

The Ecology of Savary Island

By R. S. SHERMAN

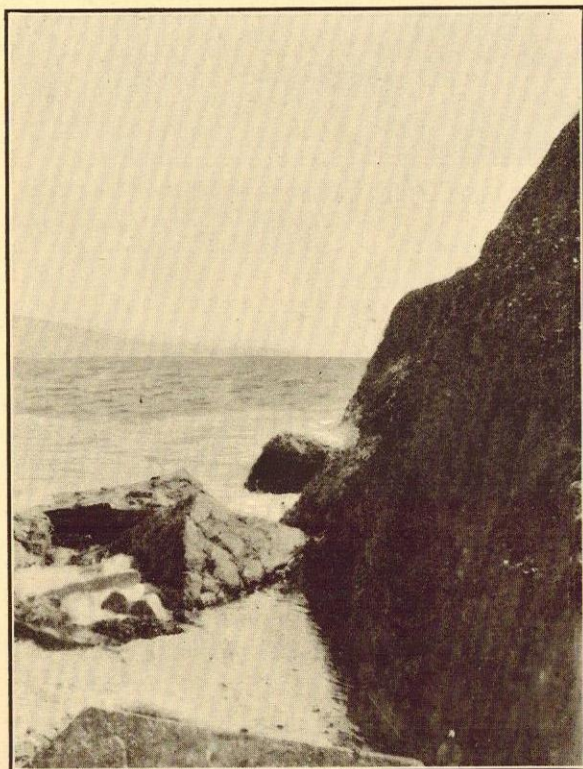
Photographs accompanying this article are by the Author and Mr. Fred Perry.

Sketch of tree by Miss Maud Sherman.



SAVARY ISLAND lies in the sheltered narrow straits that separate Vancouver Island from the mainland and almost half-way between the Gulf of Georgia and Queen Charlotte Sound. It is washed by tidal currents that come from north and south and interlace their streams at this point like the interlocked fingers of folded hands. The waters surrounding the island are, on an average, warmer than the waters either to the north or south. The average rainfall is about that of Victoria. This low rainfall is due to the fact that the prevailing winter winds blow from the south-east and deposit the major part of their moisture on the mountains of Vancouver Island. Between Vancouver Island and Savary, however, is a wide stretch of water which must replenish, to a certain degree, the water-content of the moving air. But as Savary has no great elevation above sea-level, 150 feet being the maximum, the moisture-laden winds pass on, to deposit their surplus on the western slopes of the

high mountains lining the shores of the mainland around Desolation Sound and Toba Inlet.



GREEN'S POINT

Savary Island is about five miles in length, is not more than half a mile in width, and extends in the form of a crescent from N.E. to S.W. The concave side is towards the west or north-west. At the N.E. extremity, known as Green's Point, is a mass of granitic rock, some five acres in extent, forming steep cliffs on the seaward slopes and giving rise to a series of small benches, more or less horizontal, where a shallow deposit of soil has accumulated. This point of rock has kept the sands of Savary from being swept away by the tides. The south-west extremity, known as Indian Point, is

formed of sand-dunes. A striking feature of the island is the line of high cliffs facing Vancouver Island. These cliffs are in places 150 feet high, and are formed of hard compact sand with underlying strata of clay.

The interior of the island is undulating or level. In places well-defined benches descend to the sea on the west side. In many places, especially on the eastern or (as it is popularly known) the southern shore, are ancient dunes, now well covered with a permanent vegetation. Smaller dunes, also well covered, are found on the west or



GREEN'S SHACK (JACK GREEN)

north-west shore. In parts of the interior are depressions and elevations, generally parallel with the existing shore line, which, so far as I can determine, must have been formed by winds in ancient days. Both hollows and slopes are now heavily forested with trees ranging from a hundred to five hundred years old.

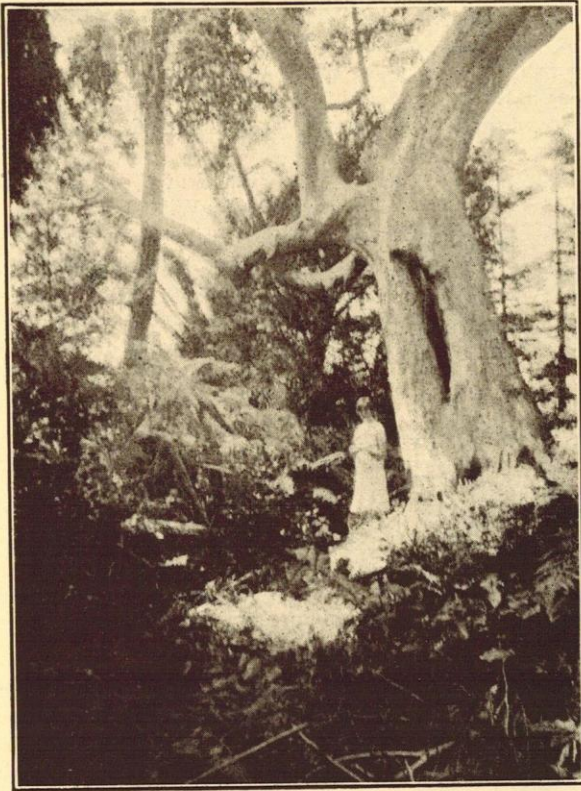
We cannot properly appreciate or evaluate the forces that have been at work in the fashioning of this island unless we revert to very remote times, when Savary was connected with two other islands, Hernando on the west and Harwood on the east. There is no doubt that at one time these three islands formed one unbroken land mass. The continuous reefs and shallows connecting the three islands, the reefs consisting of a type of boulders common to the three, are sufficient evidence. One of these boulders is of immense size, and, since the visit of Captain Vancouver to these shores, has been known as Mystery Rock. It lies about midway between Savary and Harwood.

Visualizing these three islands as being, not remotely, connected, we can account for some apparent anomalies in the ecological aspects of Savary Island. I shall revert to these problems a little later on.

Just at this point I should like to refer briefly to the human element which has left its impress on Savary Island. When I first visited the island in 1892, its sole inhabitant was an old crippled man by the name of Jack Green. He lived in a cabin on the north shore, not far from Green's Point, which appropriately bears his name. Connected with

the cabin was a log structure which he operated as a store and trading post. On the slopes contiguous to his house and store he had cut down the original forest of Douglas fir and planted various crops between the huge stumps. He had a flock of some three hundred sheep, besides cattle, pigs and poultry. Jack Green and a visitor to his ranch were murdered in 1893, as they sat at a game of cards. For some years thereafter the island was abandoned by all but bands of Indians, who, from time immemorial, have visited Savary to feast on clams and other shell-fish and to take their toll of mowich

or deer, which are still to be found on the island in considerable numbers. These Indians made their encampments at three points, each having a natural spring of fresh water. The favorite camping ground was at the north shore, where a living spring still pours its pellucid waters into the sea. Adjacent to this spring are middens containing Indian relics perhaps a thousand years old. These middens are penetrated by the roots of Douglas firs fully 500 years old. Bone needles and stone implements have been found in these middens, but relics of this kind are comparatively scarce, probably due to the fact that these Indians were fish-eaters, not hunters.



THE LARGEST ARBUTUS ON SAVARY ISLAND.
ESTIMATED AGE 1000 YEARS.

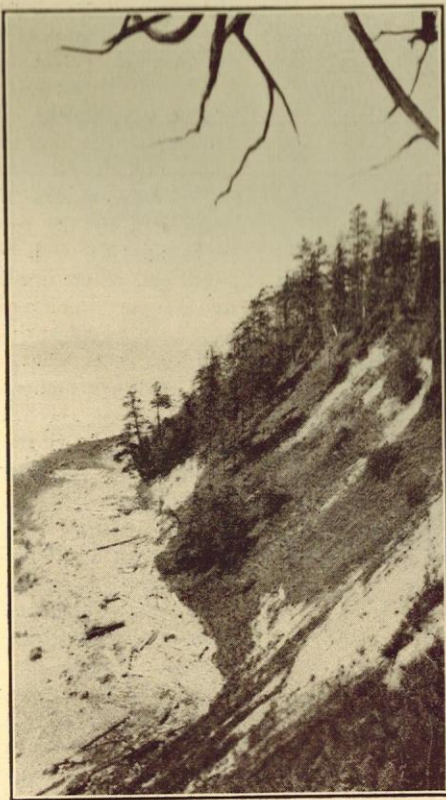
beautiful stand, exhibiting the action of forces that are at work and always have been at work in eliminating weaklings from Nature's forest children. The stand is so dense that the lower branches of the young trees have been forced to give up the struggle for light and air. The dead lower branches are falling rapidly and their broken ends are being covered over by the vigorous growth of the sturdy trunks. Some of the smaller and weaker trees have been killed outright and are being razed to the ground by the action of insect pests and fungoid growths. Their remains will supply food to the survivors of this forest-in-the-making and to the undershrubs which are fast making their appearance.

The area cleared by Jack Green some forty years ago is now covered with a dense growth of young Douglas fir, a

About twenty years ago logging operations were carried on at several points, and a comparatively large area was stripped of its larger trees. This area is now supporting a second growth forest of alders; but among the alders young vigorous Douglas firs, cedars and Grand firs are struggling to assert themselves.

Much of Savary Island is still covered with primeval forest. Taking the island as a whole, the Douglas Fir-Red Cedar-Western Hemlock association predominates. But there are certain areas where almost pure stands of Lodgepole Pine (*Pinus contorta*) prevail. In one isolated spot there is a small but vigorous stand of the Western White Pine (*Pinus monticola*), and there is a zonal stretch where the Western Yew (*Taxus brevifolia*) is a rival of the Western Red Cedar for second place in the forest formation. Arbutus, too, is well represented, scattered here and there through the dense forest and forming the dominant tree in a limited area near Indian Point.

Other representatives of the forest fraternity are Broad-leaved Maple (*Acer macrophyllum*), Wild Cherry (*Prunus emarginata*), Sitka Willow (*Salix sitchensis*), Red Alder (*Alnus rubra*), Cascara (*Rhamnus purshiana*), the Flowering Dogwood (*Cornus nuttallii*), and quite locally, Green Alder (*Alnus sitchensis*), the Aspen Poplar (*Populus tremuloides*), the Smooth Maple (*Acer glabrum*), the Douglas Thorn (*Crataegus brevispina*), the Garry Oak (*Quercus garryana*), and the Crab Apple (*Pyrus rivularis*). Of special interest is a scattered occurrence of the Grand Fir (*Abies grandis*), which seems to thrive best when occupying a subordinate position in a forest formation.



CLIFFS ON THE SOUTH SHORE OF SAVARY.

a height of ten to fifteen feet. Some specimens are, according to my personal knowledge, over twenty years old. The larger ones are probably more than twice that

Of shrubs Savary Island has a rich selection, both underwood shrubs and those demanding more light and freedom. Of underwood shrubs the Salal (*Gaultheria shallon*) is dominant throughout the forest. Nowhere, perhaps, outside of the Queen Charlotte Islands, does the Salal thrive in greater luxuriance. Specimens ten feet high are common; the leaves are extremely large, and the fruit is abundant and luscious. The Red Huckleberry (*Vaccinium parvifolium*) is generally distributed throughout the forest, and in places attains

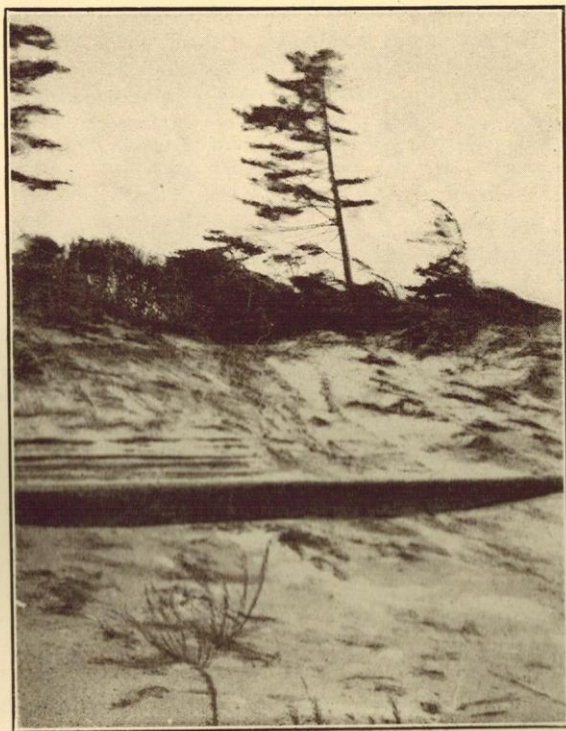
age. The Ocean Spray (*Holodiscus discolor*) is a common shrub, even in the deep shade of the forest. Here it attains prodigious heights, for a shrub, in its efforts to get its share of light and to spread its blossoms where the bees and the butterflies may reach them. Two species of Oregon Grape (*Berberis nervosa* and *B. aquifolium*) are abundant, both as underwood shrubs and in the open spaces. Of special interest is the occurrence, over a considerable area, of the Evergreen Huckleberry (*Vaccinium ovatum*).

On the borderlands of the forest thrive such shrubs as the False Box (*Pachystima mersinites*), the Waxberry or Snowberry (*Symphoricarpos racemosus*), the Orange Honeysuckle (*Lonicera ciliosa*), the Red Elderberry (*Sambucus racemosa*), the Saskatoon Berry (*Amelanchier alnifolia*), the Osage Orange or Mock Orange (*Philadelphus gordonianus*), that beautiful western shrub the Red-flowered Currant (*Ribes sanguineum*), the Thimbleberry (*Nuttallia parviflora*), and, in great abundance, two species of Wild Rose (*Rosa gymnocarpa* and *R. nutkana*). In favored localities the Salmon Berry (*Rubus spectabilis*), the Gooseberry (*Grossularia divaricatum*) and the Soapoolallie (*Shepherdia canadensis*) may be found. On open sea-bluffs and old sand-dunes there is often a dense mat of the Bearberry (*Arctostaphylos uva-ursi*) and an occasional specimen of its congener, the Manzanita (*A. tomentosa*). The latter species, being an erect shrub, is more susceptible to the force of the wind, and it usually selects a sheltered nook in which to spread its tomentose leaves.

The formation of large areas of open meadows on the south shore of Savary Island has aroused the interest and challenged the interpretative intelligence of visiting ecologists. These meadows, let me repeat, lie on the south or south-eastern shore. Let it be understood that this is the side of the island most exposed to prevailing winter winds. Let it also be understood that this side of Savary faces Harwood Island, formerly beyond a doubt connected with Savary. Also it faces a stretch of reefs which represent the eastern extension of Savary in remote ages.

Now, the cliffs on the south shore of Savary are of different formations, varying from fairly loose sand to compact clay. Where sand obtains, the prevailing winds have formed protective dunes along the seafront. Behind these dunes, on their lee side, the forest has been able to establish itself to the very edge of the cliffs. Where the winds were not able to form dunes, owing to the hard nature of the strata, there are no protective ramparts behind which the forest has been able to advance. Here we find the meadows, covered with a low growth of herbaceous plants, able to withstand the onslaughts of the strong south-easterly gales. It is well-known, in fact, that strong prevailing winds are an obstacle to the growth of forests.

There is, however, a part of the south shore that presents an apparent anomaly. In this part there are no protective dunes, and yet the forest extends to the very verge of the cliffs. Many trees each year are undermined and tumble into the sea. This part of Savary faces the reefs that stretch away towards Harwood Island. In my mind there is no doubt that a continuous forest once extended across this empty expanse of waters. Once established, this ancient forest was able to maintain an unbroken front along the rim of the encroaching sea. But where the meadows are, the winds of centuries have swept with irresistible force and fought back the forest growth. Had this part of the island been of a sandy structure, dunes would have



SAHARA DESERT

wind accomplishes its deeds of distortion and forms these weird witch-trees of Savary. The mere mechanical or dynamic force of the wind, acting in one direction for a considerable portion of the year, must be a potent factor. The attrition exercised by sand particles driven with the full force of south-easterly gales must retard growth of twigs, branches and leaves on the windward side. The desiccating effect of the fast-moving air must also be reckoned with. Probably there are other factors; but I think these three are dominant.

It is surprising how calm the air is just behind the dune-rimmed crest of the cliffs. Within ten feet of the edge are luxuriant growths of tender shrubs and herbaceous plants. For ages the deer have had their main runways along this belt of calms. What is probably the largest *Arbutus* in British Columbia grows within a hundred feet of the storm-swept cliffs. This tree is doubtless a thousand years old. Yews of unusually large girth are found in this favoured area, as are also Red Alder, Sitka Willow, Broad-leaved Maple, Wild Cherry, Flowering Dogwood and Cascara.

Most of the forest shrubs previously mentioned attain their finest development in this zone. Herbaceous plants comprise such form as the Deer's Foot (*Achlys triphylla*), False Solomon's Seal (*Smilacina racemosa* and *S. sessilifolia*), the Fairy Bells (*Disporum oreganum*), the Wild Lily-of-the-Valley (*Maianthemum bifolium*),

been thrown up and behind them the forest would have advanced and taken possession of these vacant areas.

As evidence of the struggle which has been waged for countless ages between wind and forest, we can point to the weird, distorted and stunted forms of the trees that form the vanguard of the forestic army. The south-easterly gales sweep up the cliffs armed with countless particles of sand. After one of these gales the leaves of the underwood shrubs and herbs, immediately and for some distance behind the protective dunes, are laden with a deposit of almost impalpable dust.

It may be of interest to speculate as to the actual way in which the

the pretty Pink Orchid (*Calypto bulbosa*), the Rattlesnake Plantain (*Peramium decipiens*), the Star Flower (*Trientalis latifolia*), and the False Mitrewort (*Tiarella trifoliata*).

The prevailing ferns are the common Bracken (*Pteridium aquilinum*), which thrives at the very edge of the cliff, and the Western Sword Fern (*Polystichum munitum*). A species of Scouring Rush (*Equisetum hyemale*) flourishes within root-reach of the cliff's edge. Beside the trails and deer-runs thick clumps of Indian Pipe (*Monotropa uniflora*) occur, the minute seeds being carried, no doubt, by the feet of men and animals.

Anchored to the gnarled branches of wind-swept firs you may see nests of the Northern Bald Eagle (*Haliaeetus leucocephalus*). This royal beach-comber is seen here in his chosen habitat. Ascending to dizzy heights on moveless wings, in spirals graceful as the curves of clouds, he soars into the face of the storm and screams his defiance to the spirits of earth and sky. Having performed this ancient rite of his race and proclaimed his sovereignty over sea and land, he descends to his eyrie in one of these towering firs and thence casts a brooding and possessive eye over his broad domains.

Another bird of the cliffs is the American Sparrow Hawk (*Falco sparverius sparverius*), who, on sunny days when the grasshoppers are stridulating over the hot sandy slopes, may be seen fluttering but almost moveless, watching for its tiny prey. I hardly dare mention that the Northwest Coast Kingfisher (*Ceryle alcyon caurina*) haunts the steeper cliffs, where he builds his nest, for fear the information might reach the ear of the government and a gunboat be sent out to exterminate this terrible marauder. The Northwestern Flicker (*Colaptes cafer cafer*) and the Pileated Woodpecker (*Phloeotomus pileatus*)—not using a gun, I cannot say whether it is subspecies *abieticola* or *picinus*—find good pecking and good picking in this area. Ants abound, to the delight of the Flicker; and the stubs of dead, defeated firs give ample exercise to the snake-like neck of the Log-cock. The Band-tailed Pigeon (*Columba fasciata*) evidently nests in this belt of forest, for I have seen and heard a number of these birds throughout the summer. Another interesting bird that makes his home in this particular area is the Coast Pygmy Owl (*Glaucidium gnoma grinelli*), whose monotonous cry sometimes rends the stillness of night from twilight until dawn.

The seaward slopes of the cliffs are inclined at various angles, depending largely on the texture of the soil. Where the slopes are not too steep, the wind blows fine sand up the face of the cliffs, and the accumulation of this sand forms those protective dunes behind which the forest can advance to the very verge. On the slopes of moderate inclination many plants find a foothold. At the very foot of such a slope or, may we say, between its extended toes, appear typical shore forms as the Beach Pea (*Lathyrus maritimus*), the Lyme Grass (*Elymus arenarius*) and a species of Lupine, probably *Lupinus littoralis*. Gumweed (*Grindelia integrifolia*) appears here and creeps up the sandy slopes in open formation, anchoring itself by deep lignified roots and forming a series of tussocks. The Broom (*Cytisus scoparius*) was introduced on Savary Island in 1912. It is beginning to oust the native species of sand-binders. If it could be confined to the steep sand-slopes of the south shore, this shrub might in time vindicate its existence and the wisdom of those who introduced it; but, unfortunately, it has invaded the interior of the island, where it is becoming a menace to our native flora.

Breaking the continuity of the cliffs on the south shore are two extensive sandy wastes, known locally as the Sahara and the Kalahari deserts. The sand of the Sahara has been blown upward to form a huge dune with a steep slope on its leeward side. At the very top of this dune is a breastwork of matted firs sheltering one of the largest *Arbutus* trees on the island. To protect its foliage from the sand-laden blasts, this

tree has assumed an almost horizontal habit. During the long dry summer the sands of the Sahara, except for a few scattered clumps of *Artemisia*, is lifeless. But in spring it produces in sheltered spots a brief though attractive flora, consisting largely of dwarfed forms of the Sea Blush (*Valerianella congesta*), Blue-eyed Mary (*Collinsia grandiflora*) and the Miner's Lettuce (*Montia parviflora*). Delicate grasses spring up, too, but fade and perish before they can flower.



ARBUTUS PROTECTED BY SAND-DUNES OF THE SAHARA

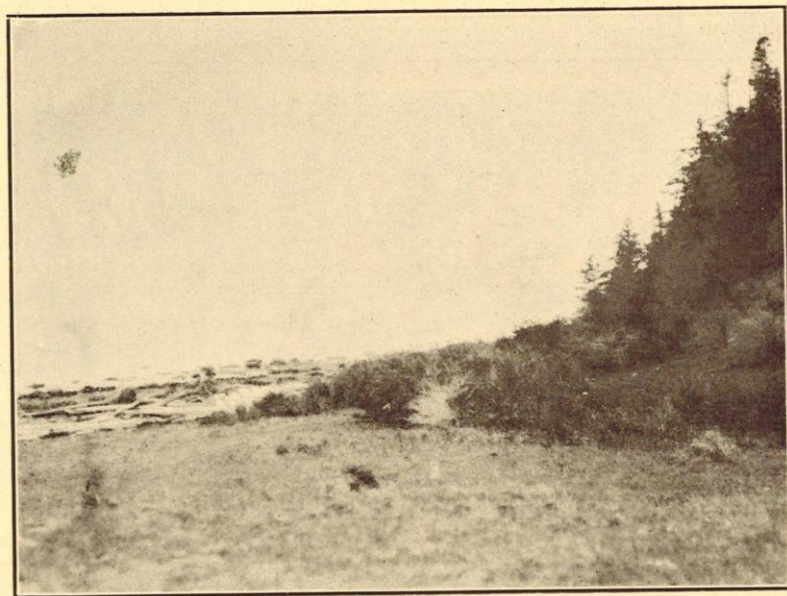
Kalahari is low enough to support the Lyme Grass and high enough to suit the needs of the Indian Consumption Plant (*Lomatium nudicaule*), the Oregon Grape and an encroaching army of Lodgepole Pine. This desert is also backed by a high dune, thickly forested on its steep leeward side.

Beyond the Kalahari and before coming to another stretch of precipitous cliffs, we have a meadow formation backed by an almost pure stand of Lodgepole Pine. About midway up this reach of meadow and close to the shore is one of the three Indian springs, previously mentioned. Its exact location can be detected as far as you can see, by the vivid green and luxuriance of the surrounding vegetation. It is in the belt of pines, stalwartly encroaching on this meadow, that we find a species of Mistletoe (*Arceuthobium americanum*), a parasite on *Pinus contorta*.

On this meadow are patches of Bearberry, Oregon Grape and Wild Rose, usually

On the Kalahari, which is merging into the grey-dune formation, occurs that rare dune-dweller *Convolvulus soldanella*, listed by Warming as native to the dunes of Holland, and of which I have specimens procured in Japan. In parts the

stunted in form. Bracken occurs, but is also dwarfed. Among the wild flowers are: the Wild Hyacinth (*Brodiaea grandiflora*), the Harebell (*Campanula rotundifolia*), the Paint Brush (*Castilleja angustifolia* var. *bradburyi*) and the Death Camas (*Zygadenus venenosus*). These plants are found on all the natural meadows of Savary Island. In addition, occurring on one or other of the meadows, are the following: Dog's-tooth Violet (*Erythronium grandiflorum* var. *album*), the Blue Violet (*Viola langsdorfii*), the Woolly Sunflower (*Eriophyllum lanatum*), the Yarrow (*Achillea millefolium*), the Goldenrod (*Solidago* sp.), one or more of the Asters the Chocolate Lily (*Fritillaria lanceolata*), the Lesser Paint Brush (*Orthocarpus pusillus* and possibly *faucibaratus*), the Self-heal (*Prunella vulgaris*), the Shooting Star (*Dodecatheon pauciflorum*), the Wild Carrot (*Daucus pusillus*), the Dove's Foot (*Geranium molle*), one or more species of Lupine, the Lance Clover (*Trifolium triden-*



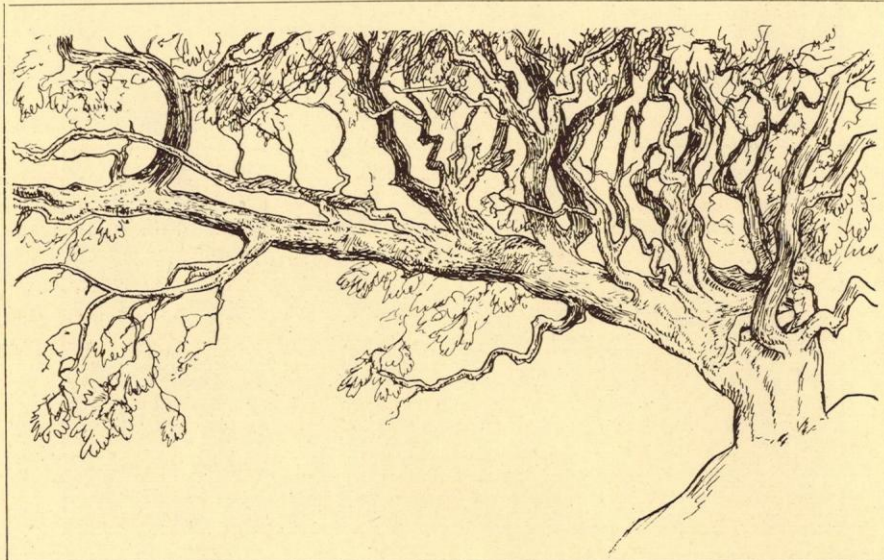
ONE OF THE NATURAL MEADOWS, SAVARY ISLAND.

tatum), the Cup and Saucer Clovers (*T. microdon* and *T. macrocephalum*), the Wild Strawberry (*Fragaria bracteata*), the Mouse-eared Chickweed (*Cerastium arvense*), the Blue-eyed Grass (*Sisyrinchium grandiflorum*), the Fool's Onion (*Brodiaea lactea*) and *Lithophragma tenella*.

On the rocky benches at Green's Point we find some of the meadow plants, such as *Zygadenus venenosus*, *Brodiaea grandiflora* and *B. lactea*. Species that seem largely confined to this area are: *Mimulus langsdorfii*, *Saxafraga integrifolia*, the Alum Root (*Heuchera micrantha*), the Tiger Lily (*Lilium parviflorum*) and the Wild Onion, of which there are two species, *Allium cernuum* and *A. acuminatum*. I should have mentioned that these onions are also found on the meadows. In depressions, where the soil is deep, sturdy specimens of the Cow Parsnip (*Heracleum lanatum*) flourish. On benches little above high tide, within reach of the spray storms, grows a species

of plantain with fleshy leaves (*Plantago maritima*). Where the rock dips under the deep soil there is a patch of Dog-bane (*Apocynum androsaemifolium*). One of the sand-binders thrives well on Green's Point. This is the Gumweed (*Grindelia integrifolia*). In this area the Gumweed is heavily infested with that beautiful parasite, the Broom Rape (*Orobanche comosa*). I have dug up this plant and found it closely clasping a slender rootlet of its host. Clinging to these rocks and finding a foothold in crevices are dwarfed forms of the Saskatoon Berry (*Amelanchier alnifolia*), which apes the habit of the Bearberry with which it is associated.

Along the interior trails of Savary are found a few plants not yet mentioned and not appearing to occur in any particular association. Among these are: *Pyrola secunda*, the Yellow Violet (*Viola sempervirens*), the White Hawkweed (*Hieracium albiflorum*), several *Habenarias* or Rein Orchids, and the Yerba Buena (*Micromeria douglasii*). Nor must we forget one of the most beautiful of our early summer flowers, the Columbine (*Aquilegia formosa*), found growing on the fringe of the forest.



Among the halo-xerophytes along the north sea-front is found the Sea Purslane (*Portulaca oleracea*), and an important sand-binder at Indian Point, and near the Goose-pasture is a sedge (*Carex macrocephala*).

Of saprophytes and parasites reference has been made to a few. One of the most abundant is the Indian Poque (*Boschniakia strobiliacea*), a root-parasite on the Salal. *Newberrya congesta* (*Hemitomes congestum*), the Cone Plant, is not uncommon in the midst of the coniferous forest. *Allotropa virgata* and the Coral Root (*Corallorhiza mertensiana*) are other forms met with in the same habitat.

In a soil so lacking in humus as that of Savary Island, it is surprising to find such a large number of fungoid growths. During the fall months the trails are bordered with numerous healthy specimens of gill-bearing fungi as well as other forms. Some species seem to be relished by the deer.

Before leaving the plants I should like to call attention to some missing links in the flora of Savary Island. Of deciduous trees and shrubs we lack the Western Birch, the Black Cottonwood, the Vine Maple and the Bird Cherry or Indian Plum, not to mention, of course, bog-loving shrubs or mountain forms. Of evergreen conifers which we might expect to occur, there are two missing, the Sitka Spruce and the Juniper. The latter is quite common on the adjacent islands and the mainland.

Of native mammals we have only three that I have actually seen. These are the Columbia Black-tailed Deer, Townsend's Chipmunk and the Douglas Squirrel or Chickaree. The last has almost totally disappeared in recent years. I attribute its destruction to cats introduced by the summer visitors and left to go wild, and to the attack of a parasitic fly (*Cuterebra frontanella*), which is ordinarily supposed to attack rabbits. I took specimens of this fly every year until the disappearance of the squirrels. Dr. Hadwen, an eminent authority on parasitic Diptera, to whom I submitted specimens and data, expressed the opinion that this fly must be parasitic on the squirrel.

It may be plainly seen that some of the outstanding principles of plant ecology are well illustrated by plant communities on Savary Island. Forest, meadow, rock, littoral and every stage of dune-formation are represented.

The meadow formation is particularly interesting. Here we see the seasonal associations well developed. In spring appear such annuals as *Valerianella congesta* and *Collinsia grandiflora*, followed by a retinue of bulbous plants, such as *Fritillaria*, *Erythronium*, *Dodecatheon*, *Brodiaea*, *Allium* and *Zygadenus*. Flowering plants requiring a certain amount of shade follow: *Campanula rotundifolia* is a good example. The shade is supplied by numerous grasses and the bracken. When the grasses have withered, *Solidago*, *Aster* and *Achillea* hold sway. The dead and depressed grasses and bracken afford protection to some of the lowly wintering biennials and to the early-flowering annuals.

