

Rose Spit

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ECOLOGICAL RESERVES COLLECTION
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REPORT ON STUDIES AT
ROSE SPIT ECOLOGICAL RESERVE

1977

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I. INTRODUCTION

Rose Spit Ecological Reserve, established in 1971, is a unique area of extensive sand dunes, meadow and wildlife habitat. It is a popular recreation area, frequented by both hikers and motorists. Due to recent controversy pertaining to the use of all terrain vehicles (ATV's) on the reserve, the office of the Ecological Reserves of British Columbia moved to provide a thorough study of both the ecology and recreational use of the area. From May 20 through August 28, 1977, three distinct studies were carried out at Rose Spit. These were:

1. an identification and mapping of the vegetation associations, and assessment of damage to these associations by recreation.
2. a census of the shorebirds which feed on the sand beach from Tow Hill to Rose Spit.
3. a record of public use of the area.

The Study Area

Rose Spit Ecological Reserve covers 420.49 acres on the north-eastern extremity of Graham Island of the Queen Charlotte Islands, British Columbia. It extends from $54^{\circ}08'30''$ to $54^{\circ}10'30''$ N latitude and $131^{\circ}39'$ to $131^{\circ}41'$ W longitude, which includes lots 1015, 1015A, 1015B and 1016. (see map 1)

The sandspit is still growing. Reworking of the glacial sands and silt deposited on the Queen Charlotte Lowlands during the last glaciation has created a continuous sand beach from Skidegate Inlet to Masset. Prevailing southeasterly winds cause erosion of the east coast, after which currents carry and deposit the sands northward into Dixon Entrance (Brown, 1960).

Due to the prevailing southeasterly winds, the east coast is in an active state of dune formation, as demonstrated in the encroachment of blowout dunes into the Picea forest. A longitudinal dune is present along the extent of the east coast of the spit, although its seaward edge has been altered by the continual pounding of drift-logs and subsequent erosion. The central spit is low lying and protected from sand movement by the east coast dunes. The north

MAP 1 Rose Spit Ecological Reserve

Rose Spit

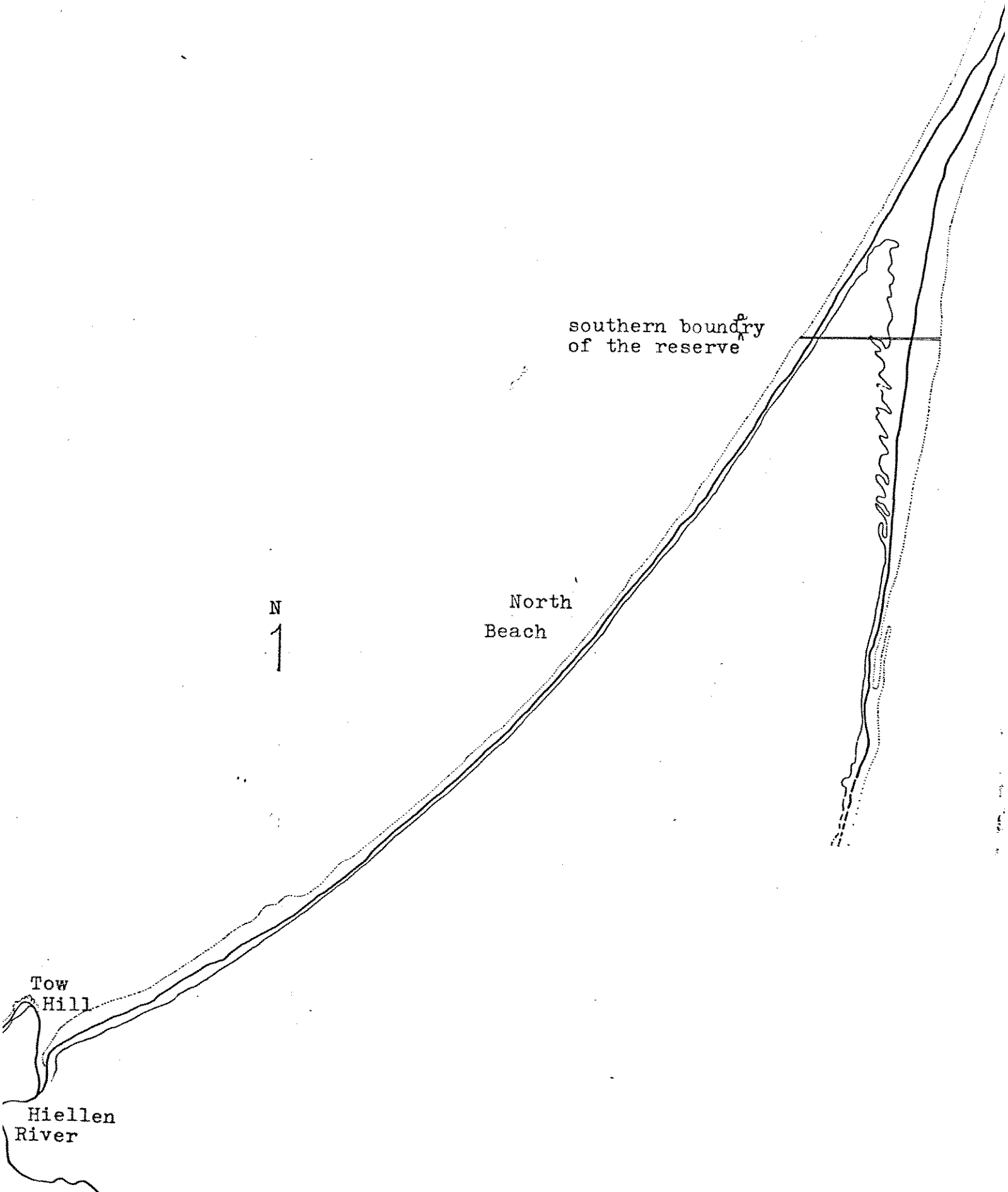
southern boundary
of the reserve

North
Beach

N
↑

Tow
Hill

Hiellen
River



coast has been relatively stabilized following the development of a longitudinal sand dune behind the driftwood zone.

II. VEGETATION

A. Introduction

Sand dunes and their vegetative cover are in a delicate state of balance. The physical processes of sand movement by littoral drift and wind determine dune type and formation. Pioneer plants colonize newly formed dunes, restricting further movement of the sand. As a dune becomes more stable, more species can colonize it. However, if the vegetation is disturbed, the sand will begin to move again.

This study examined the present state of the vegetation of the spit. This involved a determination of the vegetative associations present, a speculation of possible successional trends, and an analysis of the effects of recreation on the vegetation.

B. Methods

1. Plot establishment and analysis

A reconnaissance of the study area was conducted prior to sampling to note the basic vegetation patterns and possible communities present.

The Braun-Blanquet (releve) technique of vegetation sampling (Mueller-Dombois, 1974) was used to analyze the vegetation. Sample plots (relevés) were established in floristically homogeneous areas of the previously recognized communities. The number of sample plots in each of these communities depended on the extent of the community, varying from five in the forested stands to ten in the non-forested stands. Plot size was 200m² in the diverse forested stands, and 100m² in the less complex non-forested areas. All releve sampling was conducted in June. All species were identified and named according to Taylor and Calder, 1971.

Analysis of each sample plot included notes on general location, exposure, slope, elevation, ground cover and vegetation. Plant species were listed and their percent cover recorded. Miscellaneous comments on stability and disturbance were recorded.

Relevés were also done in disturbed areas. An attempt was made to determine the extent of damage to the natural vegetation of these

areas by comparing them with adjacent undamaged sites.

Appendix I is a synthesis table of releve data from undamaged sites.

2. Synthesis of floristic data

The Ceska-Roemer (1972) computer program was used to determine characteristic species groups from the vegetation data. Appendix I is a charted representation of the three major species groups. Community types were determined according to the secondary species group accompanying the major group.

Within each community type, constant and characteristic species were determined. A constant species occurs in 80% or more of the sampled plots, and is a constant dominant species if its average cover value exceeds 10% of the plot area. Characteristic species were established according to the rules of Braun-Blanquet (1935) as exclusive, selective or preferential species according to the following criteria:

- exclusive species - a species completely or almost completely confined to one community.
- selective species - a species found most frequently in a certain community.
- preferential species - a species present in several communities, but predominantly or with better vitality in one certain community.

C. Results and Discussion

Analysis of the synthesis table of releve data (Appendix I) results in the recognition of three distinct vegetation types present at Rose Spit Ecological Reserve. The first type is characterized by the presence of Arenaria peploides. This type occupies a very small area of the reserve, and is primarily restricted to the driftwood zone along the north coast.

The second vegetation type is characterized by the constant presence of the Poa douglasii species group, which includes P. douglasii, Carex macrocephala, Tanacetum huronense and Glenhnia littoralis. These species are characteristically related to

inhabitation and stabilization of shifting sand (Kuramoto, 1973). Within this basic vegetation type, four distinct associations can be delimited according to the presence or absence of Elymus mollis, Lupinus littoralis and Ceratodon purpureus and their associated species. These latter species groups appear to indicate some possible successional trends from the initial colonization of sand dunes to the colonization of older, more stable areas.

The third major vegetation type is characterized by the presence of mature stands of Picea sitchensis. Three major variations on this vegetation type occur within the reserve, delimited by the presence or absence of the shrub, Gaultheria shallon, the grass, Calamagrostis nutkaensis, or the moss, Eurynchium oreganum. It is difficult to deduce any successional trends or patterns in the colonization of the dune forest.

Map 2 delimits the vegetation types and associations present at Rose Spit.

The plant associations:

1. Arenaria peploides vegetation type

Constant, not dominant:

Arenaria peploides

Exclusive species:

A. peploides







+ Cakile edentula

Mertensia maritima

This vegetation type extends along the north coast, through the driftwood zone, as illustrated in map 2. Occasional individuals of Elymus mollis and small colonies of Carex macrocephala were also present in the sample plots. In July, after this area had been sampled, Cakile edentula, an annual herb, appeared exclusively in this area.

It appears that this foreshore zone is uninhabitable to most vegetation. Gravel and rock, up to ten centimeters deep, often covered the sand, inhibiting seed germination. Inundation of the area by high winter tides and subsequent shifting of gravel and logs would further limit colonization. The succulents A. peploides and

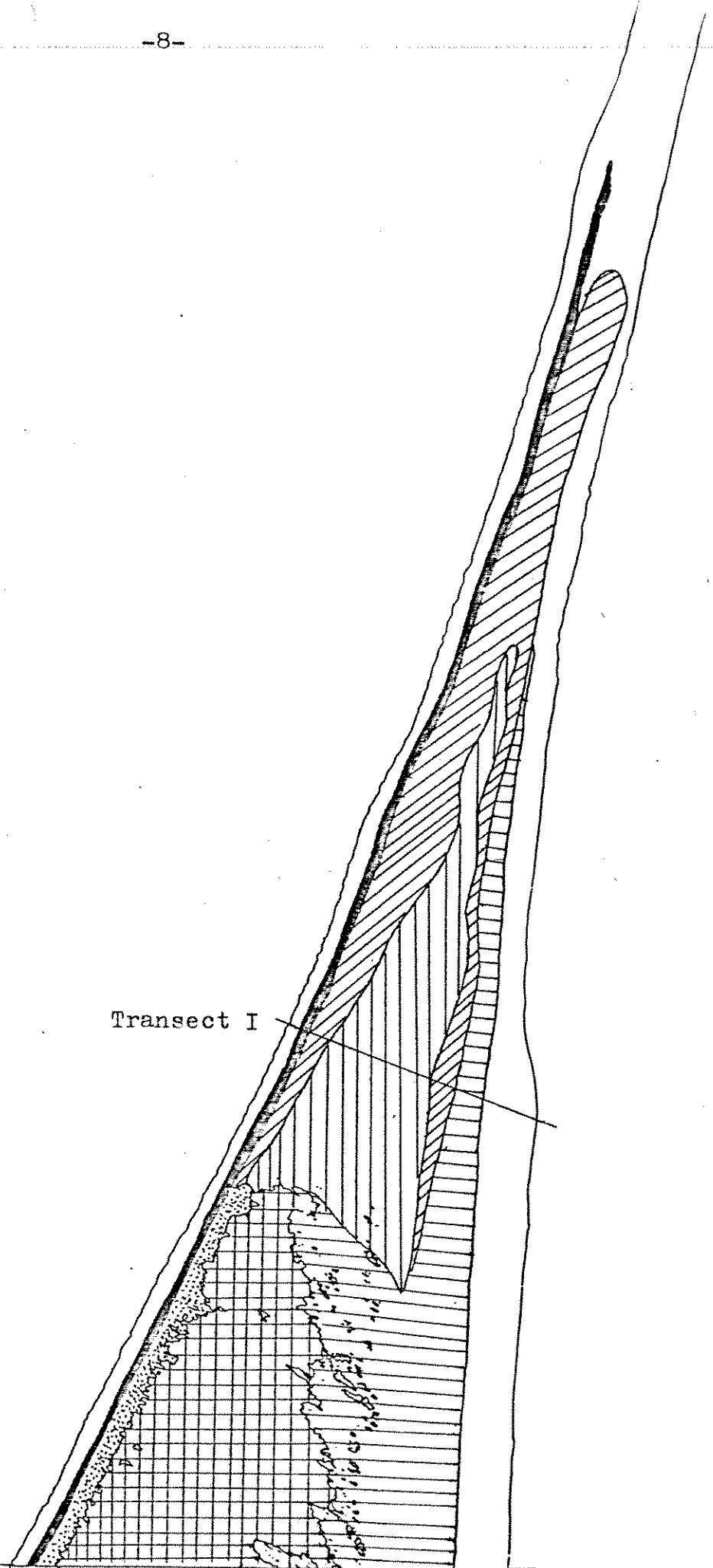
MAP 2. Vegetation types of Rose Spit Ecological Reserve.

- Poa douglasii
vegetation type
-  Arenaria peploides vegetation type
 -  Tanacetum huronense association
 -  Lupinus littoralis association
 -  Elymus mollis association
 -  Ceratodon purpureus association
 -  Picea sitchensis vegetation type

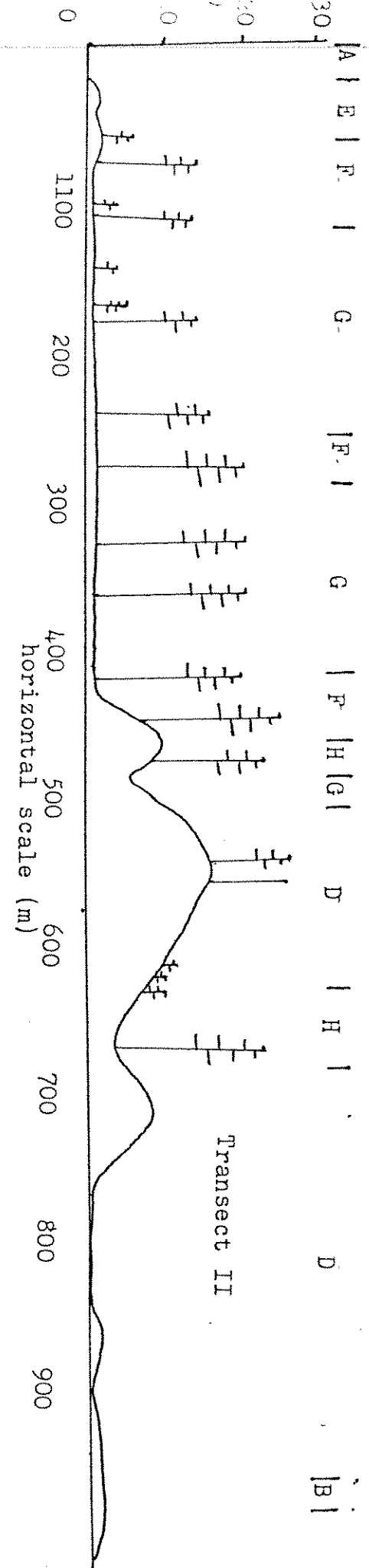
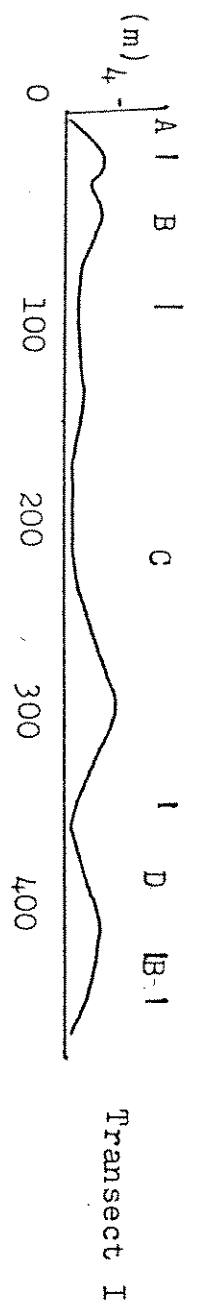


Transect I

Transect II



Transsects I and II (see Map 2)



- A. Arenaria peploides vegetation type
- Poa douglasii vegetation types
- B. Elymus mollis association
 - C. Lupinus littoralis association
 - D. Tanacetum humronense association
 - E. Ceratodon purpureus association
- Picea sitchensis vegetation types
- F. P. sitchensis/E. oreganum association
 - G. P. sitchensis/G. shallon association
 - H. P. sitchensis/C. nutkaensis association

M. maritima form large, prostrate mats. This habit may aid in water retention and help stabilize the local substrate. E. mollis appears only as isolated individuals, apparently unable to spread by rhizomes in this area. C. macrocephala, although not numerous, does form small colonies, spreading by rhizomes.

2.

2. Poa douglasii vegetation type (Plates I & II)

i) Tanacetum huronense association

Constant dominant:

Tanacetum huronense

Constant, not dominant:

Poa douglasii

Carex macrocephala

Glenhia littoralis

This association occurs leeward of the driftwood zone along all but the northern extremity of the east coast, and on the blowouts, as illustrated in map 2. Along the east coast, this area is level and exposed. The substrate is largely solid, hardpacked sand or gravel in the south, grading into fine sand past treeline. Vegetation cover is low, averaging 30%. This association meets with the Lupinus littoralis association to the northwest.

The windward sides of the blowouts also support this association. Here the total cover is also low, averaging 28%. C. macrocephala is less abundant here than in the previously described area, but otherwise the vegetative cover is very similiar. The substrate, however, is very different. The loose, fine sand of the blowouts is constantly being moved by the prevailing southeasterlies.

ii) Lupinus littoralis association (Plates III & IV)

Constant dominant:

Lupinus littoralis

Tanacetum huronense

Constant, not dominant:

Poa douglasii

Preferential species:

Lupinus littoralis

Achillea millefolium

Fragaria chiloensis

This association occupies the area between the north and east coast dunes, beyond treeline (map 2). Adjacent to treeline, the

substrate is gravelly and hard-packed, as in the south-east Tanacetum huronense association. Here, total vegetative cover averages 40%. Individuals of L. littoralis are low and spreading. P. douglasii, T. huronense and G. littoralis make up most of the ground cover in this area. Further north, the substrate changes to loose sand. Here the dense growth of L. littoralis, F. chiloensis and A. millefolium may reach over a meter in height, and total vegetative cover averages 98%. In a few areas along the north-east edge of this association, lush colonies of Lathyrus japonica^{us} occur.

The success of these herb species in the central spit area may be due to their ability to establish themselves rapidly after initial dune stabilization. The relatively harsh and exposed conditions may exclude forest species from this area. Burning of the meadow for grazing purposes may have occurred as recently as 20 years ago, effectively halting forest encroachment into this area.

iii) Elymus mollis association (Plates V & VI)

Constant dominant:

Elymus mollis

Constant, not dominant:

Poa douglasii

Carex macrocephala

Map 2 illustrates the large extent of this association. It is characterized by a fairly constant cover of E. mollis, in combination with either the L. littoralis or T. huronense species groups. Total vegetative cover varies from 10% to 100%, with an average of 57%.

Leeward of the driftwood zone, along the east coast, lies a narrow band of the E. mollis association. Here it is found with the T. huronense species group. E. mollis is a very effective sand-binder, very robust, with strong rhizomes. In association with the T. huronense group, these species play an important role in stabilizing the windward side of the spit.

To either side of the meadow, and extending north past the meadow, E. mollis is found in association with the L. littoralis species group. In the south it occupies the small dunes east of the low-lying meadow.

Although no releves were done in the area, it was noted that E. mollis was the only species inhabiting the base of the lee side of the steep east coast blowouts. It also occurred sporadically at the edges of the mature Picea forest.

iv) Ceratodon purpureus association (Plate VII)

Constant dominant:

Poa douglasii

Constant, not dominant:

Carex macrocephala

Elymus mollis

Poa confinis

Ceratodon purpureus

Cladonia chlorophyta *chlorophaea?*

Picea sitchensis

Eurynchium oreganum

Exclusive species:

Ceratodon purpureus

Cladonia chlorophyta

Due to the prevailing southeast winds, the northwest coast, leeward of the Picea forest, is sheltered and relatively stable. This physical stability has allowed the colonization of the dune ridge by the forest successional species of this association. C. purpureus and E. oreganum are important in the colonization and stabilization of sand dunes. This stability allows seedlings of P. sitchensis to colonize the dune ridge, which further stabilizes the area.

The forest species described above occur in conjunction with the sandbinders of the T. huronense association. As one approaches the forest, members of the T. huronense association decrease in cover value, while the forest species, P. sitchensis and E. oreganum, increase to dominance.

3. Picea sitchensis vegetation type

Due to the greater number of species present in this vegetation type, and the small number of releves performed, constant, constant dominant, etc., are not considered.

i) Picea sitchensis/Eurynchium oreganum association

This association appears to be the natural successional step from the Ceratodon purpureus association of the north west coast, and commonly occurs behind the longitudinal dune of this coast. This association is characterized by a moss cover of close to 100%, dominated by E. oreganum, Mnium glabrescens and Hylocomium splendens. The herb species Stellaria crispa and Moneses uniflora are common, but have very low cover.

ii) P. sitchensis/Gaultheria shallon association

Complete inundation of some areas by the shrub G. shallon has eliminated moss and herb species. This association covers most of the P. sitchensis vegetation type throughout the central part of the forest.

iii) P. sitchensis/Calamagrostis nutkaensis association

It appears that, in this association, a more open canopy in the forest has allowed for fast colonization by C. nutkaensis, thus eliminating the salal. This association is most prevalent on the edges of the Picea forest.

Disturbance

Two major forms of disturbance from recreational activities were observed in the area: campsites and roadways. Relevés were done in both these areas in an attempt to quantify the disturbance. Species composition and vegetative cover values were used.

1. Campsites

Three campsites have been established in the reserve. (map 3). Use of the campsites will be discussed in a later section on human activity. All three campsites have been established in areas of the P. sitchensis/E. oreganum association. Here little clearing is required to set up a campsite. (Plate XIV)

A 200m² releve was performed in each campsite. Table 1 summarizes the releve data from the campsites, and compares them with average values in the undisturbed P. sitchensis/E. oreganum relevés.

Cover value and species diversity are both greatly reduced in these disturbed areas.

2. Roadways

A network of main and secondary vehicle trails are present in the reserve. (map 3). Use of these trails will be discussed in a later section on human activity. Relevés of 100m² were analyzed at random points along the trails (map 3) and in adjacent undisturbed areas. These relevés are compared in Table 2.

The total cover value in each case is lower in the disturbed area. This is to be expected, as two vehicle tracks, with a total cover of approximately 20% of the releve area, pass through each plot. In most cases, however, the total cover was reduced by more than this amount. This is partially because the vehicles do not always remain on the established trail, but may go to either side to gain better traction.

Species diversity is also lowered, though not as drastically as in the campsite areas.

In each releve it was noted that the roots of plants in and adjacent to the tracks were exposed and torn. (Plate IX)

TABLE 1. Relieve data from campsites compared with average cover values from undisturbed P.sitchensis/E.oreganum associations.

<u>species</u>	<u>campsite</u>			<u>average</u>
	<u>1</u>	<u>2</u>	<u>3</u>	
<u>P.sitchensis</u>	4	2	4	4
<u>E.oreganum</u>	2	3	2	3
<u>C.nutkaensis</u>	-	-	-	-
<u>S.crispa</u>	-	-	-	-
<u>H.splendens</u>	-	-	-	1
<u>Mnium sp.</u>	-	-	-	-
<u>Moss sp A</u>	-	-	-	-
<u>M.glabrescens</u>	-	-	-	1.5
<u>M.dilatatum</u>	-	-	-	-
total % ground cover	10	50	10	96
no. of species	4	4	4	10

TABLE 2. Relieve data from roadways compared with adjacent, undamaged areas.

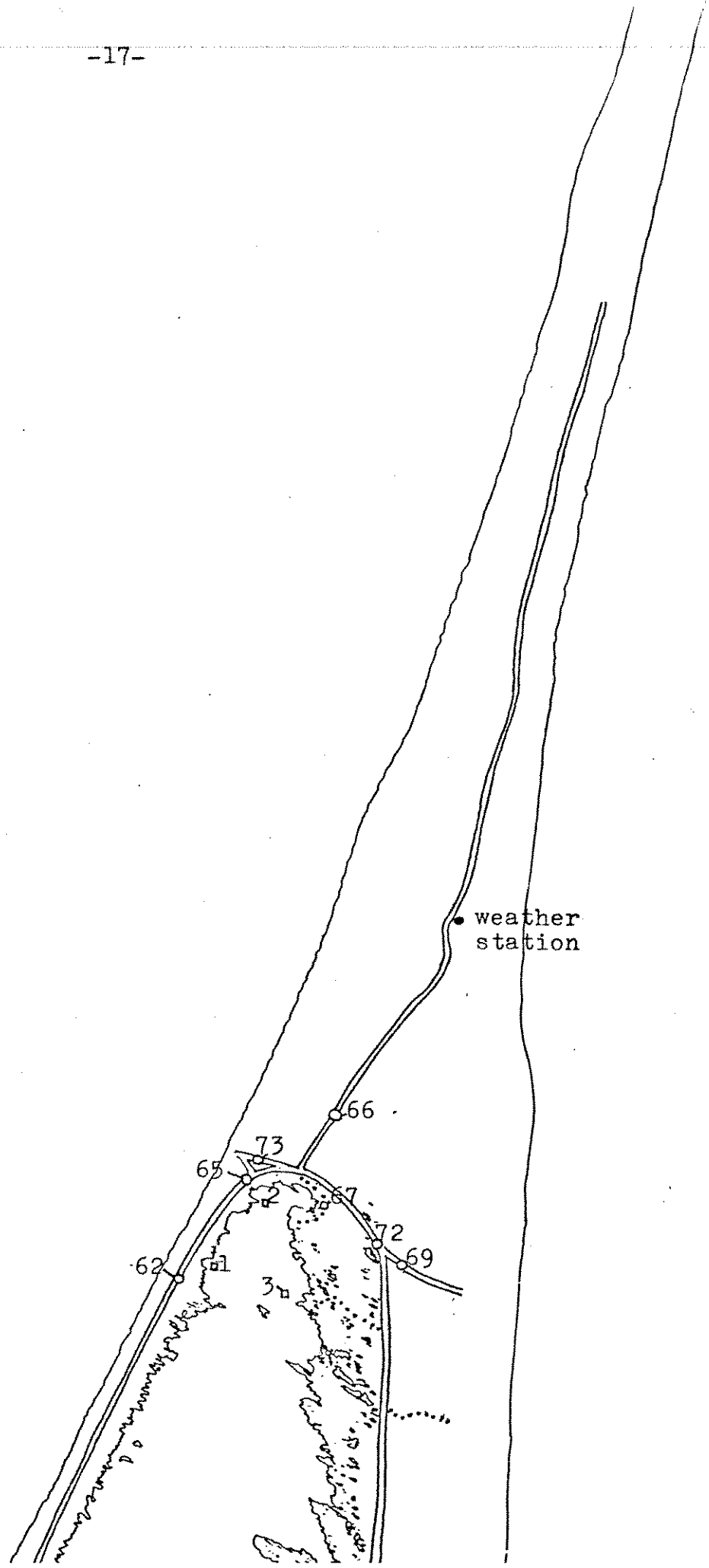
<u>Vegetation type</u>	<u>L.littoralis association</u>			<u>E.mollis association</u>			<u>C.purpureus association</u>	
	<u>66</u>	<u>69</u>	<u>72</u>	<u>62</u>	<u>67</u>	<u>73</u>	<u>65</u>	
<u>releve no.</u>	<u>u</u>	<u>d</u>	<u>u</u>	<u>d</u>	<u>u</u>	<u>d</u>	<u>u</u>	<u>d</u>
<u>species cover value</u>								
<u>P.douglasii</u>	2	1	2	1	-	1	1	1
<u>C.macrocephala</u>	1	2	2	-	1	1	1	1
<u>T.huronense</u>	2	-	3	-	1	1	3	2
<u>G.lieocarpa</u>	1	-	1	-	1	-	2	-
<u>E.mollis</u>	-	-	-	-	1	1	1	1
<u>L.littoralis</u>	2	2	2	-	2	-	1	1
<u>A.millefolium</u>	2	-	-	-	-	-	-	-
<u>F.chiloensis</u>	3	-	-	-	-	-	-	-
<u>C.purpureus</u>	-	-	-	-	-	-	2	-
<u>P.sitchensis</u>	-	-	-	-	-	-	3	-
total % cover	100	35	10	6	30	3	10	7
no. species	7	7	5	5	5	5	6	4

* u - adjacent undisturbed sites
d - disturbed sites

Cover values: - less than 1% , 3 26 to 50%
1 1 to 10% 4 51 to 75%
2 11 to 25% 5 76 to 100%

MAP 3. Disturbed areas.

- == frequently used vehicle trails
- old vehicle routes and less used tracks
- campsites
- releves in damaged areas



III. VEHICLE AND HIKER TRAFFIC

A. Introduction

Vehicles have been driving on the beaches from Tow Hill to Tlell for many years. The establishment of Rose Spit Ecological Reserve in 1971 and Naikoon Park in 1973 made use of the beaches by vehicles illegal. These laws, however, have never been enforced.

In recent years there has been some public pressure advocating the closure of these beaches to motor vehicle traffic, or at least control of this traffic. Reasons for traffic control have included danger to bird life, damage to fragile sand dune vegetation, and destruction of the aesthetics of a natural wilderness area. The Masset Beach Buggy Club opposes this view, and maintains that vehicles do little damage to the area as they remain on established thoroughfares.

This study attempted to gain information on the use of this area by both hikers and motorists, to assess the ecological damage to the area by these factions, and to gather further public opinion on the situation.

B. Methods

A record was kept of the number of vehicles and hikers observed in the study area throughout the summer. When possible, people were approached and questioned as to their origin and destination, and asked for their comments concerning vehicle traffic on the beaches. The data collected here must be considered an underestimation of the actual use of the area due to the impossibility of recording all traffic.

C. Results and Discussion

1. Hikers

i) numbers, routes and origins

Table 3 presents data of the hiker traffic observed during this study. Hikers passing through the reserve were using one of three routes:

a) from Tow Hill along North Beach to Rose Spit and return. This hike was usually done in one day.

TABLE 3. Hiker traffic along the observed routes.

<u>month</u>	<u>route hiked</u>		<u>local</u>	<u>visitor</u>	<u>local</u>	<u>visitor</u>	<u>local</u>	<u>visitor</u>
	(a)	(b)						
May	-	6	-	5	-	1		
June	2	-	6	3	-	18		
July	31	5	12	-	2	8		
August	20	2	-	-	-	16		

(One non-local hiker was from Edmonton, two were from San Diego, California. The remainder were from British Columbia,)

TABLE 4. Organized hiking groups.

<u>Group</u>	<u>number</u>	<u>route</u>
Rangers, Prince Rupert	12	(c)
Victoria Outdoor Club	7	(c)
Masset Summer Recreation Program	10	(a)
Masset Summer Recreation Program	8	(b)

TABLE 5. Vehicles observed at Rose Spit Ecological Reserve.

<u>month</u>	<u>ATV's</u>	<u>motorcycles</u>
May	11	2
June	24	1
July	32	2
August	33	2

b) from Tow Hill to the east coast along Fife Trail, and returning to Tow Hill via Rose Spit and North Beach. This hike usually took three days, with overnight stops at Fife Point and either Rose Spit or along North Beach.

c) between Tlell and Tow Hill via Rose Spit. This 60 mile hike took from three to ten days.

ii) comments

Few hikers knew of the existence of Rose Spit Ecological Reserve, or of the philosophy behind the establishment of such a reserve. Most, however, were aware of the presence of Naikoon Park, and many had read the park brochure and were surprised at the presence of vehicles within the park. The brochure states no vehicles are permitted without special written permission. A total of 26 hikers felt there should be no vehicle traffic on the beaches. One visitor hiking from Tlell felt vehicle tracks made the east coast more difficult to walk due to the loosened gravel.

No visiting hikers mentioned requiring the assistance of vehicles. The Masset Summer Recreation Program, however, made arrangements prior to their hikes for vehicles to transport food, water and camping equipment.

iii) disturbance

Hikers generally travelled on the beach or along established vehicle routes. No extraneous hiking trails were observed.

An estimate of nine groups, totalling 55 individuals, used the campsite areas within the reserve. On most occasions the campsites were left in good condition. However, on July 20 an extra campfire pit was created in Campsite 1, and the campground was left in disarray. On July 28, also in Campsite 1, initials were carved into a tree, food, clothing and garbage were left behind, and driftwood was strewn about. (Plate XV). These occasions demonstrate the problem of campsites within the reserve. The Masset Beach Buggy Club established these sites and do attempt to maintain them in good condition. However, anonymous violators do exist, and there is no power to correct this abuse.

2. Vehicles

i) numbers and routes

Table 5 summarizes data of the vehicle traffic observed on the reserve during this study. Vehicles were recorded whenever seen, or when fresh tracks were observed along the beach or on the high tide trail. However, this must be accepted as an underestimate of the total number of vehicles passing through the reserve.

Most vehicles drove to or from the east coast, crossing the reserve at the single track at tree line. Vehicles often went south along the east coast to the A-frame constructed by the Masset Beach Buggy Club in the vicinity of Fife Point. The campgrounds within the reserve were often used by these people for picnics, but seldom for camping.

ii) roads and trails

Numerous roads and trails have been established within the reserve (Map 3). On the north coast, vehicles can pass along the beach or the high tide trail. The latter route lies behind the driftwood zone, between the two small foreshore dunes. This track is used primarily when high tides or soft, gravelly conditions make the beach impassable. The reserve can be transversed at tree line, and vehicles can continue through the driftwood zone and south along the east coast. It was requested that all vehicles remain on this single, established track to keep disturbance to a minimum.

However, other routes were used by motorists during this study. A well-defined vehicle track extends north from tree line, through the Lupinus-Fragaria meadow, past the weather station. Although few motorists used this road, those that did felt it should remain open. It was used primarily during strawberry season in July. Apparently, it is also used during the winter when the beach is impassable to salvage crabpots, boats and other goods that wash up on the spit.

Another well-defined trail passes south along the east coast at the base of the blowouts. Access to the east coast beach by this route has been blocked by shifting sand and driftwood, so it is under little use.

Two less defined trails lead up the blowouts. One extends from treeline up the most northerly blowout dune, and the other extends from the east coast trail to campsite 3. Vehicle tracks were often seen along these trails.

iii) violations

Any vehicles using routes other than the established "single track" at tree line or along the high tide trail were considered in violation. When possible, the motorists were approached and told of restrictions on vehicle use in the area. Most observed these regulations once informed of them.

The following is a list of the most common violations:

- a) to either side of the high tide trail. Motorcycles and cars are both driving along side of the established trail when it is too soft. It is becoming a well defined trail. (Plates VIII & XII)
- b) in the vicinity of the access road from the north coast to the single track that traverses the reserve at tree line. Many different routes appear to be used to pass to or from the north coast, and some vehicles don't even remain on these. (Plate XIII)
- c) on the meadow road and through the meadow vegetation. (Plates X & XI)
- d) across the dunes and blowouts on the east coast.
- e) on the trail at the base of the blowouts on the east coast.

iv) comments

Members of the Masset Beach Buggy Club feel they have a right to drive along the beach and trails to otherwise inaccessible areas. Their large investment in ATV's demonstrates their strength of desire to do so. There is a strong feeling that Naikoon Park and Rose Spit Ecological Reserve have been imposed upon them, and not created for them, the local public.

IV. Shorebird Census

A. Introduction

Many shorebirds feed on the sand beach between Tlell and Masset during migration to and from breeding grounds. The beach offers an abundance of various small marine life, insects and seaweed. Preliminary observations showed the favored feeding area is on North Beach between Tow Hill and Rose Spit. Shorebirds occur in very small numbers on the east coast. This census covered the area from Tow Hill to and including Rose Spit.

B. Methods

The beach and spit were divided into five areas (Map 4). These were delimited with regard to areas walked most frequently as a single unit, and beach quality. Each area was censused at least once per week. Counts were made at low tide, which appeared to correspond with peak feeding periods.

This study began after the majority of shorebirds had passed through the area on their northward migration, and concluded, we feel, before the major southern fall migration. It can be assumed, therefore, that large numbers of birds passed through the study area after the completion of this study.

C. Results and Discussion

Table 6 summarizes the bird counts in each area on a bi-monthly basis. The maximum number of birds observed in any one count carried out in the two-week period has been used.

Each species of shorebird occurring in the study area is further described below:

Family Chadriidae plovers

Charadrius semipalmatus Semipalmated plover

This shorebird was the only species known to nest in the study area. Three pair were constantly observed in area 4, and one young with two adults was observed in this area on June 10. It was common, present in small flocks in most areas throughout the study. Numbers varied from sitings of individuals and small groups of up to 4 in June and July, to an occasional group of 50 in late July and August.

MAP 4. Shorebird census areas.

- Area 1: Tow Hill to the southern boundary of Rose Spit Ecological Reserve. This beach is primarily gently sloping, fine sand. To the north it becomes somewhat steeper, and the sand coarser. The majority of the shorebirds were seen here.
- Area 2: southern boundary of the reserve to the end of the meadow vegetation, north coast. This area is steeper, covered in coarse gravel.
- Area 3: Rose Spit north of the meadow vegetation. This beach is fairly steep, covered in a mixture of sand and gravel.
- Area 4: tree line to the end of the meadow vegetation, east coast. This beach is steeply sloping, covered in coarse gravel. Sand bars are present at low tide.
- Area 5: the meadow.
- Area 6: tree line to the southern boundary of the reserve, east coast. This beach resembles Area 4.



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This species was observed feeding at shoreline and in the seaweed at low tide.

Squatarola squatarola Black-bellied Plover

This species was observed on four occasions, feeding at low tide in groups of two or three in flocks of sanderling.

Family Scolopacidae sandpipers

Crocethia alba Sanderling

This was the most common shorebird in the study area from mid-July through August. Flocks varied in size from 50 to 250. It was most often seen feeding at low tide with flocks of western sandpipers and semipalmated plovers. This species was observed throughout the study area, but the largest flocks occurred in Area 1.

Ereunetes mauri Western Sandpiper

This sandpiper was observed in all areas from early to mid-July, but only in Area 1 until mid-August. It was not constantly observed, but appeared to pulse through the area. It fed at shoreline with flocks of sanderling.

Erolia minutilla Least Sandpiper

This species was seen only on three occasions. On July 18 and 21 it was seen in Area 1 feeding with sanderling. On July 17 it was seen feeding in Areas 3 and 4 in the seaweed.

Actitis macularia Spotted Sandpiper

This species was seen on only three occasions. On August 10 and 18 one individual was seen in Area 6, and on August 19 two were seen in Area 2. All were observed in and amongst the drift logs.

Numenius phaeops Whimbrel

A flock of 60 were observed in Area 5 on May 22. Later, small groups of 8 or less were observed feeding in Areas 1, 4 and 5.

Arenaria melanocephala Black Turnstone

This species was observed on four occasions in mid-July, in small flocks in Areas 1, 2, 3 and 4.

Arenaria interpres Ruddy Turnstone

One individual was observed in Area 2 on July 20.

Erolia alpina Dunlin

A pair of dunlin were observed in Area 1 on May 19 and 20.

Table 6. Shorebird Census Data

Area 1.	May 20	June 3	June 17	July 1	July 15	July 29	Aug 12	Aug 26
Semipalmated plover	10				400	110	128	
Blackbellied plover	2					1		
Sanderling	2				126	550	759	
Western sandpiper				12	150	115	109	2
Least sandpiper					15	50	6	
Whimbrel	2	3		8			3	
Black turnstone			10					
Dunlin	7							
Area 2.	May 20	June 3	June 17	July 1	July 15	July 29	Aug 12	Aug 26
Semipalmated plover	10			20	15	18	1	
Blackbellied plover	2					2	2	
Sanderling					22			
Western sandpiper				120		70		
Spotted sandpiper							2	
Whimbrel				4				
Black turnstone					5			
Ruddy turnstone						1		

Table 6 (cont.).

Area 3.

	May 20	June 3	June 17	July 1	July 15	July 29	Aug 12	Aug 26
Semipalmated plover					5	3	3	
Sanderling					5	7	4	
Western sandpiper				70				
Least sandpiper					8			
Black turnstone					3			

Area 4.

	May 20	June 3	June 17	July 1	July 15	July 29	Aug 12	Aug 26
Semipalmated plover			2	4	6		4	
Sanderling	20					6		
Western sandpiper				40				
Least sandpiper					3			
Whimbrel	2				8	1		
Black turnstone					6			

Area 5.

	May 20	June 3	June 17	July 1	July 15	July 29	Aug 12	Aug 26
Semipalmated plover	2					15		
Whimbrel	60	6	1			3		

Table 6 (cont.).

Area 6.

	May 20	June 3	June 17	July 1	July 15	July 29	Aug 12	Aug 26
Semipalmated plover						1	7	
Blackbellied plover						1		
Sanderling						35	37	
Least sandpiper							1	
Spotted sandpiper						1	1	

V. Recommendations

1. We recommend a closure of the Ecological Reserve to all motor vehicle traffic, in accordance with the Ecological Reserves Act of British Columbia (1975). The following are what we feel the more important reasons for this recommendation:

a) The sand dune vegetation along the high tide trail is suffering significant damage, as vehicles are not remaining on the single track. Access to this trail from the beach, which lies in Naikoon Park, has caused the greatest damage. The foredune has been worn through at this point. As this access is becoming more torn up and less passable, a new one is being established to the north.

b) Vehicle violations through the meadow and on the blowouts are numerous. We appreciate the assistance of the Masset Beach Buggy Club in approaching and educating violators when possible, but policing of the area appears to be impossible.

c) Vehicle traffic appeared to disrupt the shorebirds while feeding. Vehicles were seen passing through flocks without slowing. Compaction of the sand may also affect their food supply.

2. We recommend that, along with closure of the Ecological Reserve, an area be set aside, closer to Masset, where owners of ATV's could drive on the beaches.

3. If the above two recommendations are not possible, we recommend the restriction of vehicle traffic to the beaches, i.e., the closure of the high tide trail. Vehicles could travel up the beach to tree line, traverse the Ecological Reserve along the single track, and continue south along the east coast.

4. We recommend a closure and dismantling of the campsites within the reserve, as camping and campfires are in violation of the Ecological Reserves Act. To facilitate this closure, campsites should be established both on the east coast and north coast in Naikoon Park.

5. We recommend improved public education concerning Ecological

Reserves. This should include the reasons for their establishment, the respective uniqueness of each reserve, and how the public can use and appreciate the area.

6. We recommend a continued monitoring of Rose Spit Ecological Reserve. This should include a vegetation study of regeneration on roads, trails campsites and permanent plots, and a continuance of the shorebird census and observations on human activity.

APPENDICES

APPENDIX II

Vegetation - Permanent Plots

Five permanent plots were established within the reserve in mid-August (map 5). Plots 1 to 4 are located in areas of vehicular disturbance. Plot 5 is located on the east coast where active erosion and deposition appears to be occurring. All plots are approximately 10 x 10 meters, marked with four 5 x 5 cm. cedar stakes, 1 meter long, driven into the ground until only about 10 cm. remained exposed. Percent cover for each species was recorded, in order to provide more exact values for future comparison.

Permanent Plot 1.

Location: on the north coast, about 10 meters inside the reserve, 2 meters east of the high tide trail.

Description: Ceratodon purpurescens association. Vehicle tracks pass through this plot, running parallel to the high tide trail.

Releve data:

<u>species</u>	<u>percent cover</u>
<u>Poa douglasii</u>	40
<u>Carex macrocephala</u>	3
<u>Elymus mollis</u>	5
<u>Poa confinis</u>	1
<u>Ceratodon purpurescens</u>	3
<u>Glenhia littoralis</u>	<1
<u>Picea sitchensis</u>	2
<u>Eurynchium oreganum</u>	<1
Moss sp. A	<1
TOTAL	50%

Permanent Plot 2.

Location: west of tree line on the north coast, west of the high tide trail, between an old trail from the beach, and a more recently used one.

Description: Tanacetum huronense association. A vehicle track passes through this plot.

Releve data:

<u>species</u>	<u>percent cover</u>
<u>Poa douglasii</u>	5
<u>Carex macrocephala</u>	2
<u>Tanacetum huronense</u>	3
<u>Glenhia littoralis</u>	2
<u>Lupinus littoralis</u>	<1
TOTAL	10%

Permanent Plot 3.

Location: east coast, in the blowouts, on the vehicle trail leading to Campsite 3.

Description: Tanacetum huronense (blowout) association.

Releve data:

<u>species</u>	<u>percent cover</u>
<u>Poa douglasii</u>	2
<u>Tanacetum huronense</u>	2
<u>Carex macrocephala</u>	2
<u>Glenhia littoralis</u>	< 1
TOTAL	5%

Permanent Plot 4.

Location: on the meadow road, 50 paces past the weather station.

Description: Lupinus littoralis (north and central) association.

Releve data:

<u>species</u>	<u>percent cover</u>
<u>Poa douglasii</u>	5
<u>Carex macrocephala</u>	3
<u>Lupinus littoralis</u>	20
<u>Achillea millefolium</u>	20
<u>Fragaria chiloensis</u>	50
TOTAL	90%

note: these tracks are becoming revegetated, primarily with C. macrocephala and F. chiloensis. The F. chiloensis in the tracks is prostrate, while that in the meadow is erect.

Permanent Plot 5.

Location: east coast, adjacent (inland) to the driftwood, approximately 100 m. north of the weather station.

Description: Elymus mollis (east coast) association.

Releve data:

<u>species</u>	<u>percent cover</u>
<u>Poa douglasii</u>	< 1
<u>Carex macrocephala</u>	2
<u>Tanacetum huronense</u>	5
<u>Glenhia littoralis</u>	1
<u>Elymus mollis</u>	30
<u>Poa confinis</u>	1
<u>Lathyrus littoralis</u>	2
TOTAL	40%

MAP 5. Permanent plots.

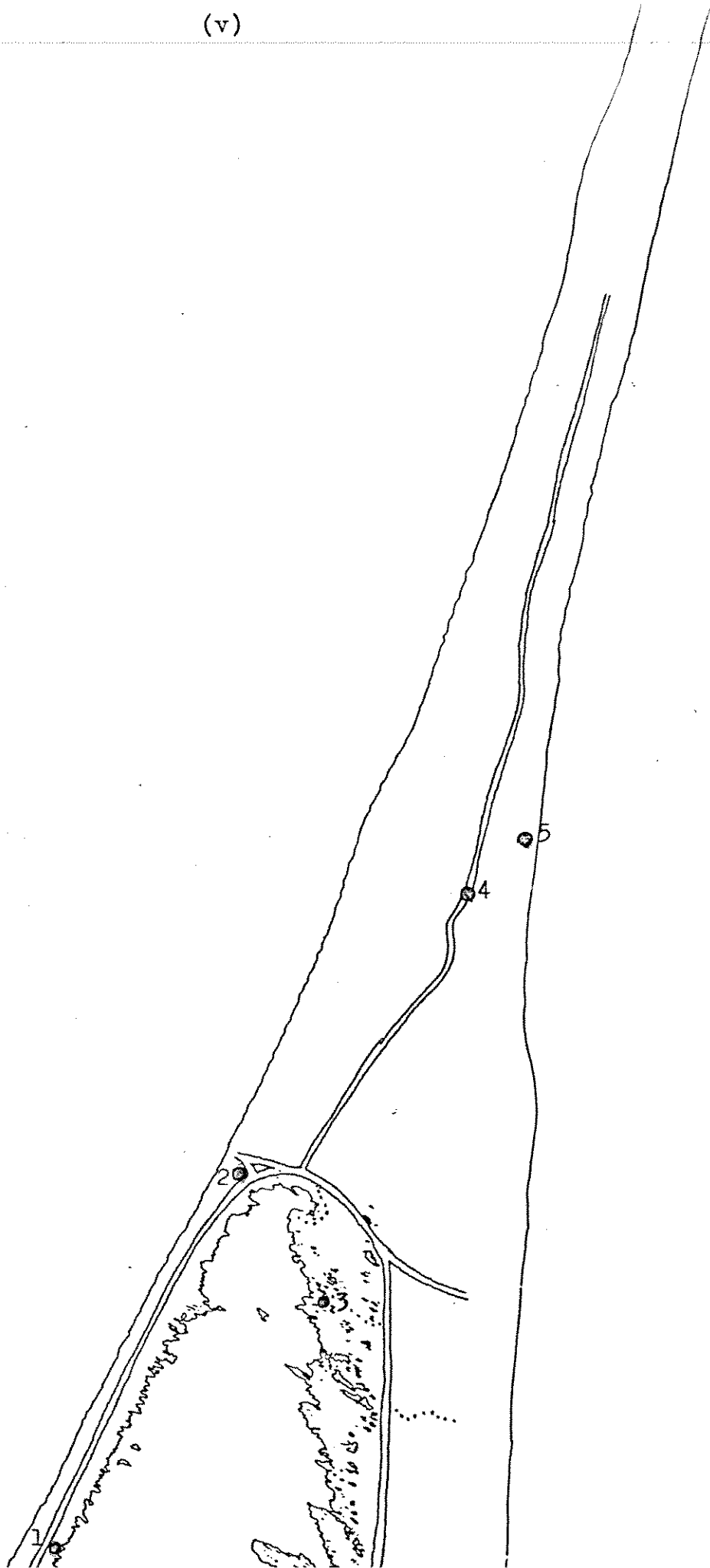
== frequently used vehicle trails

--- old vehicle routes and less used tracks

○ permanent plots

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APPENDIX III

Vegetation Species List
for Rose Spit Ecological Reserve

Herbs:

Achillea millefolium L.
 Agrostis palustris Huds.
 Arenaria peploides L.
 Cakile edentulae (Bigel.) Hook
 Calamagrostis nutkaensis (Preusl) Steud.
 Cardamine oligospermae Nutt.
 Carex macrocephala Willd.
 Carex physocarpa Presl.
 Castellija unalaschensis Malte
 Cerastium vulgatum L.
 Deschampsia caespitosa (L.)
 Elymus mollis Trin.
 Fragaria chiloensis (L.)
 Galium trifidum L.
 Galium triflorum Michx.
 Glenhia littoralis Schmidt
 Juncus leseurii Boland.
 Lathyrus japonicus Willd.
 Lathyrus littoralis (Nutt.) Endl.
 Lupinus littoralis Dougl.
 Lazula multiflora Retz.
 Lazula parviflora (Ehrh.) Desv.
 Mianthemum dilatatum Wood
 Mertensia maratima (L.) Gray
 Poa confinis Vasey
 Poa douglassi ssp. macrantha (Vasey) Keck
 Prenanthes alata (Hook.) D.Dietr
 Ranunculus acris L.
 Rumex acetosella L.
 Stellaria crispa Cham.&Schlecht.
 Tanacetum huronense Nutt.
 Tiarella trifoliata L.
 Viola adunca Smith

Shrubs:

Gaultheria shallon Pursh
 Rubus spectabilis Pursh
 Vaccinium parvifolium Smith

Trees:

Picea sitchensis (Bong.) Carr
 Pyrus fusca Raf.
 Tsuga heterophylla (Raf.) Sarg.

Mosses:

Ceratodon purpurescens Brid.
Eurynchium oreganum Sull.
Eurynchium triquestrous
Hylocomium splendens B.S.G.
Leucolepis menzeisii Steere
Mnium glabrescens Kindb.
Pogonatum macounii Kindb.
Rhytidiadiadelphus spp.
Scaparia sp.

Lichens:

Cladonia chlorophaea Spreng.
Cladonia furcata (Huds.) Schrad
Hypogemia enteromorpha (Ach.) Nyl.
Peltigera canine (L.) Willd.

APPENDIX IV

Notes on Birds and Mammals
Observed at Rose Spit Ecological ReserveBirds

Common loon Gavia immer common
 Red-throated loon Gavia stellata common
 Western grebe Aechmophorus occidentalis common
 Red-necked grebe Podiceps grisegena common
 Double-crested cormorant Phalacrocorax auritus seen only once
 Black brandt Branta nigricans common in May
 Mallard Anas platyrhynchos seen in late summer
 American wigeon Mareca americana seen once
 White-winged scoter Melanitta deglandi consistently seen offshore.

The following counts, covering the area from Tow Hill to
 Rose Spit, were made:

June 1	2,100
June 15	1,400
July 1	1,500
July 15	850
August 1	1,350
August 15	900

Surf scoter Melanitta perspicillata commonly seen amongst white-winged scoters, but in much lower numbers.

Goshawk Accipiter gentilis seen only once

Bald eagle Haliaeetus leucocephalus both immatures and matures were common.

Peregrine falcon Falco peregrinus seen only twice

Pigeon hawk Falco columbarius seen only once

Sandhill crane Grus canadensis commonly seen feeding on the meadow.

In May and June, 2 were commonly observed, by August
 7 were sometimes seen.

Glaucous-winged gull Larus glaucescens common

Herring gull Larus argentatus common

Pigeon guillemot Cepphus grylle seen only once.
Rufous hummingbird Selasphorus rufus observed doing mating
flight in May and June.
Common flicker Colaptes auratus common
Barn swallow Hirundo rustica common
Tree swallow Iridoprocne bicolor common
Common raven Corvus corax common
Black-capped chickadee Parus atricapillus common
Winter wren Troglodytes troglodytes common
Robin Turdus migratorius common
Varied thrush Ixoreus naevius common
Hermit thrush Hylocichla guttata seen occasionally
Townsend's warbler Dendroica townsendi seen occasionally
Blackpoll warbler Dendroica striata seen only once
Oregon junco Junco oreganus common
Song sparrow Melospiza melodia common

Mammals

Marten Martes americana tracks were common along the beach
Red squirrel Tamiasciurus hudsonicus common
Deer mouse Peromyscus maniculatus common
Black-tailed deer Odocoileus hemionus common
Raccoon Procyon lotor seen only on three occasions.
Harbour seal Phoca vitulina 30 to 40 were commonly observed at
the end of the spit.
Northern sea lion Eumetopias jubata only seen once.

PLATES

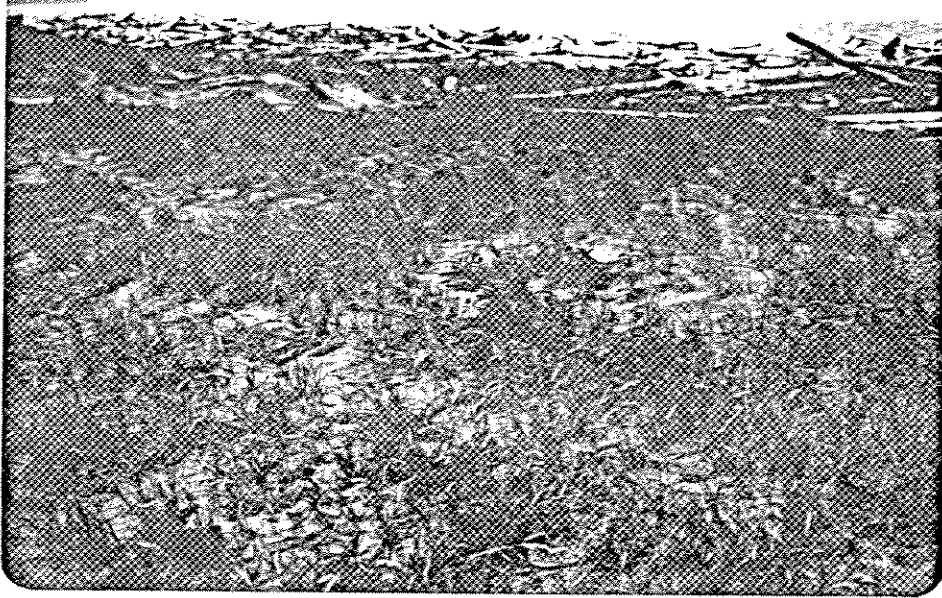


PLATE I. Tanacetum huronense association -
north coast type, abundant Poa douglassi

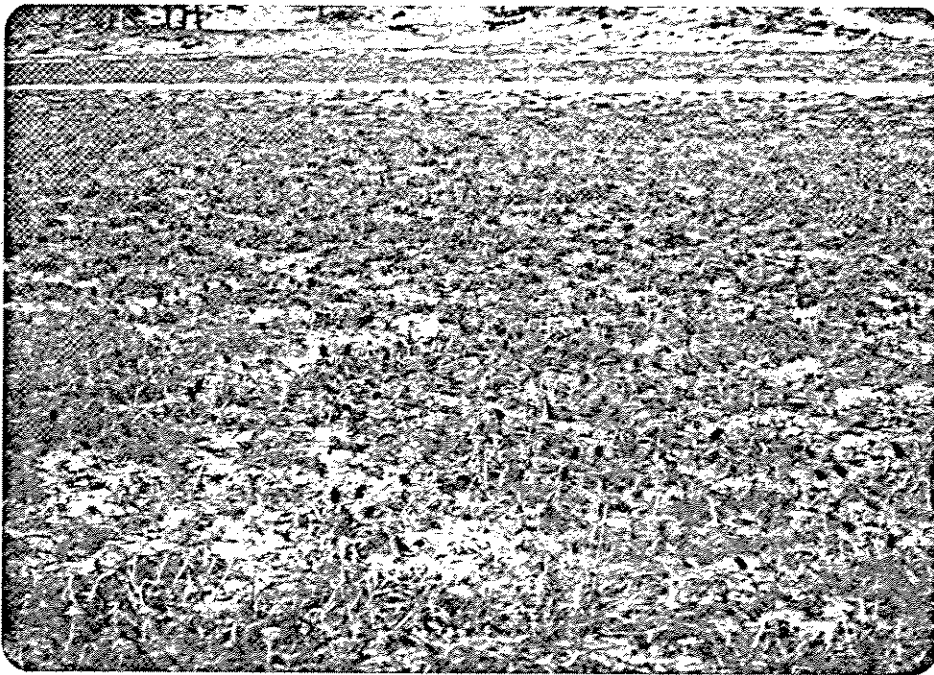


PLATE II. Tanacetum huronense association -
east coast type, abundant Carex macrocephala



PLATE III. Lupinus littoralis association -
late June.



PLATE IV. Lupinus littoralis association -
mid-August.



PLATE V. *Elymus mollis* association -
north coast within driftwood zone.

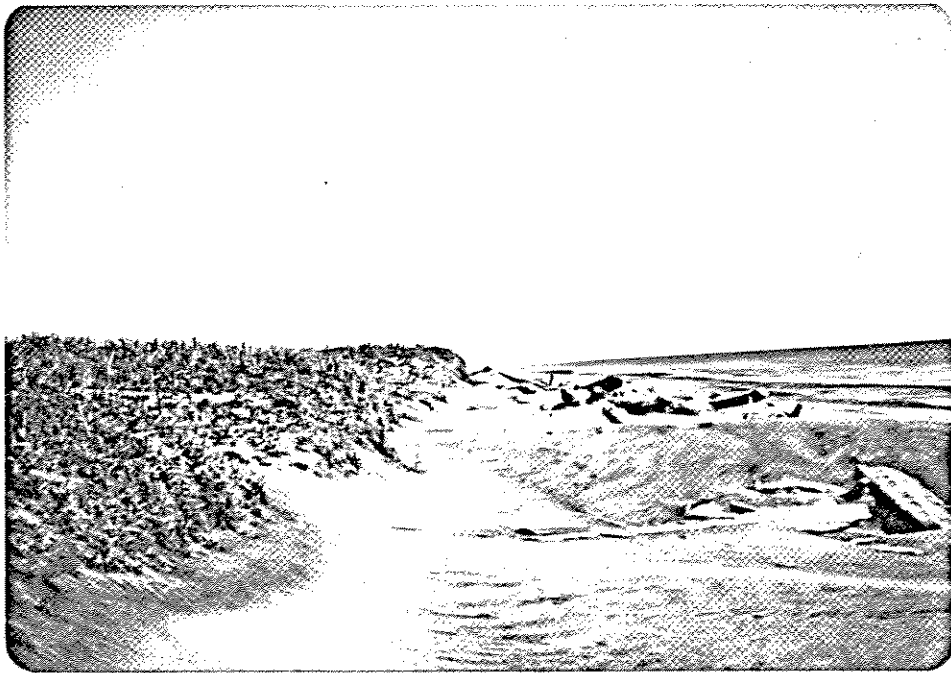


PLATE VI. *Elymus mollis* association -
east coast at driftwood barrier.

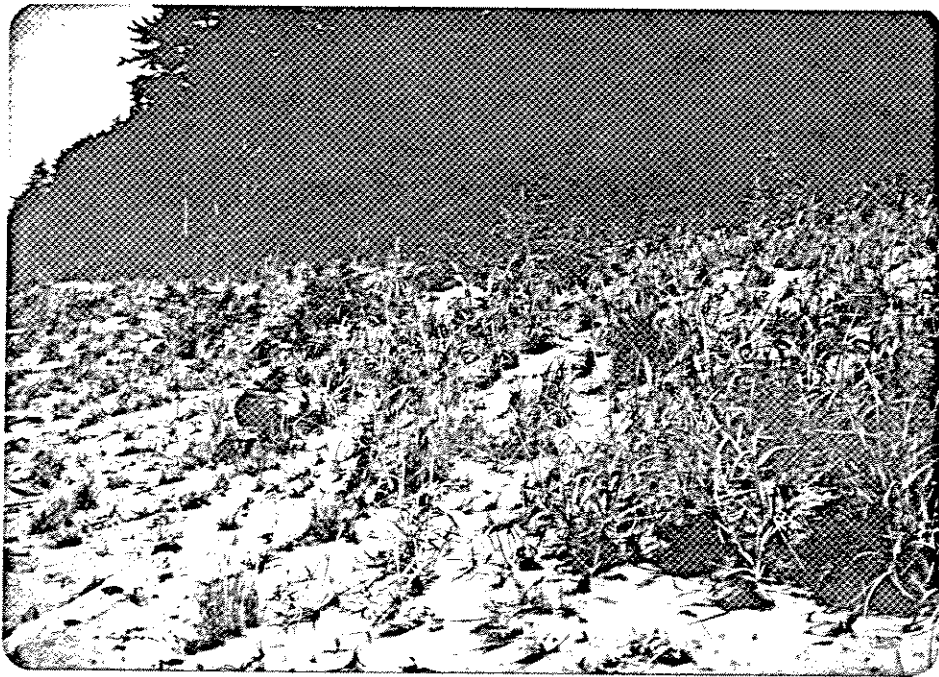


PLATE VII. *Ceratodon purpureus* association -
north coast stable dune.



PLATE X. Vehicle violation - driving upon open meadow.



PLATE XI. Meadow road - passing through north end, Elymus mollis association with abundant Lathyrus japonicus.

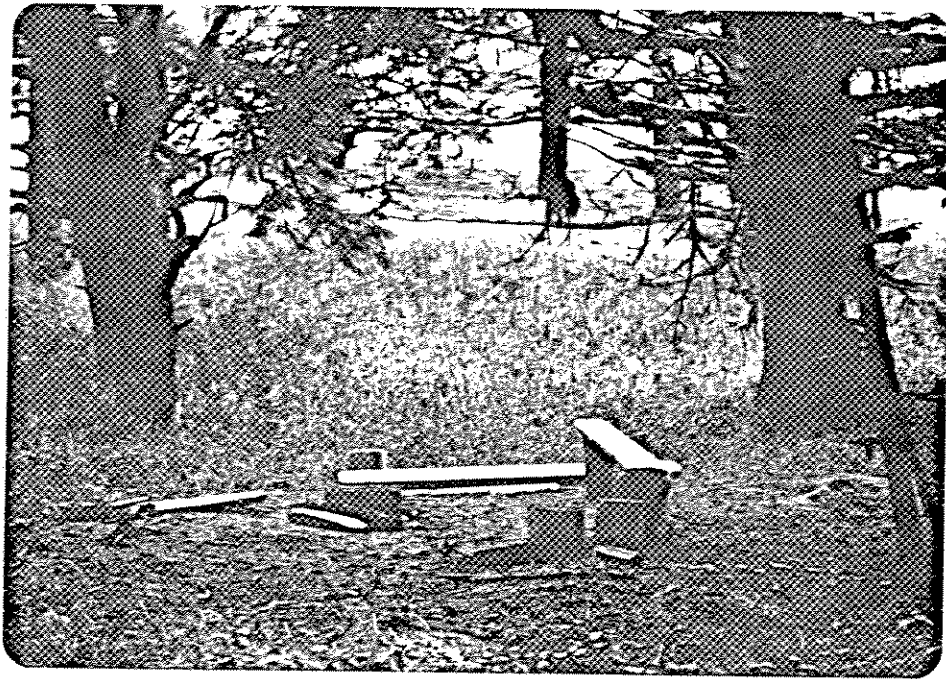


PLATE XIV. Campsite 3 - among blowout dunes
of east coast; Picea/Calamagrostis association.



PLATE XV. Disturbance to Campsite 1 -
occurred July 28, 1978.

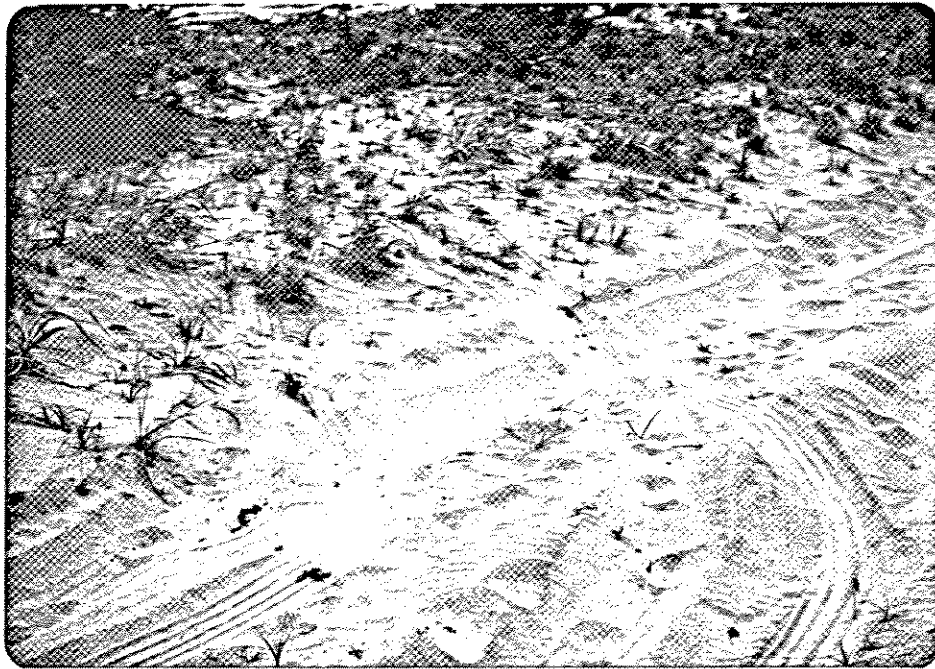


PLATE VIII. vehicle violation - driving upon north coast dune.



PLATE IX. Erosion and exposure of roots due to vehicle traffic at treeline.

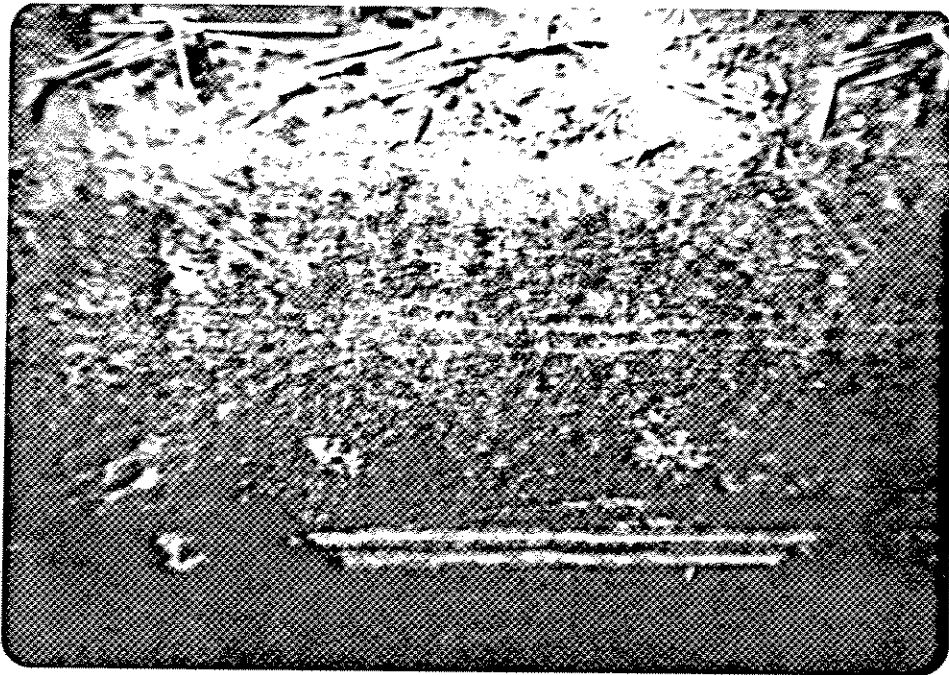


PLATE XII. Evidence of initiation of new roadway over north dune and parallel to High Tide Trail.

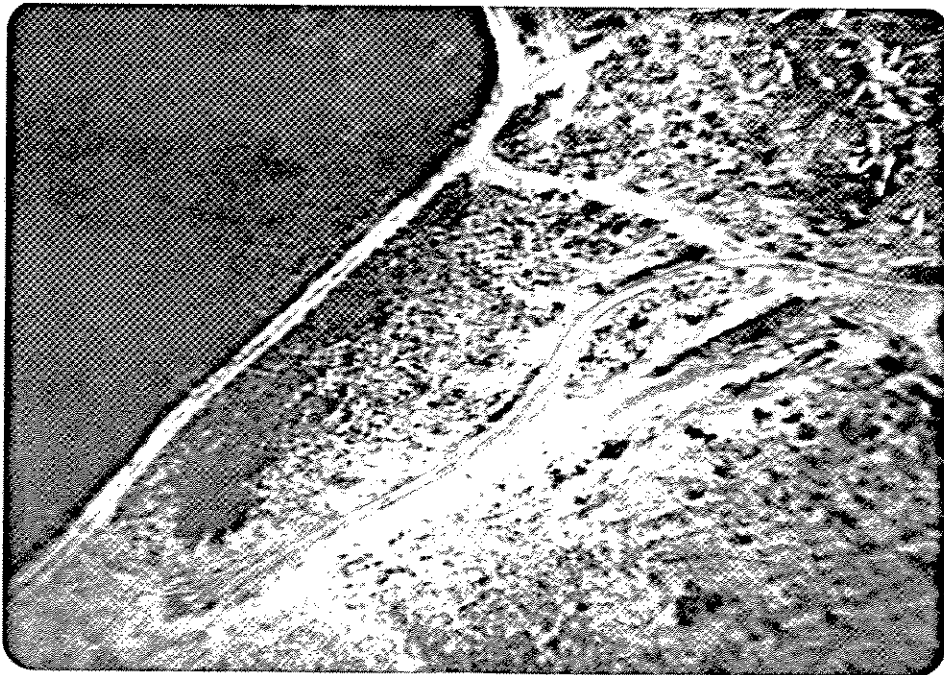


PLATE XIII. Roadway pattern at northwest corner at treeline.