Populus trichocarpa (black cottonwood)		X++	X++	X++	X										X-	X++				X	X++			
SHRUBS																								
Alnus rubra (red alder)																	X-						X	
Alnus sinuata (Sitka alder)		X	X	X++		X	X		X-					X++	X	X		X	X		X++		X	
Alnus tenuifolia (thin-leaved alder)					X+	X				X++			X			X	X-	X						
Cornus stolonifera (red osier dogwood)		X++	X++	X++	X++	X	X	X	X+	X++	X		X		X	X	X-		X-		X+			
Juniperus communis (creeping juniper)																								X
Malus fusca (Oregon crabapple)															X	X	X	X	X-					
Menziesia ferruginia (fool's huckleberry)						X		X--					X	X-	X								X+	
Oplopanax horridus (devil's-club)	X	X+	X-			X+	X++	X++	X++		X		X++		X	X			X		X		X+	
Ribes bracteosum (stink currant)						X	X		X						X						X+		X	
Ribes lacustre (prickly currant)		X				X--		X--	X--						X-									
Ribes laxiflorum (trailing black currant)															X-									
Rubus parviflorus (thimbleberry)															X									
Rubus spectabilis (salmonberry)	X	X	X--		X++	X	X	X	X+	X-	X				X	X	X	X	X++		X+		X	

Shrubs (continued)	Flemer cabin	Cottonwood beach	#14-POTR bench	Small Slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Dry Wash Cr.bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E.of Twin Lks.	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Island beach	Knig tideflats	Banana Point	Petersburg
Salix alaxensis (felt-leaf willow)																X				X+				
Salix barclayi (Barclay willow)					X	X				X+						X	X+	X	X--	X+				
*Salix interior$_1$ (sandbar willow)		X														X				X+				
Salix monticola (park willow)																X				X				
Salix sitchensis (Sitka willow)		X			X+	X	X			X+				X+		X	X	X	X+	X+				
Sambucus racemosa var. arborescens (red elderberry)		X	X		X	X	X		X-	X					X	X	X		X		X-		X	
Sorbus aucuparia (European mountain-ash)																								X-
Sorbus scopulina (western mountain-ash)																X-								
Sorbus sitchensis (Sitka mountain-ash)														X--										
Vaccinium alaskense (Alaska blueberry)																							X	
Vaccinium caespitosum (dwarf huckleberry)																								X
Vaccinium ovalifolium (oval-leaved huckleberry)						X			X--				X+	X-	X			X					X	X
Vaccinium parvifolium (red huckleberry)	X++					X		X+					X+											X
Vaccinium uliginosum (bog huckleberry)																								X
Vaccinium vitis-idaea (lingonberry)																								X
Viburnum edule (high-bush cranberry)		X	X-		X	X	X	X-	X+				X			X	X	X						
HERBS																								
Achillea millefolium ssp. borealis (yarrow)															X							X		
Actaea rubra (baneberry)		X				X	X			X					X	X			X		X			
Andromeda polifolia (bog rosemary)																								X
**Angelica arguta$_2$ (sharp-toothed angelica)																X-								

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May 1983
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Herbs (continued)	Flemer cabin	Cottonwood beach	#14-POTR bench	Small Slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Dry Wash Cr. bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E.of Twin Lks	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Is. beach	Knig tideflats	Banana Pt.	Petersburg
Angelica genuflexa (kneeling angelica)						X				X++	X			X	X	X	X	X	X					
Angelica lucida (seacoast angelica)																						X		
Aruncus sylvester (goat's-beard)						X			X						X	X	X				X			
Boschniakia rossica (ground-cone)			X--																					
Caltha palustris ssp.asarifolia (yellow marsh-marigold)																•X		•X				•X-		
/Caltha sp. [? biflora] (marsh marigold)																X								
Cardamine oligosperma var.kamtschatika 3 (Siberian bittercress)																		•X--						
*Cardamine pratensis ssp. angustifolia 4 (cuckoo flower)																		•X-						
*/cf. Cardamine purpurea 5 (purple bittercress)						X																		
Carex ssp. (sedges)				X++		X L++								X++		•X L++	X++	•X++				X-		
/Castilleja cf.hyetophila (Indian paintbrush)																						X		
Circaea alpina (enchanter's-nightshade)															X	X								
Coptis asarifolia (fern-leaved gold-thread)												X	•X L											X
Coptis trifolia (trifoliate gold-thread)												b X												X
Cornus canadensis (bunchberry)	X												•X L	•X L										
Cornus suecica (Swedish cornel)																							X	X
/cf.Dicentra sp.																X								
Dodecatheon jeffreyi (Jeffrey shooting-star)																					b X			•X L
Dodecatheon pulchellum (pretty shooting-star)															•X L-									
Drosera anglica (long-leaved sundew)																								X
Drosera rotundifolia (round-leaved sundew)																								X

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May 1983
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Herbs (continued)	Flemer cabin	Cottonwood beach	#14-POTR bench	Small Slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Dry Wash Cr. bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E. of Twin Lks	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Is. beach	Knig tideflats	Banana Point	Petersburg
⁄Empetrum nigrum (crowberry)																								X
Epilobium angustifolium (fireweed)		X																						
⁄Epilobium cf. luteum (yellow willow-herb)																X⁻								
Equisetum fluviatile (swamp horsetail)																		X						
Equisetum pratense (meadow horsetail)		X	X⁺		X	X			X	X				X		X								
Equisetum variegatum var. alaskanum (variegated scouring-rush)		X	X⁻⁻											X		X⁺⁺				X⁺				
Eriophorum russeolum var. albidum [E. chamissonis] (cotton-grass)																•X[L]								
⁄Fauria crista-galli (deer cabbage)												X												X
Fritillaria camshatcensis (Kamshatka fritillary)					X⁻										•X	•X	X		X		X	X		
Galium triflorum (sweet-scented bedstraw)		X				X				X					X	X								
Geum calthifolium (caltha-leaved avens)																								X
Geum macrophyllum (large-leaved avens)					X	X				X					•X	•X	X		X					
Heracleum lanatum (cow parsnip)		X	X⁻		X	X			X						X	X	X		X		X			
Hierochloe odorata (vanilla grass)																						X		
Hippuris vulgaris (mare's-tail)																		X						
Iris setosa ssp. setosa (wild iris)																						X		
Kalmia polifolia (kalmia)												X⁺⁺												X⁺⁺
Ledum groenlandicum (Laborador tea)																								X
Ledum palustre ssp. decumbens (northern Laborador tea)																								X
*⁄Limnosella aquatica (mudwort)																X⁻⁻								
*⁄Listera convallarioides (broad-lipped twayblade)		X⁻⁻	X⁻⁻		X⁻⁻											X⁻⁻								

Stikine River Plant List
May 1983

Herbs (continued)	Flemer cabin	Cottonwood beach	#14-POTR bench	Small Slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Dry Wash Cr. bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E. of Twin Lks	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Is. beach	Knig tideflats	Banana Point	Petersburg
Lupinus nootkatensis (Nootka lupine)																						bX		
Lysichitum americanum (yellow skunk-cabbage)					•X	•X			•X⁻				•X	•X	•X	•X	•X		•X				•X	
Maianthemum dilatatum (wild lily-of-the-valley)															bX	X	X		X		X		X	
Menyanthes trifoliata (buckbean)																X⁻⁻								•X⁺
⁄Mimulus guttatus (yellow monkeyflower)											X													
Monesis uniflora (one-flowered pyrola)																						bX		
Montia sibirica [Claytonia s.] (Siberian miner's-lettuce)															•X									
Osmorhiza purpurea (sweet cicely)		X	X⁺		X	X			X						•X	X								
Oxycoccus microcarpus [Vaccinium oxycoccus]g (bog cranberry)												X												X
Plantago macrocarpa q (Alaska plantain)																						X		
Plantago major (broad-leaved plantain)											X													
Potentilla egedii ssp. grandis [P. anserina var. grandis] (silverweed)																						X		
Potentilla palustris (marsh five-fingers)														X		X	X	X						
⁄Pyrola sp. (?asarifolia)10 (pyrola, wintergreen)		X	X⁺⁺												X	X								
Pyrola secunda (one-sided wintergreen)			X⁻			X⁻⁻			X					X⁻⁻											
Ranunculus bongardii [R. uncinatus var. parviflorus] (little buttercup)											X				•X⁻									
Ranunculus repens (creeping buttercup)						X⁻																		
⁄Ranunculus sp. (buttercup)															X									
Rubus arcticus ssp. stellaris (Nagoon berry)												•X⁻⁺		•X		•X		•X						•X
Rubus chamaemorus (cloudberry)																								•X

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Herbs (continued)	Flemer cabin	Cottonwood beach	#14-POTR bench	Small Slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Dry Wash Gr. bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E. of Twin Lks	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Is. beach	Knig tideflats	Banana Point	Petersburg
Rubus pedatus (five-leaf bramble)	X++												X++										X	X
**/cf. Sanicula crassicaulis „ (snakeroot)																						X		
/Sanguisorba menziesii? (Menzies' burnet)																X L++								
/Sanguisorba stipulata ? (Sitka burnet)																								X
Saxifraga mertensiana (Merten's saxifrage)															•X L-									
Saxifraga punctata (brook saxifrage)															X L-									
Scirpus spp. (rushes)																								X
Sedum rosea ssp. integrifolia (rosy stonecrop)															X L									
Streptopus amplexifolius (twisted stalk)		X	X-		•X	•X	•X	•X	•X	•X					•X	•X	•X		•X		•X			
Streptopus roseus var. curvipes (rosy twisted stalk)						•X	•X	•X	•X	•X					•X+	•X		•X						
Tellima grandiflora (fringecup)															•X				b X		b X			
/Thalictrum sp. (meadowrue)																X	X							
/Tiarella unifoliata (foamflower, coolwort)						X		X															X	
Tiarella trifoliata (three-leaved coolwort)						X			X		X				X									
Tofieldia glutinosa ssp. brevistyla (tofieldia)																								X
Trientalis arctica (Arctic starflower)																		•X						•X
Urtica lyallii [U. dioica] (stinging nettles)						X	X			X							X		X++					
Veratrum viride ssp. eschscholtzii (green false hellebore)															X		X		X					
Viola epipsila ssp. repens [V. palustris] (marsh violet)						•X				•X	•X				•X	•X	•X	•X						
Viola glabella (Johnny-jump-up)											•X				•X				•X					

Stikine River Plant List
May 1983

	Flemer cabin	Cottonwood beach	#14-POTR bench	Small slough mdw.	#16-Small Slough	Guerin Slough	#17-Guerin PISI	#18-Guerin TSHE	#19-Guerin PISI	#20-Guerin SASI	Ketili River	Dry Wash Cr. bog	#22-Dry Wash PISI	#23-Dry Wash SASI	Kakwan cabin/Pt.	Kakwan "gravels"	#15-E. of Twin Lks	Twin Lakes	#21-Twin Lks RUSP	Andrew Island	Limb Is. beach	Knig tideflats	Banana Point	Petersburg
FERNS																								
Athyrium filix-femina (lady-fern)					X	X	X		X	X					X	X			X		X		X	
Cystopteris fragilis (fragile fern)																					X			
Dryopteris austriaca [D. dilatata] (spreading wood-fern)						X	X	X	X						X	X								
Gymnocarpium dryopteris (oak fern)						X	X+	X	X						X+								X	
*Polypodium hesperium ,2 [P. vulgare var. columbianum] (licorice fern)																							X	
Polystichum braunii ,3 (Alaska shield-fern)						X	X+	X	X++						X	X			X					
Pteridium aquilinum (bracken)																X								
Thelypteris phegopteris (beech-fern)						X			X						X			X					X	
FERN ALLIES																								
Lycopodium annotinum ssp. annotinum (stiff club-moss)						X-		X																X
Lycopodium annotinum ssp. pungens (stiff club-moss)																							X+	
Lycopodium clavatum (ground-pine)																							X	X
Lycopodium selago (fir club-moss)						X-		X				X			X									X
MOSSES [only to indicate sphagnum areas]																								
Sphagnum spp. (sphagnum moss)												X++				X++								X++

Compiled by Jean L. Siddall
Lake Oswego, Oregon
May, 1983

Stikine River Plant List
May 1983
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NOTES AND COMMENTARY

The flora used for plant identification include: Hulten, Flora of Alaska and neighboring territories; Welsh, Anderson's Flora of Alaska and adjacent parts of Canada; and Hitchcock, et al., Vascular Plants of the Pacific Northwest.

Nomenclature usually follows Anderson's Flora of Alaska, with synonyms given in [ ] where necessary.

Symbols used:

++ = codominant	= blooming on date seen
+ = abundant	= in bud
- = uncommon	= in fruit
-- = scarce	⁄ = need flower for positive identification
R = regenerating (trees)	* = out of known range in Alaska, as given on Hulten's maps
L = local	** = may be new state record; not in Hulten or Anderson

Notes:

1 - Salix interior - known range (Hulten) is Yukon north
2 Angelica arguta - not in either Hulten or Anderson; known range is s.BC to Cal.(Hitchcock)
3 Cardamine oligosperma var. kamtschatika - in Anderson but not Hulten
4 Cardamine pratensis ssp. angustifolia - known range is Juneau north (Hulten)
5 Cardamine purpurea - known range is Yukon north (Hulten)
6 Limnosella aquatica - known from disjunct sites in Alaska but none SE (Hulten)
7 Listera convallarioides - known in Alaska only from the Aleutian Islands (Hulten), but occurs as far south as Oregon (Siddall)
8 Oxycoccus microcarpus - on Oregon list of rare and endangered species as Vaccinium oxycoccus
9 Plantago macrocarpa - on Oregon list of rare and endangered species; probably now extinct in Oregon.
10 Pyrola ?asarifolium - based on known ranges, this should be Pyrola minor, but the leaves are much too large; known range for P.asarifolium is Juneau north.
11 Sanicula crassicaulis - known range is s. BC to Calif. (Hitchcock)
12 Polypodium hesperium - "very rare in Alaska" (Anderson); not in Hulten.
13 Polystichum braunii - Hulten splits P. braunii into ssp. braunii and ssp. andersonii, with the key difference being that the upper basal pinnae are conspicuously longer than succeeding pinnae in P. andersonii. I (Siddall) collected many leaflets from the plants on transect #17, which intergrade from "equal to" to "conspicuously longer than"within the same population. I have seen many P. andersonii in Oregon. The fronds do not overwinter under the snow, as these do, and characteristically they have a bulblet on the rachis (stem), which none of these have. I am therefore not recognizing the subspecies.

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Site descriptions/date of inventory:

Flemer cabin, T60s R86e, 5/11/83 - mature PISI/RUSP-VAPA/RUPE-COCA
Most of the area was still under snow, so few herbaceous species were seen. Those that were visible (bunchberry, 5-leaf bramble and red huckleberry) are part of a plant community more like the Pacific Northwest than other areas of the Stikine.

"Cottonwood beach", T60s R86e, 5/9 & 5/11/83 - POTR/ALSI-COST-RUSP-SARA-OPHO/EQPR
A steep sand beach on the north side of the Stikine River opposite Flemer cabin. Salix interior is colonizing the sand in front of the cottonwood-Sitka alder-shrub community. [Beaver and beaver cuttings.]

#14-POTR bench, T60s R86e, 5/9/83 - POTR/ALSI-COST/EQPR
A very uniform cottonwood/Sitka alder-dogwood stand with scattered viburnum, salmonberry and devil's-club on an old river terrace. Shrubs were just leafing out; some areas of the transect were still under snow. Plants of interest were last years stalks of Boschniakia rossica. This area has been heavily browsed in the past, but not during the past several years.

Small Slough meadow, T60s R86e, 5/11/83 - Carex, with COST/ALSI/POTR/PISI edges
This large sedge meadow at the end of transect #16 is surrounded by distinct zones of dogwood, then alder and cottonwood, and finally spruce. There were snow patches persisting along the edges; herbs were not up yet.

#16-Small Slough, T60s R86e, 5/9 & 5/11/83 - dense COST-RUSP-ALTE-SASI, with scattered PISI
Area just out of snow; shrubs just leafing out; very few herbs up yet. Based on the height of the browse, this area is used mostly in winter when covered with deep snow. This must be an impenetrable brush thicket in summer.

Guerin Slough, T60s R86e, 5/11, 5/12 & 5/16/83 - PISI (TSHE)/ALSI-SASI-OPHO
The open channel of the shallow slough and its muddy floodplain is lined with Alder and Sitka willow. The banks above the slough are a mosaic of Sitka spruce-western hemlock stands, and willow-alder or salmonberry-devil's-club thickets. The stream flows through a Carex meadow at the upper end. Moose use along the channel is heavy. This area would change radically if the water table dropped three feet.

#17-Guerin PISI, T60s R86e, 5/11/83 - PISI/OPHO-ALSI/Polystichum braunii
Mature spruce stands are interspersed with thickets of devil's-club and alder. In areas under devil's club where the snow has just gone out, Polystichum braunii is abundant. New fiddles are coming up through old leaves which over-wintered under the snow. In areas which thaw out sooner, the understory is oak fern.

#18-Guerin TSHE, T60s R86e, 5/12/83 - mature TSHE-PISI/OPHO-VAPA-RUSP/ferns
A mature spruce-hemlock forest, with devil's-club, red huckleberry and salmonberry understory. The ground cover was predominately ferns and club-moss, with few other species, an interesting plant community. [Black bear]

#19-Guerin PISI, T60s R86e, 5/16/83 - PISI (TSHE)/OPHO-(RUSP-COST-VIED)/Polystichum braunii
Like #17, this is mature spruce/devil's-club/Polystichum braunii, but with more hemlock regenerating, less alder and no Sitka willow. There is also greater species diversity on this transect in both the shrub and herb layers.

#20-Guerin SASI, T60s R86e, 5/16/83 - dense SASI-SABA-ALTE-COST/Angelica -Equisetum
A dense stand of willow-alder-dogwood adjacent to a muskeg, with Angelica genuflexa and Equisetum pratense in the understory, and very few other species present.

Ketili River, T59s R85e, 5/20/83
The focus of this survey was to determine if any unusual plants occurred in the area around the hot springs that had not been seen elsewhere. Most of the species were common to the Stikine but there were two new species - Mimulus guttatus, yellow monkeyflower, down stream from the hot springs, and Plantago major, a lawn weed, near the boardwalk. It is of interest that the latter is the only introduced species seen on the river in two weeks, and it probably came in on someone's boots. All other species were native, which shows how pristine the Stikine still is.

Dry Wash Cr. bog, T59s R84e, 5/19/83 - dwarf TSHE-TSME-PISI/Kalmia-Rubus/Sphagnum
A sphagnum bog similar to the Petersburg muskeg in species composition, but the tree species here were "bonsai" western and mountain hemlock and spruce, rather than lodgepole pine. There are at least four species of sphagnum in this bog.

#22-Dry Wash PISI, T59s R84e, 5/19/83 - mature PISI/OPHO-VAOV/RUPE
A wet site spruce/devil's-club community with both red and oval-leaved huckleberry, 5-leaf bramble, and bunchberry in the understory. If the Flemer cabin area were resurveyed after the snow goes out, it would probably have many of the same species as this site.

#23-Dry Wash SASI, T59s R84e, 5/19/83 - ALSI-SASI/Carex
An almost pure stand of Sitka willow and alder invading a carex meadow, with occasional micro-habitats of small spruce/oval-leaved huckleberry/bunchberry. This transect and the nearby bog were the only places mountain hemlock was seen along the river. At the time of survey, the site was awash with 6" to 1.5' of water.

Kakwan cabin/Pt., T60s R84e, 5/8 to 5/20/83 - PISI/diverse shrub and herb communities
A diverse mosaic of mature spruce, open brush areas, wet streamside habitat, and rock cliffs. Plants just coming up on May 8 were in full bloom by May 20. The Kakwan cliffs were the only site seen during the survey for Sedum rosea ssp. integrifolia, Dodecatheon pulchellum, Saxifraga mertensiana and Saxifraga punctata.

Kakwan "gravels," T60s R84e, 5/8, 5/10, 5/20/83
There are many plant communities within a small area on the gravel bars west of Kakwan Point. These vary from pioneer Salix interior-Salix monticola-Equisetum variegatum communities colonizing often-flooded sand and gravels, to cottonwood-shrub habitat with well-established

Kakwan "gravels"(continued)

understory on river levees and "islands" of higher ground. There are Carex meadows and sphagnum bogs behind the levees and along sloughs where the water table stays high, and Carex meadows being invaded by willow and alder (transect #15). Each is directly related to its elevation above the river, which fluctuates dramatically in this area. A microhabitat of Eriophorum-Equisetum was found in one small, then dry, slough. This was the only cottongrass seen on the river. Salix alaxensis (preferred ruffed grouse browse) was only seen in the Kakwan-Andrew Island area. Salix interior is apparently not known from SE Alaska.

#15-E. of Twin Lakes, T60s R84e, 5/10/83 - SABA (SASI)/Carex-(herbs), with ALTE

Dense to scattered willow with some alder invading a Carex meadow, which has high species diversity. This is one of two sites where red alder was found.

Twin Lakes (Figure Eight Lake), T60s R83-84e, 5/18/83

The lakes were nearly dry when surveyed. Vegetation on the mudflats around the lakes was sparse, but included Equisetum fluviatile and Hippuris vulgaris not seen elsewhere during the survey. There are Carex meadows at the east end of the lakes, which species found otherwise only in Dry Wash Cr. bog, Knig tideflats or Petersburg muskeg. Two species of Cardamine were only seen here. The lakes are surrounded by stands of willow and alder.

#21-Twin Lakes RUSP, T60s R83e, 5/18/83 - RUSP-SASI/Urtica lyallii

A dense thicket of salmonberry-Sitka willow/nettles, with few other species.

Andrew Island, T60s R84e, 5/15/83 - POTR/SAAL-SABA-SASI-(SAIN-SAMO)/EQVA

In the small area of the island surveyed, there were almost pure stands of cottonwood/Alaska Barclay and Sitka willow on sand, with sandbar and park willow establishing themselves with Equisetum variegatum, in more recently disturbed sloughs. All five willows seen on the Stikine occur here together. (Ruffed grouse drumming)

Limb Island, T60s R83e, 5/13/83 - mature POTR/ALSI-shrub

A mature cottonwood/diverse shrub-herb community on a sand beach above high water line. This stop was to listen for moose radio transmitters; only a small section of beach was seen. It is the only site for fragile fern found during the survey, however.

Knig tideflats, T60s R82e, 5/13/83 - coastal Carex meadow above high tide

This is the only tidal area surveyed, and therefore many species seen here were not found elsewhere. These include, Lupinus nootkatensis, Potentilla egedii, Angelica lucida, Iris setosa, etc. Of special interest was Plantago macrocarpa, which is on the list of rare and endangered plants in Oregon, and is now probably extinct on the Oregon coast.

Banana Point, Mitkof Island, T61s R81e, 5/13/83 - mature PISI/MEFE-OPHO-VAAL-VAOV/MADI

The only area surveyed was in the immediate area of the boat ramp. Several species were seen only here: Monesis uniflora, Vaccinium alaskense and Polypodium hesperium, which is apparently rare in Alaska. (bald eagles)

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Petersburg, T58s R79e, 5/14, 5/15/83 - dwarf PICO-JUCO/Kalmia-Andromeda/Sphagnum

Other than Sorbus aucuparia, all species listed were found in the "Petersburg muskeg," an extensive area of Sphagnum bog with open ponds, which extends from the town to the airport. It is of interest that lodgepole pine and dwarf juniper, usually thought to be dry-site species further south, are growing here in water, and that Alaska cedar, usually the bog species, occupies higher ground. Although similar in general species composition to the Dry Wash Cr. and Kakwan bogs, some species were only seen here: Andromeda, both Drosera, Empetrum, both Ledum, Rubus chamaemorus, Tofieldia, and Lycopodium annotinum ssp. pungens.

Siddall Comments and Observations:

This report is written not only to record what we found, but also to help future botanists following me up-river, as it apparently contains new information not previously reported. Salix interior, for instance, a key member of the plant community colonizing sandbars along the river, is not known from SE Alaska, according to the floras. In all, we found five species for which the Stikine River is a significant range extension within Alaska; and two others not known to be in Alaska at all. The presently known range is s.BC to Calif.

I am very impressed that in two weeks on the river, only one introduced plant was seen, and that was next to the boardwalk near the hot springs. All of the rest were native species. This may not be unusual in Alaska, but it certainly is in the south 48.

Based on Hulten's maps, there is an interesting "vegetation break" between Wrangell and Juneau. Species in the Wrangell/Stikine area go south, some such as Plantago macrocarpa, and Fritillaria camchatcensis (found in Oregon for the first time in 1982), reach their southern limit in Oregon. Species in the Juneau/Sitka area go west along the coast, or into the interior.

Appendix C. Scientific and Common Names of Plants.[a]

Alnus rubra	red alder
Cornus stolonifera	American dogwood
Equisetum variegatum	variegated horsetail
E. arvense	common horsetail, devil's-guts
E. fluviatile	water horsetail
Malus fusca	Oregon crabapple
Echinopanax horridum	devil's club
Picea glauca	white spruce
P. mariana	black spruce
P. sitchensis	Sitka spruce
Ribes bracteosum	stink currant
Rubus spectabilis	salmonberry
Salix alaxensis	Alaska willow, felt-leaf willow
S. interior	sandbar willow, interior willow
S. sitchensis	Sitka willow
Sambucus racemosa	redberry elder
Tsuga heterophylla	western hemlock
Viburnum edule	high-bush cranberry
V. ovalifolium	over-leaved huckleberry
V. parvifolium	red huckleberry

[a] Nomenclature follows Hulten 1968.