PROVINCE OF BRITISH COLUMBIA
DEPARTMENT OF RECREATION AND CONSERVATION

PROVINCIAL MUSEUM
of NATURAL HISTORY and ANTHROPOLOGY

REPORT FOR THE YEAR 1965

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1966

To Major-General the Honourable GEORGE RANDOLPH PEARKES,
V.C., P.C., C.B., D.S.O., M.C.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The undersigned respectfully submits herewith the Annual Report of the Provincial Museum of Natural History and Anthropology for the year 1965.

W. K. KIERNAN,
Minister of Recreation and Conservation.

Office of the Minister of Recreation and Conservation,
March, 1966.

PROVINCIAL MUSEUM OF NATURAL HISTORY AND ANTHROPOLOGY,
VICTORIA, B.C., March, 1966.

The Honourable W. K. Kiernan,
Minister of Recreation and Conservation, Victoria, B.C.

SIR,—The undersigned respectfully submits herewith a report covering the activities of the Provincial Museum of Natural History and Anthropology for the calendar year 1965.

I have the honour to be,
Sir,
Your obedient servant,

G. CLIFFORD CARL,
Director.

DEPARTMENT OF RECREATION AND CONSERVATION

The Honourable WILLIAM KENNETH KIERNAN, *Minister.*

D. B. TURNER, PH.D., *Deputy Minister.*

PROVINCIAL MUSEUM OF NATURAL HISTORY AND ANTHROPOLOGY

STAFF

G. CLIFFORD CARL, PH.D., *Director.*

CHARLES J. GUIGUET, M.A., *Curator of Birds and Mammals.*

WILSON DUFF, M.A., *Curator of Anthropology* (to July 31st).

ADAM F. SZCZAWINSKI, PH.D., *Curator of Botany.*

DONALD N. ABBOTT, B.A., *Acting Curator of Anthropology* (from September 1st).

ERIK THORN, *Chief of Displays* (from October 1st).

FRANK L. BEEBE, *Illustrator and Museum Technician.*

JOHN H. SMYLY, *Technician* (from May 31st).

MICHAEL D. MILLER, *Student Assistant* (from June 15th).

ROBERT H. NICHOLS, *Field Agent* (from September 1st).

PETER L. MACNAIR, B.A., *Assistant in Anthropology* (from November 29th).

JOHN H. W. SENDEY, *Student Assistant* (from October 1st).

MARGARET CRUMMY, B.A., *Clerk-Stenographer.*

BETTY C. NEWTON, *Assistant in Museum Technique.*

SHEILA Y. NEWNHAM, *Clerk.*

HELEN M. BURKHOLDER, *Clerk.*

CLAUDE G. BRIGGS, *Attendant.*

GORDON KING, *Relief Attendant.*

TOTEM-POLE RESTORATION PROGRAMME

HENRY HUNT, *Chief Carver.*

E. C. (TONY) HUNT, *Assistant Carver.*

PROVINCIAL MUSEUM OF NATURAL HISTORY AND ANTHROPOLOGY

Objects

(*a*) To secure and preserve specimens illustrating the natural history of the Province.

(*b*) To collect anthropological material relating to the aboriginal races of the Province.

(*c*) To obtain information respecting the natural sciences, relating particularly to the natural history of the Province, and to increase and diffuse knowledge regarding the same.

(Section 4, *Provincial Museum Act,* chapter 311, R.S.B.C. 1960.)

Admission

The Provincial Museum is open to the public, free, on week-days, 8.30 a.m. to 5 p.m.; Saturdays, 9.30 a.m. to 5 p.m.; and on Sunday afternoons, 1 to 5 p.m.

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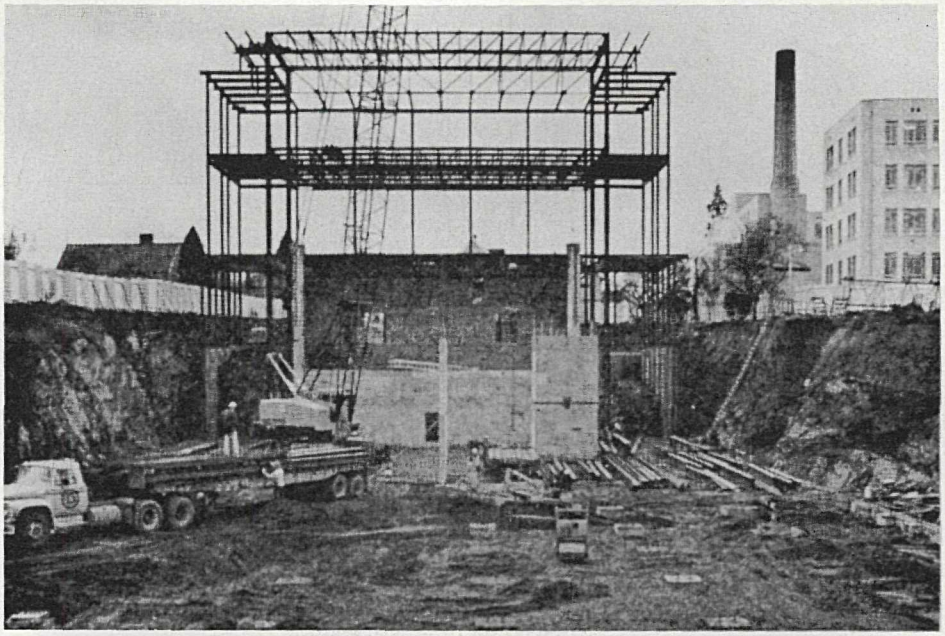
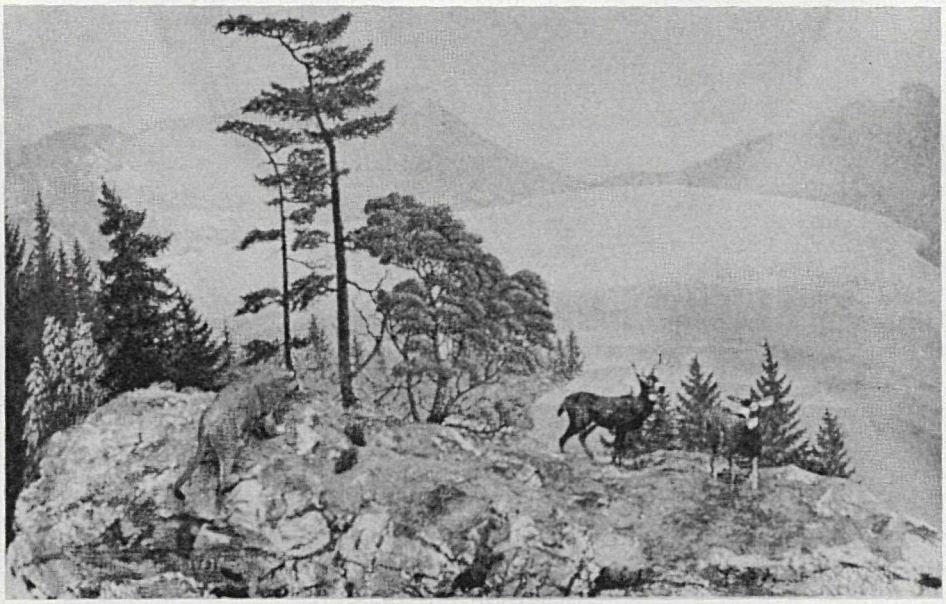


Steel and concrete skeleton of new museum complex reached this stage at the end of 1965.



Model by F. L. Beebe of a proposed coastal diorama for the new museum building.

REPORT OF THE PROVINCIAL MUSEUM

For the Year 1965

REPORT OF THE DIRECTOR

Regular routines of museum operation were carried on throughout 1965 in the usual way, but pervading all was a new outlook as a result of the programme of planning and construction which dominated our activities.

FIELD WORK

A number of visits to various parts of the Province were made this year mostly to collect specimens and information in connection with new exhibits being prepared for the new building. The first of these was in May when several staff members spent a number of days in the Okanagan Valley in company with Mr. Clarence Tillenius, a noted artist-illustrator who has been engaged to create dioramas for the new museum building. The main purpose of the visit was to select a locale for a habitat group featuring the wildlife of the dry Interior and to make field sketches, preliminary collections, and a photographic record of a specific area. Mrs. Grace Bell, of Victoria, also assisted by making a taped record of typical natural sounds. Mr. Karl Spreitz, of the Photographic Branch, was responsible for photography.

In late May, Mr. C. J. Guiguet and Mr. F. L. Beebe collaborated with officials of the Fish and Game Branch in making a survey of the peregrine falcon population in the Queen Charlotte Islands, necessitated by increasing requests for permits to take birds for use in falconry.

In June, Mr. Wilson Duff visited Prince Rupert, Hazelton, Kitwanga, and other centres in this general area in connection with his various anthropological interests.

In mid-July Mr. Guiguet, Mr. Tillenius, and Mr. John Hermann-Blome, taxidermist, visited the Chilcotin country to collect specimens of bighorn sheep to be mounted for display in a habitat group being planned.

During part of August, Mr. Guiguet continued a long-term trapping programme designed to study the distribution of small mammals on coastal islands. Folger, Edward, King, and Seppings Islands were surveyed as well as a portion of Bamfield Peninsula.

In the latter part of August, Dr. Szczawinski worked in the Peace River district making a representative collection of plants in the neighbourhood of Hudson Hope as part of an over-all programme being carried on in the Province. The British Columbia Hydro and Power Authority were most helpful in providing accommodation, transportation, and other services.

At other times, Dr. Szczawinski made a number of short field visits to various parts of Vancouver Island, assisting various botanists in collecting research material.

In mid-September, Mr. Guiguet, Mr. Hermann-Blome, and wildlife artist Mr. Hugh Monahan, travelled to Tuya Lake, north-west of Dease Lake, to collect caribou and to make on-the-spot photographs, colour notes, and plant collections for a diorama featuring the wildlife of this portion of the Province.

In early November, Mr. Guiguet spent several days in the Columbia Valley north of Golden in an attempt to secure a moose suitable for display, but unfavourable weather conditions precluded success. Later, in December, he was able to collect a suitable animal north of Fort St. James with the aid of Mr. Tillenius and

Conservation Officer Gordon Gosling, who were in the area gathering material for a habitat group.

Also during the summer months a considerable amount of field work was carried on by the Archæological Sites Advisory Board, mainly at Montague Harbour on Galiano Island, where an extensive "dig" was made. Although the Museum was not directly involved, Mr. Duff and Mr. Abbott assisted in several ways and paid several visits to the site during the season.

Thanks to a sum of money released by special warrant and administered by the Provincial Secretary's Department, we were able to begin purchasing historical material for both the Provincial Museum and Provincial Archives. For this purpose Mr. R. H. Nichols was appointed field agent. His itinerary this season passed through the East Kootenay area, Shuswap, Lytton, and parts of Vancouver Island. Several lots of valuable Indian material were obtained as well as series of old photographs and miscellaneous pioneer items.

PUBLICATIONS

The following publications have appeared in 1965:—

G. Clifford Carl.

Pelicans in British Columbia. Wildlife Review, Vol. 3, No. 7, pp. 12, 13.

The Amphibians of British Columbia. British Columbia Provincial Museum Handbook No. 2, pp. 1–63 (reissue).

Wilson Duff.

Thoughts on the Nootka Canoe. Report of the Provincial Museum for 1964, pp. 24–31.

The Indian History of British Columbia. Vol. 1, The Impact of the White Man. Anthropology in British Columbia, Memoir No. 5 (1964), pp. 1–117.

R. Y. Edwards.

Birds Seen in Active Pass, British Columbia. Report of the Provincial Museum for 1964, pp. 19–23.

J. Bristol Foster.

The Evolution of the Mammals of the Queen Charlotte Islands, British Columbia. Occasional Papers of the British Columbia Provincial Museum, No. 14, pp. 1–130 (December).

C. J. Guiguet (with I. McT. Cowan).

The Mammals of British Columbia. British Columbia Provincial Museum Handbook No. 11 (third edition, revised), pp. 1–414.

Josephine F. L. Hart.

Life History and Larval Development of *Cryptolithodes typicus* Brandt (Decapoda, Anomura) from British Columbia. Crustaceana, Vol. 8, Pt. 3, pp. 255–276.

A. F. Szczawinski.

Insectivorous Vascular Plants of British Columbia. Victoria Naturalist, Vol. 22, No. 3, pp 25–27.

Asclepias speciosa Torr. Milkweed, Silkweed. Victoria Naturalist, Vol. 22, No. 4, p. 37.

Several other publications are in various stages of preparation. Among them are Handbook No. 25, "The Lily Family (Liliaceæ) of British Columbia," by Dr. T. M. C. Taylor, and Volume 2 of the "Indian History of British Columbia," by Wilson Duff, scheduled for appearance in 1966.

At the 1965 annual meeting of the American Association for Conservation Information, the British Columbia Department of Recreation and Conservation entry of the Handbook Series was awarded second place for outstanding publications in the international field.

CURATORIAL ACTIVITIES

During the course of the year, several moves were made involving both curators and collections. Through the Department of Public Works, additional space was made available in the old "Mc and Mc Building," 1450 Government Street. Here, two offices, a display laboratory, a workshop, and storage areas were created to take care of our immediate needs. Totem poles, canoes, furniture, and other historical and biological materials were moved in and restoration work was commenced on those destined for display.

A second shift involved moving the illustration studio and preparation room from quarters occupied since the early 1930's to a reconditioned dwelling at 609 Superior Street. Included in the transfer were skeletons and unrelated boxes of several whales, fish specimens, fossils, shells, and publications. Some historical collections, and archæological materials, including human remains, were also moved into storage areas in this newly occupied building.

In May, Dr. A. F. Szczawinski, Curator of Botany, attended the founding meeting of the Canadian Botanical Association in Ottawa and was elected Regional Director of the Association for a two-year term. Dr. Szczawinski has also been active in making preliminary arrangements for the world congress of botanists to be held in Tokyo in 1966.

RESEARCH

Further collecting was carried on by Mr. Guiguet in the Barkley Sound area as reported elsewhere as part of a long-range study of the distribution and evolutionary history of the small mammals of British Columbia, particularly insular forms.

A major research project in the field of botany was launched by Dr. A. F. Szczawinski and Dr. T. M. C. Taylor (former head of the Department of Botany, University of British Columbia), who are collaborating on a study leading to a publication on the flora of British Columbia.

Work on the archæological material collected at the Pedder Bay site in 1964 has been carried on by Mr. Abbott and will eventually lead to a publication on this important midden.

Throughout the year the Museum has continued to loan research material to other institutions or specialists and has carried on an active exchange of plant specimens with herbaria in Canada, the United States, and Europe.

THUNDERBIRD PARK

The carving programme in Thunderbird Park has been carried on by Henry Hunt and Eugene (Tony) Hunt as usual with but a few interruptions occasioned by sickness. Except for a few accessories which are to be added later, the two poles destined for erection on the campus of the University of Victoria were completed and delivered in June. These are a copy of a 50-foot Nass River pole obtained from the City of Prince Rupert and a replica of a 55-foot pole acquired from Kitwancool in 1962.

Work was then started on a replica of the 40-foot Haida pole, known as the Weeping Women of Tanu, and this reached about the half-way mark by the end of the year.

Besides these larger projects the carvers were called upon to produce several smaller poles, some for the Museum collection and some for official gifts. Among the latter was an Indian-style box by Tony Hunt used at an international conference of travel agents at Hong Kong.

Several poles and canoes were moved from the Indian house to the new workshop at 1450 Government Street, where they were cleaned, repaired, and stored.

STAFF CHANGES

The Museum staff suffered a serious loss when Mr. Wilson Duff left to accept a teaching post at the University of British Columbia. During his 15 years of service, Mr. Duff accomplished a great deal in furthering the Museum's interest in the filed of anthropology. He was instrumental in bringing the late Chief Mungo Martin to Victoria in 1952 and directed the carving programme in Thunderbird Park. He founded the Museum's publication series in anthropology and directed the Province's archæological programme since 1960, when it was initiated under a new Act. For two years he was president of the British Columbia Museum's Association and is currently a member of the Indian Advisory Committee. His experience in all phases of the museum field was of great help in the initial planning stages of the new building. His fellow staff members wish him well in his new post.

Following Mr. Duff's departure, Mr. Don Abbott was made Acting Curator of Anthropology.

In September, Mr. Erik Thorn joined our staff as Chief of the Display Division. His varied experience in designing and installing exhibits in museums, both in Europe and in Canada, will be invaluable in directing the preparation of a display programme for the new building.

Other recent appointees are: Mr. John Smyly as technician; Mr. Michael Miller as student-taxidermist; Mr. Robert H. Nichols as field agent and Mr. John Sendey as assistant (both in co-operation with the Provincial Archives); and Mr. Peter Macnair as assistant in anthropology.

On a part-time basis, early in the year Mr. R. York Edwards, Park Interpretation Officer of the Provincial Parks Branch, was loaned to us to help organize the display programme in its formative stages. His assistance at this critical time was greatly appreciated.

EXTENSION

Throughout the year, staff members gave a number of illustrated talks to various groups and a few presentations of a more formal type were presented to learned societies. Museum personnel also took part in several sessions of career counselling arranged by local service clubs through the National Employment Service.

In early spring the Director presented a series of wildlife and conservation lectures in various centres across Canada, east as far as Quebec City, under the combined auspices of the Canadian Audubon Society, the National Audubon Society, and local conservation groups.

PLANNING AND CONSTRUCTION PROGRAMME

When the decision was made in 1964 to construct a museum-archives building to commemorate the 1967 Centennal it was realized that timing was of utmost importance in order to meet the deadline. Public Works officials charged with the planning programme therefore drew up a work schedule which has been successfully followed to date with only minor changes.

The site chosen for the new structure is immediately north of the present Douglas Building, an area which has been used as a parking-lot for some years. This location has the advantage of being in close proximity to other Government buildings and convenient for use by the general public.

Early in the planning it was obvious that a single building could not be designed to provide the varied facilities and services required; a complex of three interconnected structures was therefore decided upon.

The largest is a four-floored rectangular building to house two large exhibit halls, a lecture theatre, classrooms, administration offices, lounges, and other public facilities. Workshops and storage areas will occupy most of the basement level.

The second structure is a tower designed to accommodate the scientific staff. It will contain offices, laboratories, storerooms, preparation rooms, and illustration studio. The design will permit the installation of mezzanine floors when additional space is required.

The third building is a low two-storied structure to house the archives and related services. It will contain the reference library, the microfilm bureau, a repography service, and facilities for displaying and storing maps, pictures, documents, and other two-dimensional material of historic value.

To harmonize with their surroundings and particularly to show a kinship with the Legislative Buildings, the new structures will be faced with stone from the same quarries and will repeat certain design elements which characterize the older buildings. The landscaping will feature courtyards at various levels in which will be located pieces of sculpture by British Columbia artists.

To make the best use of the limited time available, planning has been done in stages and contracts for each phase have been let. Excavation started on May 6 with a ground-breaking ceremony during which Honourable W. A. C. Bennett, Premier, set off the first blast. Other phases of construction were: July, first steel contract let; August, construction of foundations commenced; October, substructure of lecture theatre completed; November, first steel erected; December, final working drawings almost completed.

DISPLAY PROGRAMME

In addition to the activities already outlined in connection with collecting of display materials, considerable time was devoted to planning the exhibit halls, particularly in the natural history division, and some progress has been made.

The major undertaking in this division is the planning, construction, and installation of a series of dioramas or habitat groups, which, together with accessory exhibits, will give an over-all picture of the natural history of the Province when completed. The first phase, planned for installation in 1967, involves four large dioramas, as follows:—

Coastal Region.—Featuring blacktail deer and cougar in oak-arbutus habitat in fall overlooking the Gulf Islands.

Dry Interior.—Featuring bighorn sheep in spring above Vaseux Lake, Okanagan Valley.

Sub-alpine Plateau.—Featuring caribou in summer in the Tuya Lake area.

Northern Interior.—Featuring moose in black spruce habitat in winter near Pink Mountain.

Mr. Frank L. Beebe of the Museum staff is undertaking the direction and installation of the first-named diorama, Mr. Clarence Tillenius and Mr. Hugh Monahan, both noted wildlife artists with considerable museum experience, have been engaged to direct and install the remaining three planned at this time. Mr. John

Hermann-Blome has been invited to do the taxidermy of the large mammals, and Mr. A. J. Braun will prepare some of the birds and other accessory mounts.

In all cases, field-sketches, colour-notes, and photographs have been obtained during on-the-spot visits, and a scale model has been constructed of one.

A scale model of both exhibit floors has also been prepared and a general floor plan has been agreed upon. Work is proceeding on the layout details for the human history division.

In May we obtained space in the old "Mc and Mc Building," 1450 Government Street, where a display studio, workshop, and storage space were prepared. Here, totem poles, canoes, and other objects from scattered sources were gathered together and restoration work was commenced. By the end of the year many had been repaired and readied for display.

ATTENDANCE

The following attendance figures for 1965 are estimates based upon sample counts at irregular intervals:—

January	4,900	August	71,500
February	6,900	September	19,000
March	6,600	October	3,900
April	10,000	November	2,800
May	13,000	December	1,500
June	15,300		
July	36,600	Total	190,000

Compared with the total estimated attendance of 161,700 for the previous year, the number of visitors this year has shown an increase of about 18 per cent, the highest on record except for the year 1962, when tourism was phenomenally boosted by the World's Fair in Seattle.

Again this year the Museum remained open until 9 p.m. each evening, except Sunday, during the summer months, as an extra service to visitors to the city.

As a point of interest, a tally was made of the number of children compared with the number of adult visitors on a typical day in late summer. The proportion was roughly 10 to 13, which was surprisingly high and pointed up the need of planning exhibits to cater to juniors as well as seniors.

OBITUARIES

We regretfully record here the passing of several persons who have been associated in some way with the Provincial Museum or with its interests.

Dr. John R. Dymond, distinguished ichthyologist, scholar, and teacher, an authority on the fishes of Canada and former Director of the Royal Ontario Museum (January 31st.)

Dr. Albert O. Hayes, structural geologist and teacher, past president of the Victoria Natural History Society. (February 1st.)

Rev. A. C. Mackie, an amateur naturalist who became an authority on the Pacific rattlesnake in British Columbia. (February 3rd.)

Mr. Phillip M. Monckton, land surveyor, amateur naturalist and nature photographer, past president of the Victoria Natural History Society. (October 4th.)

Mr. Arthur E. Pickford, former land surveyor and amateur anthropologist, a member of the Museum staff from 1944 to 1948, during which time he completed material on British Columbia Indians as a basis for the "Heritage Series" published by the Department of Education. (November 24th.)

DONATIONS AND ACCESSIONS

BOTANICAL

A number of plant collections were received from various institutions, game biologists, foresters, and private individuals. Space does not permit us to list each one of them individually, but we include all of them in a grateful vote of thanks.

Herbarium exchange was continued with the following institutions: National Museum of Canada, Ottawa; Science Service, Department of Agriculture, Ottawa; Smithsonian Institute, Washington, D.C.; University of British Columbia, Vancouver; University of Washington, Seattle, Wash.; University of Victoria, Victoria; Stockholm Museum, Stockholm, Sweden; University of Helsinki, Finland; University of Krakow, Poland; and others.

With the addition of 3,051 sheets of specimens during 1965, the total now stands at 46,691. This year a project was started to remount and uniformly label all herbarium specimens in an effort to bring the herbarium up to internationally accepted standards.

During the year a number of plant scientists from Canada and abroad visited and worked in the herbarium.

ZOOLOGICAL

Mammals

By gift—

Steven Clark, Victoria, molar of domestic cow.
Allan Colquhoun, Duncan, immature white-footed mouse.
Ted Eby, Victoria, blacktail deer.
Paul Erickson, Victoria, hind part of skull of domestic cat.
Brian R. Gates, Fish and Wildlife Branch, Vancouver, one opossum, one raccoon, one pack rat.
Clarence Hronek, Victoria, one rat.
Mrs. C. Kelsey, Victoria, part of deer skull.
J. P. E. Klaverwyden, Victoria, one mounted head of moose.
A. H. Marrion, Victoria, one vole.
Craig Morrison, Victoria, tooth of domestic horse.
Mrs. T. W. S. Parsons, Victoria, one tanned and trimmed wolverine skin.
Alastair Slydell, Victoria, one little brown bat.
J. B. H. Stevens, Port Washington, two white-footed mice.
Rhys Williams, Victoria, jaw of blacktail deer and tooth of horse.

By staff—111.

Birds

By gift—

Mrs. M. Adams, Port Washington, one hawk.
Miss Mabel D. Allen, Texada Island, one western tanager.
Mr. Beattie, Victoria, one bushtit's nest with six eggs.
Mrs. Eleanore Davidson, Victoria, one golden-crowned kinglet.
A. R. Davidson, Victoria, one Virginia rail, one Swainson thrush.
Bryan Davies, Victoria, one saw-whet owl.
Department of Public Works, one American rough-leg hawk.
Miss Charronne Douglas, Victoria, one Wilson snipe.
John Fox, Duncan, one adult whistling swan, one juvenile whistling swan.
Ralph Fryer, Victoria, one golden plover.

B. R. Gates, Fish and Wildlife Branch, Vancouver, one red-tailed hawk, one snipe, three Clark's crows, one shrike, one song sparrow, one pheasant chick, one sharp-shinned hawk.
Clarence S. Goode, Victoria, one house wren's nest with six eggs.
Miss Joan Hannay, Victoria, one yellow-bellied sapsucker.
Mrs. W. N. Hayden, Victoria, three crows.
W. J. Hawker, Victoria, one owl.
Roy Helset, Hemp Creek, one avocet.
Ray Hill, Victoria, one grouse.
M. W. Holdom, White Rock, one Hutton vireo.
Dr. G. F. Houston, Victoria, one Swainson thrush.
Will D. Jenkins, Tatlin Lake, one Audubon warbler.
J. P. E. Klaverwyden, Victoria, one linnet, three purple finches.
Jack Lenfesty, Fish and Wildlife Branch, Victoria, 11 grebes.
Don Lynch, Victoria, one robin.
John McConnachie, North Saanich, one song sparrow.
R. G. McMynn, Commercial Fisheries, one rufous hummingbird.
P. M. Monckton, Victoria, one cedar waxwing, one fulmar.
Mrs. P. M. Monckton, Victoria, one Audubon warbler.
Monterey School, Victoria, one great horned owl.
Mrs. Orme-Cott, Sidney, one golden-crowned kinglet, one orange-crowned warbler.
J. Osman, Courtenay, one albinistic widgeon.
John Palmer, Sooke, one Swainson thrush.
Michael Rynoski, Victoria, one bird's nest.
David Scholes, Victoria, one Bewick wren's nest with four eggs.
F. Sherman, Victoria, one pine siskin.
Third Officer D. E. Smith, Weathership "St. Catharines," one fulmar.
H. W. S. Soulsby, Victoria, one fox sparrow.
S.P.C.A., Victoria, one whistling swan.
Mrs. G. B. H. Stevens, Port Washington, one rufous hummingbird.
Fred Sutton, Cordova Bay, one mallard egg.
Conservation Officer Taylor, Campbell River, one trumpeter swan.
Mrs. Thiele, Victoria, one ruby-throated hummingbird.
Mrs. W. Wainman, Ocean Park, one golden-crowned kinglet.
Mrs. H. D. Wallis, Victoria, one Cooper hawk.
Mrs. E. M. Watson, Victoria, one golden-crowned sparrow.
Mrs. Mary Winstone, Victoria, one saw-whet owl.
Michael Winstone, Victoria, one barn swallow.
A. Wood-Robertson, Victoria, one mounted barn owl.
Mrs. P. M. Young, Victoria, one hawk.

By staff—66.
By purchase—11.

Amphibians and Reptiles

By gift—

Patsy Adolphe, Victoria, one toad.
Donna Brown, Victoria, three frogs.
Dave Duris, Prince George, one toad, alligator lizards.
D. R. Foster, Victoria, one painted turtle.
Kim Martin, Victoria, one tree frog with extra hind leg.
Curtis Moyls, Penticton, one western skink.
G. V. Renwald, Victoria, one lizard.

Fish

By gift—

George T. Cooper, Legal Surveys, one surf smelt.
R. L. Eriksen, Victoria, one pipefish.
Robert Partington, Victoria, one fanged viper fish.

Invertebrates

By gift—

Don Alde, Victoria, two black widow spiders.
Miss Susan Alexander, Victoria, one California prionus.
A. Campbell, Victoria, one wasps' nest made of clay.
George A. Clark, Victoria, one California silk moth.
Leslie Dale, Victoria, one stink bug.
Michael Davies, Victoria, one California silk moth.
Mrs. E. Don, Victoria, larva of swallowtail butterfly.
Mrs. Dreyer, Victoria, one underwing moth.
Gladys Eaden, Victoria, larva of swallowtail butterfly.
G. C. Emerson, North Surrey, collection of bivalves and univalve molluscs from blue clay.
Mrs. L. E. Gardner, Chrome Island Light Station, Bowser, dried shell of box crab.
Gonzales Meteorological Station, Victoria, one black witch moth.
Al Grass, Burnaby, six specimens of snails.
James Gray, Victoria, one alfalfa butterfly.
Bill Ilott, Victoria, one California prionus.
A. G. Leason, Victoria, fresh-water clams.
Mrs. B. McKibben, Victoria, one spiny wood borer.
A. G. McTaggart, Goldstream, six black widow spiders.
W. Montpetit, Port Alberni, one shamrock orb weaver.
Mrs. J. Muir, Langford, one black widow spider.
W. H. Pope, Department of Agriculture, specimens of copepods.
H. J. Russell, Victoria, two spiders.
Les G. Saunders, Victoria, collection of pinned wood borers and other insects.
R. Stewart, Victoria, one polyphemus moth.
Ralph Street, Victoria, fresh-water snails, salt-water clam.
J. E. Underhill, Parks Branch, one scorpion.
James S. White, Salem, Oreg., one plastic-mounted specimen of shore crab, kelp crab, goose barnacle, peanut worm and snail.
Norman Willey, Victoria, one wasps' nest.

Palæontology

By gift—

Charles Croft, Victoria, fossil ammonite.
Robert D. B. Jones, Victoria, piece of sandstone with fossil molluscs, one fragment of fossil wood.
Hugh McCrorie, Sequim, Wash., three concretions.
Garry Pronger, Victoria, one fossil.

Anthropology

The Canon Edward P. Laycock Collection.—(Gift.) Tsimshian and Athapascan material. Canon Edward P. Laycock, Dorset, England.

The R. H. Nichols Collection.—(Purchase.) Kootenay Indian material. R. H. Nichols, Victoria.

The John Sendey Collection.—(Purchase.) Northwest Coast Indian material. John Sendey, Victoria.

The John Sendey Colletcion.—(Gift.) Archæological specimens from Cadboro Bay, Musqueam, and Yale.

The Mildred Valley Thornton Collection.—(Purchase.) British Columbia and Plains Indian material. Mrs. Mildred Valley Thornton, Vancouver.

By gift—

R. C. Anderson, Sidney, human skull, abrasive stone.

Archæological Sites Advisory Board, archæological specimens from excavations carried out at Montague Harbour and from surface collections elsewhere on Galiano Island.

V. Belknap, Victoria, two Thompson leister spears.

L. T. Bellhouse, Galiano Island, two chipped basalt leaf-shaped points.

F. E. M. Bildstein, Kaslo, stone pestle.

British Columbia Forest Products, Victoria, human skeleton.

D. B. F. Bullen, Victoria, model Haida canoe.

Mrs. E. H. Burgess, Victoria, oblong stone.

Cecil Clark, Victoria, Stalo and Thompson basketry.

Mrs. K. Castley, Lake Cowichan, collection of Coast Salish basketry.

George Corkle, Victoria, stone hand-maul fragment, six projectile points.

Mrs. W. H. Cross, Sidney, stone object.

Mrs. M. K. Cunningham, Ganges, human skeleton.

Mrs. J. M. Curtis, Victoria, argillite totem-pole.

G. Ross Davidson, Victoria, dugout canoe.

C. P. Deykin, Victoria, model Nootka sealing canoe.

Wilson Duff, Vancouver, model Nootka sealing canoe.

Mrs. E. Geldart, Victoria, ground slate point.

L. Glowaski, Victoria, human skeleton, hand-maul.

Mrs. N. Hayden, Victoria, archæological specimens from Cadboro Bay.

H. Jones, Sooke, smoked dog salmon.

Mr. and Mrs. N. C. Lawford, Victoria, fringed bead shirt, two glass-bead headbands.

E. McWhirter, Milnes Landing, two chipped basalt projectile points, one nephrite celt, antler wedge fragment.

Miss M. Madill, Victoria, stone maul head.

S. Moore, South Pender Island, human skull.

Mrs. E. Morgan, Victoria, two human skeletons.

A. Muir, Nanaimo, chipped basalt projectile point.

Mrs. T. W. S. Parsons, Victoria, leather cushion, basket, basketry cradle, Tsimshian horn spoon.

R. Pauwels, Victoria, toggling harpoon valve.

A. G. Potter, Victoria, hand-maul.

T. M. Ramsay, Halfmoon Bay, two woven cloth rugs from Kyuquot.

Royal Canadian Mounted Police, Alexis Creek, partial human skeleton.

Royal Canadian Mounted Police, Duncan, partial human skull.

Wendell B. Shaw, Santa Monica, Calif., Cree beaded vest, Cree hymn book.

A. L. Stevens, Victoria, stone hand-maul fragment.

D. Sutherland, Nanaimo, six archæological specimens and burial fragments.

Miss Kathy Sykes, Mission, chipped projectile point.

A. N. Taylor, Victoria, two pairs of snowshoes.

Robert Thomas, Victoria, parts of human skeletons.

R. Thompson, Victoria, antler haft fragment.
Charles Utas, Sidney, ground slate projectile point.
34th Victoria Brownie Pack, one pair of decorated moccasins.
Mrs. E. G. Webster, West Vancouver, stone hammer fragment.

By purchase—
Mrs. Agnes Dick and Mrs. Cecelia Joe, Nootka freight canoe.
S. Didrickson, Sidney, Tsimshian Shaman's outfit.
H. Jones, Sooke, two wolf headdresses.
Mrs. Agnes Sawyer, spirit dancer's costume, dentalium necklace.

By the staff—
Model totem-pole carved in Thunderbird Park by Eugene (Tony) Hunt.
Archæological specimens from sites near Victoria.

Miscellaneous

By exchange—
Mrs. Grace M. Bell, Victoria, collection of tape recordings (duplicate copies) of nature sounds made in Okanagan Valley in 1965.

By gift—
Frank Buffam, Ucluelet, rock formation with work of cirratulid worm.
Jack Elias, Victoria, piece of grey limestone.
Howard Jones, Victoria, one limestone boulder perforated with burrows of piddock.
Eric D. Sismey, Penticton, "The Boke of Saint Albans," by Dame Juliana Berners, 1486, 1901 edition; "Birds of the Isle of Man," by P. G. Ralfe; "British Birds' Nests," by R. Kearton; collection of negatives of British Columbia subjects.

Proceeds from the Museum donation box during 1965 amounted to $259.72, which were turned over to the Mungo Martin Scholarship Fund.

NATURAL HISTORY OF THETIS LAKE AREA NEAR VICTORIA, BRITISH COLUMBIA

By Thetis Park Nature Sanctuary Association

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INTRODUCTION

In 1790, while on the other side of the world the tumbrils rolled to the Place de la Revolution, Spanish sailors of Manuel Quimper were the first civilized persons to view from their tiny deck the green hills cradling Thetis Lake. However, for a further half-century only the Indian from his great communal houses on the seacoast hunted deer, bear, and elk on Skirt Mountain and Seymour Hill, or carried up from the mud flats of Esquimalt Harbour the immense quantities of clams, whose shells form the middens visible today near the southern end of Thetis Lake.

Meanwhile, on the west coast of Vancouver's Island, rapacious maritime fur-traders had effected almost total destruction of the sea-otter, while Nor' Westers Mackenzie and Fraser had overcome mountains and torrents to reach the sea overland from Canada. In 1821 the Parliament of Great Britain extended the privilege of exclusive trade in the region west of the Rockies to the Hudson's Bay Company, now merged with the North West Company. Hence, to protect their interests north of the mouth of the Columbia, the company in 1842 instructed James Douglas to establish a trading-post at a suitable site near the southern end of Vancouver's Island. Here he found "a perfect Eden in the midst of the dreary wilderness of the northwest coast," and the next year Fort Victoria, locally known as Fort Camosun, enclosed 100 yards square within a stockade with bastions at the angles. Almost immediately farms were cleared and buildings constructed wherever, as at Craigflower, good arable land could be found.

Though no record remains, we may be sure that venturesome young men from the fort or from James Douglas's farm at Craigflower paddled up the peaceful Selkirk Water and ascended Craigflower Creek to Prior Lake and Thetis Lake. Their route we trace in part today along the Craigflower Trail in the nature sanctuary. Others no doubt followed the old Indian trail north-west from the head of Esquimalt Harbour, then utilized the open ridges to emerge at the top of Seymour Hill, and

savour, as we do a century and a quarter later, the idyllic prospect of Thetis Lake, rock-girt and placid below.

All Vancouver Island was granted in 1849 by Royal charter to the Hudson's Bay Company, upon the condition that it form a colony of British subjects. However, by 1853 there were no more than 300 persons in Victoria, all of whom were in some capacity servants of the company. The first real settler, Capt. Colquhoun Grant, finding all arable land owned by the company, was forced to build 20 miles distant, at Sooke. There he introduced the beautiful and invasive broom, which now covers much of Southern Vancouver Island, including the drier slopes of Thetis Lake Park.

After walking across the continent, John Greig left the service of the company and in 1854 purchased land at the head of Esquimalt Harbour and extending into the southern portion of the present Thetis Lake Park. Here he set up a lime-burning operation, of which traces still remain, and grazed cattle in the valley of Craigflower Creek. Members of his family subsequently gained title to more land in this area, and planted some of the old pear-trees we see today along the "Blue" Trail. His great-granddaughter is today a member of the Thetis Park Nature Sanctuary Association.

Now began the invasion by thousands of gold-seekers who crowded through Victoria on their way first to the Fraser bars and the Cariboo, then to Leechtown via the Empress Mountain Trail, and finally to the Klondike. Thomas Harris, a butcher by trade, purchased grazing areas enclosing the western portion of Thetis Park, and became the first Mayor of Victoria in 1862. One of the earliest city ordinances directed that "no person shall ride or drive through the public streets at a pace exceeding eight miles per hour." In those days a score of Bactrian camels swayed along the muddy road between Victoria and Esquimalt. Water from wells and springs, such as Springridge, was sold from water carts at as much as 25 cents a bucket. The growth in population forced the development, beginning in 1873, of a waterworks system from Elk and Beaver Lakes, and in 1885 Thetis Lake was joined to the system as a reserve water supply. The remains of the surge reservoir built on the south slope of Seymour Hill at that time is now known as Bladderwort Pond. By 1915 this water source was replaced by the Sooke Lake system, although the City of Victoria retained the 1,400 acres at Thetis Lake as a watershed. Since 1932 the lake area has been open to the public for swimming and recreation.

The great expansion of residential areas adjacent to Victoria has emphasized the tremendous value of the Thetis watershed as a "green belt" of exceptional beauty. During depression days, cordwood was cut in the northern and eastern areas, and " relief " labour used to develop fire roads and trails. A few years later the northern "panhandle" suffered destructive logging, and an area on the then Thetis Lake Road was set aside for a pistol range. Rerouting of the Trans-Canada Highway quite recently divided the main portion from the southern extremity of the park.

In order to arouse public resistance to alienation of any further areas of the park, Thetis Park Nature Sanctuary Association was formed in 1957 and formally organized two years later under the *Societies Act*. Its chief purpose is "to protect, preserve, and perpetuate the native flora and fauna of the Thetis Lake Park." Implicit in its work is the preservation intact of the beautiful nature sanctuary in its unspoiled primitive state, a climax forest and ecological area resulting from many hundreds of years of natural evolution.

Strenuous efforts by the society to avoid routing of a power-line through the eastern part of the park were unavailing. In 1960 the city sold more than 100 acres as a right-of-way, but the campaign aroused public resistance to any further encroach-

ment. Under the terms of an agreement with the City Council, the society is authorized "to provide facilities for access, observation, and study." This area of 400 acres is apparently the first nature sanctuary in Canada.

This article lists many groups of plants and animals present in the sanctuary, but it is incomplete with respect to such groups as grasses, insects, and invertebrates, either by reason of limitation of space here or because they need further investigation. There is ample scope for students to fill the gaps for future use. Plants are represented by 119 families, including 9 in algæ, 11 lichens, 30 fungi, 4 mosses and ferns, 47 families of herbaceous plants, and 18 families of woody plants. Two large groups of animals identified are butterflies, with 37 species, and birds, with 85 species definitely occurring in the sanctuary.

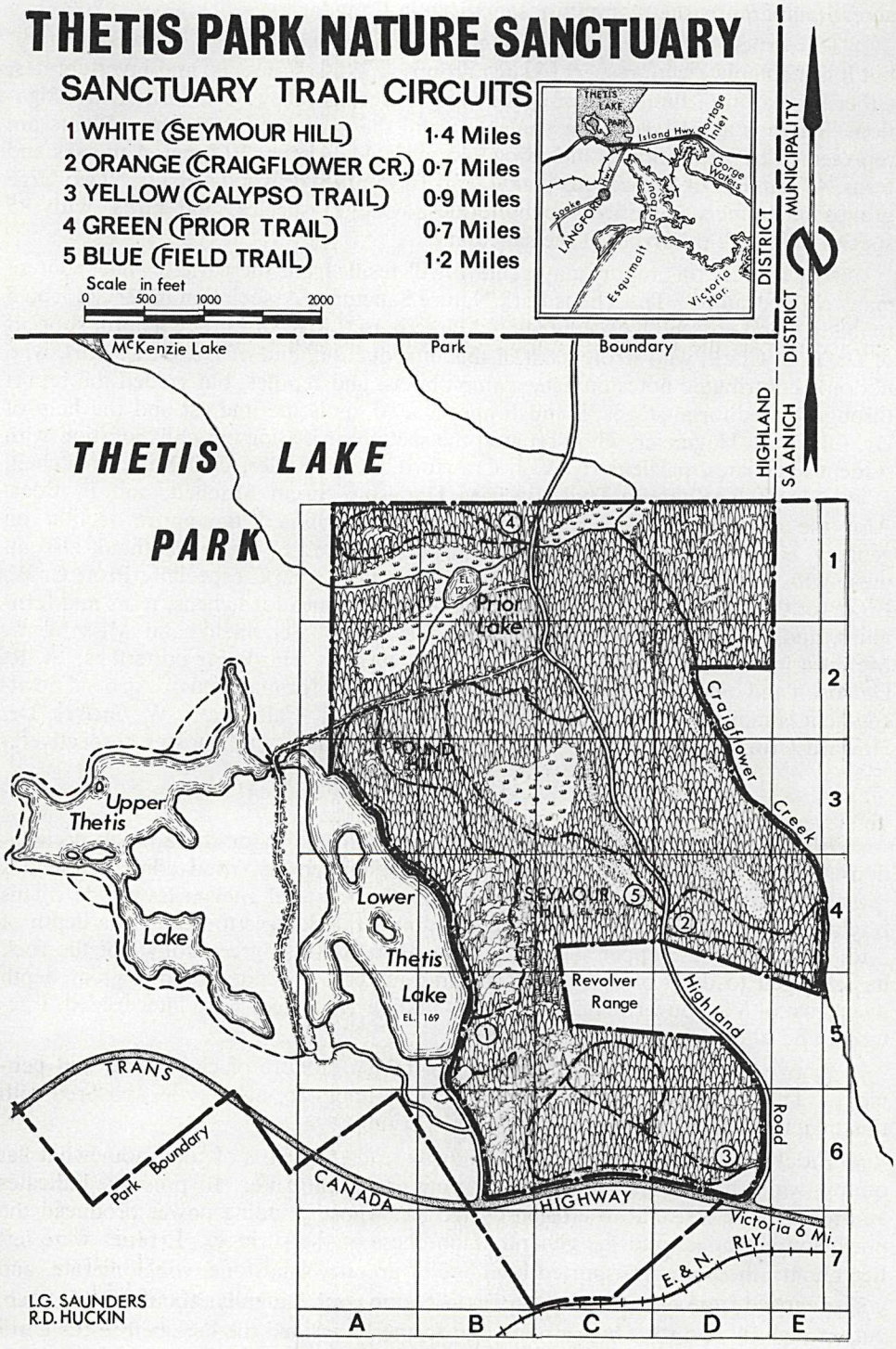
Any success this report may achieve will result from the earnest endeavour of many collaborators. The Thetis Park Nature Sanctuary Association is very indebted to many members who have contributed directly to this record. The helpful support of Dr. L. J. Clark, who wrote most of this introduction, and of Dr. G. C. Carl, who not only contributed notes on fishes, amphibians, and reptiles, but guided the report through the editorial stages, is much appreciated, as is the interest and the help of Dr. Edwin M. Hagmeier, who prepared the section on ecology in collaboration with student associates, particularly A. J. Crawford, R. A. Keller, Gail Moyer Mitchell, J. R. Marshall, Florence Hall, Barbara Hodgson, Susan Mitchell, and F. Boas. Also the assistance of A. H. Marrion, who contributed the entire section on geology, is much appreciated. The publication committee wishes to thank also all those who compiled lists of the flora and fauna in the park, especially Prof. C. W. Lowe for the algæ and micro-fauna; Miss M. C. Melburn for lichens, ferns and fern-allies, and flowering plants; Frank Boas, Dr. W. B. Scholfield, and Miss M. C. Melburn for mosses and liverworts; the late George A. Hardy for butterflies; A. R. Davidson and others for birds; and Charles J. Guiguet for mammals. Also acknowledgment is made of our indebtedness to Dr. Mason E. Hale, Dr. J. W. Groves, Dr. Howard Crum, and others for identifying lichens, fungi, and mosses respectively.

GEOLOGY

Blocks 6B and 6C.—(*See* map of sanctuary, Fig. 1, for these block designations.) On the north side of the Trans-Canada Highway, road construction has revealed the numerous large cracks in the greatly fractured ancient lava beds. This fragmentation has permitted weathering and mineral changes to occur to a depth of 5 to 8 feet below the upper surface. The original darkish-green colour of the rock has changed to deep brown. The volcanic materials, deposited to a great depth over most of Vancouver Island about 350 million years ago, were later folded, fractured, and altered in many ways.

Above the rock base is a thin layer of till (a mixture of clay, sand, and pebbles). The lower part of the hills and the valley-floors are more or less covered with this material, left by ice during the glacial period.

Block 5B.—The park-entrance roadway leads to a boss of rock, somewhat flat on top, which formed a dam across the south end of the lake. Its presence indicates an area of rock resistant to erosion by the ice, whose grinding power produced the north-south grooves and the general smoothness of the surface. Erratics were left hereabout; these are transported boulders of granite, sandstone, conglomerate, and gneiss carried from more northern areas. To the west is a gully, about 20 feet deep, cut through till and rock by a stream that formerly drained the lake before the earth dam was built.


THETIS PARK NATURE SANCTUARY
SANCTUARY TRAIL CIRCUITS
1 WHITE (SEYMOUR HILL) 1·4 Miles
2 ORANGE (CRAIGFLOWER CR.) 0·7 Miles
3 YELLOW (CALYPSO TRAIL) 0·9 Miles
4 GREEN (PRIOR TRAIL) 0·7 Miles
5 BLUE (FIELD TRAIL) 1·2 Miles
Scale in feet
0 500 1000 2000
THETIS LAKE PARK
Island Hwy
Portage Inlet
Gorge Waters
Saanich Inlet
LANGFORD
Harbour
Esquimalt
Victoria Har.
DISTRICT MUNICIPALITY
DISTRICT
HIGHLAND
SAANICH
McKenzie Lake
Park Boundary
THETIS LAKE PARK
Prior Lake
EL. 123
ROUND HILL
Craigflower Creek
Upper Thetis Lake
Lower Thetis Lake
EL. 169
SEYMOUR HILL
Revolver Range
Highland Road
TRANS CANADA HIGHWAY
Park Boundary
Victoria 6 Mi.
E. & N. RLY.
1
2
3
4
5
6
7
A
B
C
D
E
L.G. SAUNDERS
R.D. HUCKIN

Block 4B. — Grooves and scratches exposed on the lake-shore indicate the north-south movement of the ice as its great mass rode over this rock.

Block 5B.—Ascending the trail on Seymour Hill one has to scramble over much loose brown-weathered scree or rock fragments derived from the exposed rock outcrop above. Many large trees find a foothold in this material, and the underlying rock cracks. The root growth of an old Douglas fir, and that of an arbutus nearby, demonstrates one of nature's methods of breaking up rock formations. Here may be seen large pieces of stone which have been levered upwards by root growth. The trail near the top of the hill (Block 4B) is near the contact of the volcanics and a later rock formation called the Wark Gneiss, which, as a molten magma, welled up beneath the former formation, fracturing and deforming it and causing mineral changes. As this intrusion slowly cooled, it developed crystals of medium to coarse grain, of darkish-green colour and somewhat gneissic structure. Reaching the top of the trail one sees the rounded hills all about. A noticeable feature of the rock surface here is the numerous fine cracks which permitted water and temperature changes to cause a flaking action. The flakes weather into fine sandy material, which collects in the larger cracks and becomes a basis for soil.

Blocks 4B and 5B.—A difference in the rock break-up pattern takes place on the higher peak (at 485 feet elevation), where the greatly fractured volcanics are rapidly dividing into small block-like pieces. So rotten is the rock that a chunk struck by a hammer readily breaks into fragments. This remnant of the old volcanic rock (Vancouver Volcanics) surface can be traced down the south-east slope of the hill to the highways. Future exploration in the park may reveal more of this rock, or perhaps some included limestone.

The general topography of the area is due to several causes. A line joining the tops of the Sooke Hills indicates that a high plateau surface existed in pre-Pliocene times, about 13 million years ago. It was gradually eroded and dissected by valleys. Locally the downward wearing-away was carried farther, leaving a subdued area with some resistant masses, such as Seymour Hill and Mill Hill, rising above the surrounding lowlands. Streams and especially ice deepened the valley-floors, most of which have the north-to-south trend. The Wark Gneiss has had its thick covering blanket removed and has become exposed.

Blocks 4A, 5B, and 1B.—In several places rock conditions permitted the moving ice to scour out basins which are now occupied by swamps and lakes: Thetis Lake, with surface 163 feet above sea-level; the small Bladderwort Lake (6B) is higher, and had its depth increased by two cement walls; Prior Lake receives stream water from Thetis Lake and McKenzie Lake and the nearby swamps, and then drains through Craigflower Creek into Mill Hill Bay, an arm of Esquimalt Harbour.

Mention has been made of erratics at the park entrance; others may be found along the east shore of the lower Thetis Lake and the area north and east along the fire trail. At the top of Seymour Trail are two large boulders, indicating ice movement over the hills and their deposition here. Tremendous pressure was exerted downwards by thousands of feet of ice over the base rocks and the abrading materials held by the ice. Under the great weight of ice, the land sank about 500 feet below its present level. In many areas nearby, well-preserved sea shells may be found in the silty material below swamps, and some may exist in the park.

Structural weaknesses were produced in the Wark Gneiss when the molten magma cooled into solid rock, causing horizontal and vertical joints or cracks to form. Moving ice seized upon the squarish blocks and quarried them out. This rapid method of excavating produced the step-like effect up the hill on the east side of the lake, and the high wall dipping into the water on the west side of the lake.

When the ice disappeared about 12,000 years ago, the land began to rise again, with the result that wave and current action often removed till from the hillsides to lower areas. The rock basins have become fresh-water lakes and swamps. Rock-weathering and stream erosion are now lowering and reshaping this most interesting piece of landscape.

For further reading, *see* Clapp, 1917; Holland, 1964; Haig-Brown, 1961; and Mather, 1964, in the Bibliography at end of this report.

ECOLOGY

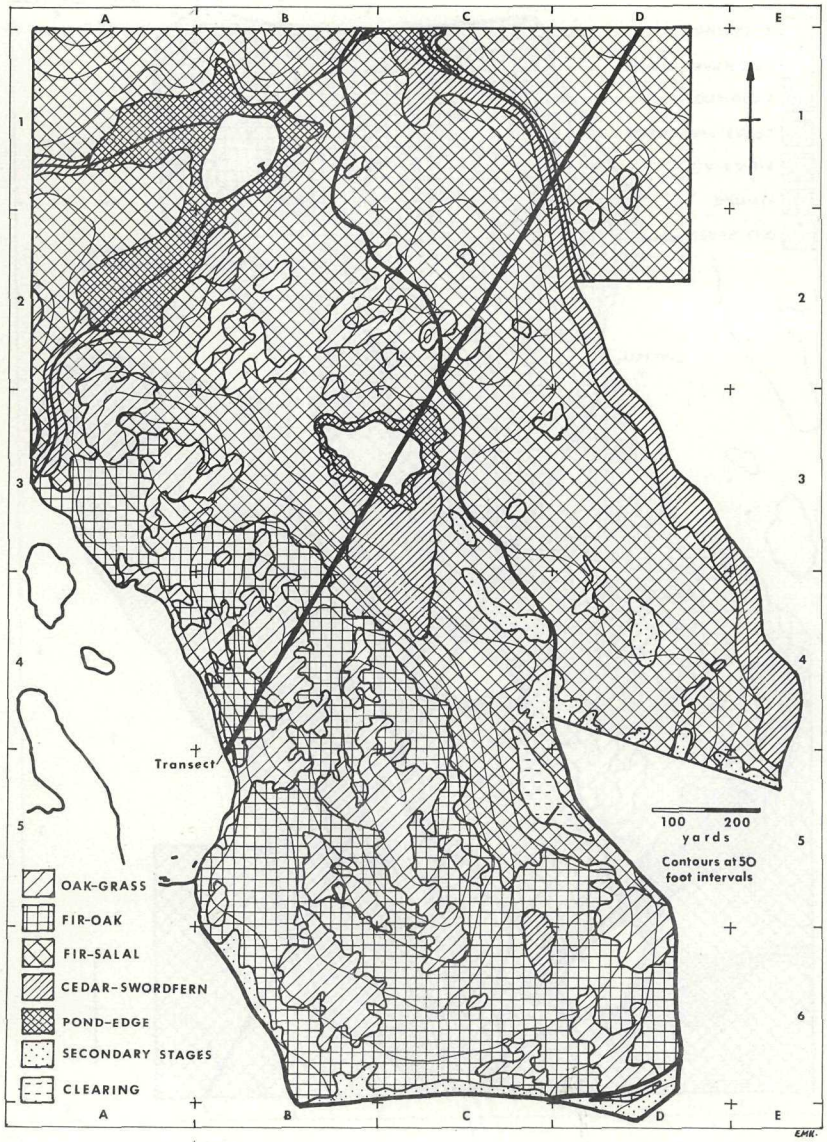
Three plant formations, each with a distinct flora and fauna, and controlled mainly by temperature, occur on Vancouver Island. The altitudinally lowest is the Coast Forest, of hemlock, cedar, and Douglas fir (Rowe, 1959). The Coast Forest formation is divided into three associations—a hemlock-cedar association in regions with over 70 inches of rainfall per year, a Douglas fir association, and an oak-arbutus association where rainfall is less than 40 inches annually. The Douglas fir association occurs on the eastern side of Vancouver Island between 500 and 1,500 feet, and the oak-arbutus association on the eastern side, from sea-level to about 500 feet, between Sooke and Courtenay. The latter also extends south to California between the Coast and Cascade Mountains (Krajina, 1965; Shelford, 1963).

Thetis Park lies ecologically and climatically intermediate between the oak-arbutus and Douglas fir associations of the Coast Forest formation. Climatic data collected on the eastern slope of Seymour Hill in the sanctuary during the fall and winter of 1962/63 extrapolate to give the following annual climatic estimates for the region: Mean monthly temperature, 46° F.; total annual rainfall, 44 inches. Equivalent data for the oak-arbutus association in Victoria are: Mean monthly temperature, 50° F.; total annual rainfall, 27 inches (Victoria weather office, 1962 and 1963).

The distribution of vegetation within the sanctuary appears to be controlled mainly by fire history and the soil-moisture requirements and tolerance to shade of individual species. Douglas fir, oak, and arbutus are species incapable of effective regeneration in the absence of fire. Because it takes about 700 years for Douglas fir to be replaced by the shade-tolerant hemlock and cedar, the eastern half of the Coast Forest on the Island is dominated by the Douglas fir association in wetter parts, the oak-arbutus association in drier (Schmidt, 1957; Silen, 1958).

Oaks generally occur in regions where summer rainfall is less than 10 inches, and where soils are loamy and well drained, either because they overlie bedrock or outwash sand or gravel. Arbutus, though drought-loving, tends to occur on slightly wetter sites. Both species are intolerant of shading, oak more so than arbutus (Silen, *op. cit.;* Tarrant, 1958).

Most tree species other than the preceding are relatively mesic (intermediate) in moisture requirements, though cedar, grand fir, the maples, yew, willow, alder, and cottonwood do best on wetter (hydric) sites, and lodgepole pine occurs on both dry (xeric) and hydric sites. Cedar, hemlock, and yew are very tolerant to shading by other trees, grand fir and the maples are moderately tolerant, Douglas fir is moderately intolerant, and the remaining species are very intolerant (Schmidt, *op. cit.;* Krajina, *op. cit.*). In the absence of fires, it is probable that with time the vegetation of the region would be made up of shade-tolerant species, and mesic sites would be vegetated by such mesic and shade-tolerant species as hemlock and cedar. Such a permanent self-perpetuating community is termed a " climax " community, but, because of fires, is absent from the area.


A
B
C
D
E
1
2
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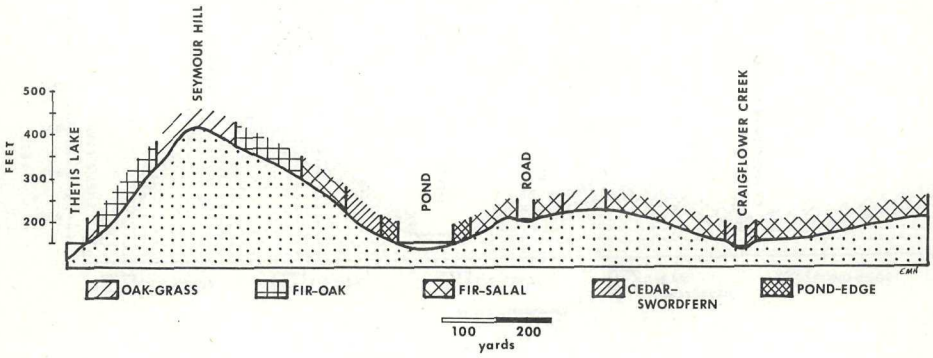
5
6
Transect
100 200
yards
Contours at 50
foot intervals
OAK-GRASS
FIR-OAK
FIR-SALAL
CEDAR-SWORDFERN
POND-EDGE
SECONDARY STAGES
CLEARING
EMH.


FEET
500
400
300
200
THETIS LAKE
SEYMOUR HILL
POND
ROAD
CRAIGFLOWER CREEK
OAK-GRASS
FIR-OAK
FIR-SALAL
CEDAR-SWORDFERN
POND-EDGE
100 200
yards
EMH.

Because certain species of plants have similar environmental requirements, they tend to occur together in assemblages termed " communities." A dozen or so distinct communities have been found within the sanctuary. The most important of these are mapped on Fig. 2 and are shown along a transect through the area on Fig. 3. The chief environmental factors affecting the distribution of communities in the sanctuary are soil moisture, exposure, and history.

The major assemblages of plants in the sanctuary, as they range from conditions of low to high soil-moisture conditions, are as follows: Bare rock, grass-lichen-moss, grass-lichen-shrub, oak-grass, fir-oak, fir-salal, cedar-swordfern, willow-skunk cabbage, sedge meadow, reed swamp, floating aquatic, and submerged aquatic. In the account following, and in Figs. 2 and 3 where their distribution is shown, the first four assemblages are grouped for simplification as variants or " facies " of the oak-grass community, and the last four as pond-edge communities. As well, permanent clearings and clearings returning to a forested condition termed " secondary stages " are identified, giving the following classification: (1) Oak-grass community, (2) fir-oak community, (3) fir-salal community, (4) cedar-swordfern community, (5) pond-edge community, and (6) secondary stages.

Considerable interdigitation and intergradation of these communities occur. Within the fir-salal community for example, hummocks support outliers of the drier fir-oak community, and depressions of areas of seepage support outliers of the wetter cedar-swordfern community. Communities have been separated by lines, but in reality they are often separated by intermediate zones of sometimes considerable width.

Oak-Grass Community

The oak-grass community occurs on the very driest sites in the park, chiefly on the rocky top and sides of Mount Seymour and Round Hill, and on other outcrops scattered throughout the area, especially those with a south-westerly exposure. In general appearance the community varies from bare rock outcrop to a grassy sward covered chiefly with oaks, and in wetter sites with some addition of arbutus and Douglas fir. The community may almost always be recognized by its open grassy park-like aspect and by the presence of oak, where the soil is deep enough, as the most important tree.

Considerable variation occurs within this community. The very driest facies have no vegetation other than lichens covering the exposed rock substrate. Where small amounts of soil have accumulated on the rock, the lichens are replaced by fruticose mosses (*Andræa, Grimmia, Rhacomitrium, Polytrichum,* and *Selaginella*). In pockets with more soil still, the ground vegetation is made up of grasses (hair and chess grass), a distinctive herbaceous spring flora (monkey flower, satin flower, whitlow-grass, saxifrage, shooting-star, stonecrop, easter lily, meconella, blue-eyed mary, camas, spring gold), or ferns (*Polypodium, Pityrogramma*).

A distinctive variety of shrubs also occurs (bearberry, ocean spray and broom). Where the soil is deeper still (in crevices and in basins), oaks occur, those in the drier locations being small, in wetter locations larger, and with progressively more arbutus and Douglas fir. These in the drier sites are often covered by lichens (*Usnea* and *Parmelia*).

The soils of this community are always shallow, or where deeper are underlain by sand or gravel, being, as a result, very dry, and are dark brown or black in colour, the dominant soil-forming process being accumulation of humus with little leaching. They are, as a result, very near to a chernozem or prairie soil type.

(Photo by E. M. Hagmeier.)

Fig. 4. Oak-grass community; oak and arbutus in foreground, with grassy understory. Location, near summit of Seymour Hill.

(Photo by E. M. Hagmeier.)

Fig. 5. Fir-oak community; canopy of Douglas fir, oak, and arbutus; understory of ferns and moss or grass. Location, near south end of lower Thetis Lake.

Fir-Oak Community

The fir-oak community occurs in sites in which the soil is somewhat deeper and wetter than in the oak-grass community. It is, within the sanctuary, restricted to the slope of Seymour and Round Hills, below the preceding community, though traces of it are found at the edges of oak-grass communities on rock knolls elsewhere in the park.

This community is transitional between the oak-grass community found on drier sites and the fir-salal community found on wetter ones. It may be recognized by possessing the same understory as the wetter facies of the oak-grass community (often of fruticose mosses and spring-flowering herbs) and a forest-cover of moderate-growth Douglas fir mixed with varying proportions of good-growth arbutus and oak.

Several facies of this community may be found. Drier sites possess a higher proportion of oak and arbutus, and the understory is covered with mosses and polypody, while wetter sites have a higher proportion of fir and the addition of a larger number of low shrubs (ocean spray, honeysuckle).

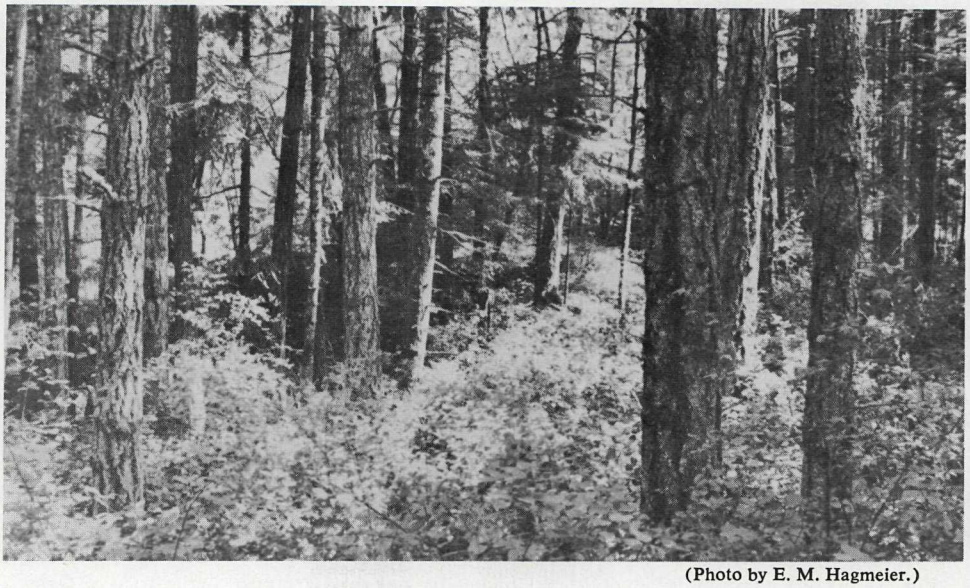
The soils under this community, while deeper and wetter than those of the community preceding, are still relatively shallow and dry. The subsoil layer is often reddish-brown and compacted into concretions.

Fir-Salal Community

The fir-salal community occurs through most of the park area in regions with soils that are neither overly dry or overly wet. This community in other parts of the drier sub-zone of the Coast Forest is considered to be a fire sub-climax.

This community constitutes the typical forest community in the park east of Seymour and Round Hills. It is easily recognized as a community of good-growth fir, with an understory predominantly of salal of from 2 to 6 feet in height.

Soils are as in the fir-oak community, though deeper, and with some tendency to the formation of a thin ashy-coloured (podzol) layer in the topsoil.



(Photo by E. M. Hagmeier.)

Fig. 6. Fir-salal community. Location, east of Highland Road just north of pistol range.

(Photo by E. M. Hagmeier.)

Fig. 7. Cedar-sword fern community; the canopy of almost pure cedar. Location, southwest of Prior Lake.

Cedar-Swordfern Community

The cedar-swordfern community occurs anywhere in the park where lateral seepage of soil water occurs within 3 or 4 feet of the surface so that the surface is damp the year round: at the base of steep slopes, in low damp areas in both the fir-oak and the fir-salal communities, along the courses of streams, around ponds, and on wet gently sloping areas. The trees present are chiefly cedar, with varying amounts of maple, hemlock, Douglas fir, grand fir, cottonwood, and, where open spaces occur in the forest canopy, dogwood. The community is easily recognized by the presence of excellent-growth cedar or grand fir in an understory dominated by clumps of swordfern. Herbs may be present or absent, depending on the thickness of the forest canopy; the moss *Eurhynchium* grows commonly on fallen logs and tree trunks.

Because of the high water-table and the regular deposition of soil by flooding or by run-off, the soils are often rich black and mucky. This community produces the best stands of timber and the best agricultural land in the area.

Pond-edge Communities

Because lakes are continually filling with silt and lowering their outlets, they eventually become ponds and finally dry land. The sequence of lake to dry land involves a series of changes in plant communities that are termed "primary succession," of which the following five stages are found in the park sanctuary.

Willow-Skunk Cabbage Community (Fig. 8)

This stage, lying in sites wetter than the cedar-swordfern and generally wet on the surface all year long, is dominated by willows, alder, skunk cabbage, and

(Photo by Cecil Clark.)

Fig. 8. Willow-skunk cabbage community; alder also present.

western dogwood. Examples are found around the now drained lowlands surrounding Prior Lake, on the edges of the seasonal pond in the middle of the sanctuary, and at the junctions of the outlet of Prior Lake and Craigflower Creek.

Sedge Meadow Community (Fig. 9)

Found in sites wetter than the preceding and at the edge of still water, this community is dominated by sedges, hardhack, and a variety of wet-land herbs. An impoverished example is found on the edges of the central pond.

Reed-Swamp Community (Fig. 10)

Found in shallow water flooded most of the year, and termed by many a "marsh," the dominant species are bullrushes and cat-tails. Most of the vegetation of the central marsh is made up of this community.

Floating Aquatic Community (Fig. 9)

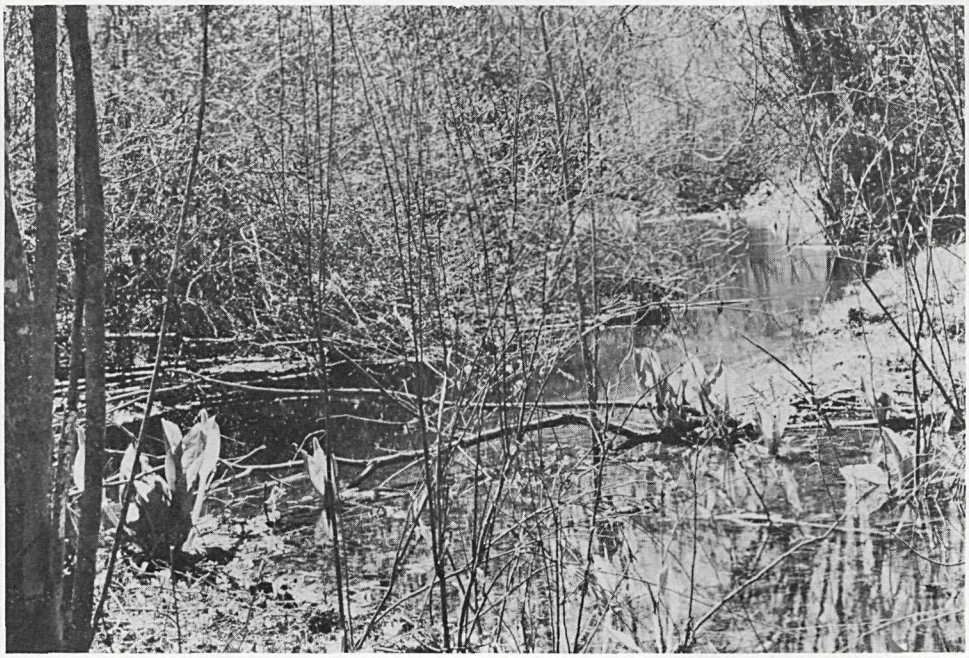
Found in water deeper than the preceding, this community is dominated by water lilies and water shield and bladderwort. Restricted examples may be seen around the edge of Prior Lake.

Submerged Aquatic Community (Fig. 9)

Made up of rooted submerged pondweeds, this community extends to a depth of about 15 to 20 feet around the edges of lakes and ponds; in Prior Lake, because apparently of the heavy load of sediment and reduced light transmission of the water, the depth of this zone is no more than about 6 feet.

(Photo by E. M. Hagmeier.)

Fig. 9. Zonation of communities at edge of Prior Lake. From foreground to background, submerged-aquatic community (tips of pond weeds), floating-aquatic community (water lilies), sedge-meadow community, and alder-skunk cabbage community.



(Photo by E. M. Hagmeier.)

Fig. 10. Reed-swamp community surrounded by sedge-meadow. Location, temporary pond in central part of sanctuary.

Prior Lake, a glacial basin in the north-western corner of the sanctuary, originally encompassed the area of the pond-edge community mapped on Fig. 2. Damming of the inlet in 1932/33 resulted in the lowering of its water level and resultant colonizing of the exposed shoreline by the present willow-skunk cabbage community. The lake presently is of about 7,500 square yards in area, and has a concentrically shaped bottom with a maximum depth of about 17 feet. Light penetrates to a depth of almost exactly 6 feet in winter (by Secchi disk), and this is about the depth to which rooted vegetation occurs. Those parts of the lake deeper than this (as sampled by dredging) are covered with copious amounts of semi-decomposed vegetation inhabited by a very few tubifex worms and caddisfly larvæ. The water of the lake is slightly acid, with a pH of about 6.5. The acidic nature of the lake and its low light penetration, together with the presence of tubifex, suggest that Prior Lake is a relatively infertile body of water. Since, however, it acts as a settling-basin for outflow from Thetis Lake, food (as determined by plankton tows) is sufficiently abundant to maintain a moderate crustacean and fish fauna on a year-round basis. Trout occur in the pond, running to 10 inches in size; they are, however, quite dark and relatively thin. Stomach contents of fish collected during the winter showed a high proportion of tubifex. Catfish and sunfish also occur in the lake.

PLANTS

Algæ

Flagellata

Euglena deses Ehr.
Euglena viridis Ehr.(?).
Trachelomonas hispida (Pert.) Stein.
Trachelomonas teres Maskell.

Dinoflagellata

Ceratium hirundinella Schrank.
Glenodinium pulvisculus Stein.
Pesidinium willii (Huit.) Kaas.

Keterokontæ

Botryococcus brounii Kütz.
Ophiocytium cochleare A. Br.
Tribonema (sp. ?).

Myxophyceæ

Coccogoniales

Cœlosphærium kutzingianum Näg.
Chroococcus limnoticus Lemm.
Chroococcus limnoticus subsalis Lemm.
Chroococcus turgidius (Kütz.) Näg.
Glœocapsa cropidinum (Raben.) Näg.

Hormogoneales

Anabæna circinalis (Kütz.) Raben.
Anabæna inæqualis (Kütz.) B. & F.
Arthrospira jenneri Sitz.
Glœothichia echinulata (J. Smith) Richter.
Lyngbya limnotica Lemm.
Oscillateria curviceps Agh.
Stigonema mammillosum (Lyngb.) Agh.
Spirulina major Kütz.
Spirulina princeps W. W. & G. S. W.

Bacillarieæ (Diatomaceæ)

Centricæ

Cyclotella antiqua W. Smith.
Melosira crenulata (Ehr.) Kütz.
Melosira variana Ehr.
Stephanodiscus niagare Ehr.

Penatæ

Cymatopleura solea Bréb.
Cymbella lanceolata Ehr.
Cymbella cuspidata Kütz.
Cymbella cymbiformis Kütz.
Diploneis ovalis Hilse.
Epithemia turgida Ehr.
Epithemia zebra Ehr.
Eunotia diodon Ehr.
Fragillaria capucina Desm.
Fragillaria crotonensis Kitton.
Gomphonema acuminatum Ehr.
Gomphonema acuminatum coronata Kitton.
Meridion circulare (Grev.) Agh.
Navicula dicephala W. Sm.
Neidium affine Ehr.
Neidium productum W. Sm.
Rhopalodia gibba (Ehr.) O. Müll.
Stauroneis phœnicenteron Ehr.
Surirella biseriata Bréb.
Surirella robusta Ehr.
Synedra pulchella Kütz.
Tabellaria fenestrata Kütz.
Tabellaria flocuculosa Kütz.

Chlorophyceæ (Excluding Desmidiaceæ)

Ankistrodesmus falcatus (Corda) Ralfs.
Bumillaria pumila W. W. & G. S. W.

Chætophora incrassata (Huds.) Haz.
Cladophora holsatica Kütz.
Coleochæte (fragments).
Dactylococcopsis acicularis Lemm.
Dictyosphærium pulchellum Wood
Eudorina elegans Ehr.
Gonium pectorale Müll.
Mougeotia viridis (Kütz.) Wittr.
Œdogonium (fragments).
Oocystis lacustris Chod.
Pandora morum (Müll.) Bory
Pediastrum areneosum Racib.
Pediastrum boryanum (Turp.) Menegh.
Pediastrum duplex Meyen.
Pediastrum tetras (Ehr.) Ralfs.
Pediastrum tetras tetraodon (Corda.) Hangs.
Perionella planctonica G. M. Smith.
Rhabdonema lineare Schm. & Lamb.
Scenedesmus bijuga (Turp.) Laghm.
Scenedesmus quadricauda (Turp.) Bréb.
Selenastrum acuminatum G. M. Smith.
Selenastrum gracile Reinsch.
Sorastrum americanum (Bohlin) Schmidle.
Spirogyra sp.
Ulothrix sp.

DESMIDACEÆ

Arthrodesmus octocornis Ehr.
Closterium acerosum (Schrank) Ehr.
Closterium dianæ Ehr.
Closterium lunula (Müll.) Nitzsch.
Closterium moniliferum Ehr.
Closterium venus (Kütz.) Bréb.
Cosmarium amœnum Bréb.
Cosmarium binum Nordst.
Cosmarium botrytis Menegh.
Cosmarium cucumis Corday.
Cosmarium botrytis tumidum Wolle.
Cosmarium dentatum Wolle.
Cosmarium despressum (Näg.) Lund.
Cosmarium furcatospermum W. W. & G. S. W.
Cosmarium moniliferum Ralfs.
Cosmarium portianum Archer.
Cosmarium quadratum Ralfs.
Cosmarium reniforme (Ralfs) Archer.
Cosmarium reniforme var. *compressum.*
Cosmarium subcumcumis Schmidle.
Cosmarium subdrepressum W. W. & G. S. W.
Cosmarium turpini Bréb.
Cosmarium turpini var. *duplominus.*
Cosmocladium hitchcockii (Wolle) G. M. Smith.
Desmidium aptogonum Bréb.
Staurastrum arctiscon (Ehr.) Lund.
Staurastrum arctiscon var. *glabrum.*
Staurastrum brevispinum Bréb.
Staurastrum ophirua Lund.
Staurastrum paradoxum Meyen.
Staurastrum paradoxum var. *longipes* Nordst.
Staurastrum polymorphum Bréb.
Staurastrum sebaldii Reinsch.
Staurastrum sebaldii var. *ornatum* Nordst.
Staurastrum setigerum Cleve.
Staurastrum striolatum.
Staurastrum vestitum Ralfs.
Xanthidium antilopæum minneapolense Wolle.
Xanthidium cristatum Bréb.

For further reading, *see* Needham, 1962, and Smith, 1950, in Bibliography.

LICHENS

SPHÆROPHORACEÆ

Sphærophorus globosus (Huds.) Wainio.

GRAPHIDACEÆ

Graphis scripta (L.) Ach.

THEOLOTREMACEÆ

Thelotrema lepadinum Ach.

STICTACEÆ

Sticta anthraspis Ach.
Sticta fuliginosa (Dicks) Ach.
Lobaria pulmonaria (L.) Hoffm.
Lobaria scrobiculata (Scop.) D. C.

PELTIGERACEÆ

Nephroma lævigatum Ach.
Nephroma resupinatum (L.) Ach.
Peltigera aphthosa (L.) Willd.
Peltigera canina (L.) Willd.
Peltigera polydactyla (Neck.) Hoffm.

CLADONIACEÆ

Cladonia bellidiflora (Ach.) Schær.
Cladonia chlorophæa (Flk.) Spreng.
Cladonia coccifera (L.) Willd.
Cladonia furcata (Huds.) Schrad.
Cladonia gracilis (L.) Willd.
Cladonia gracilis var. *dilata* (Hoffm.) Vain.
Cladonia macilenta Hoffm.
Cladonia mitis Sandst.
Cladonia scabriuscula (Del.) Leight.
Cladonia subsquamosa (Nyl.) Wainio.
Cladonia uncialis (L.) Web.
Stereocaulon subalbicans Lamb.
Stereocaulon tomentosum Fries.

PERTUSARIACEÆ

Pertusaria sp.
Pertusaria amara (Ach.) Nyl.

LECANORACEÆ

Lecanora spp.
Ochrolechia pallescens (L.) Mass.
Ochrolechia tartarea (L.) Mass.
Ochrolechia upsaliensis (L.) Mass.

PARMELIACEÆ

Cetraria glauca (L.) Ach.
Cetraria herrei Imshaug.
Nephromopsis ciliaris (Ach.) Hue.
Parmelia conspersa (Ehrh.) Ach.
Parmelia enteromorpha Ach.
Parmelia physodes (L.) Ach.
Parmelia saxatilis (L.) Ach.
Parmelia subaurifera Gyel.
Parmelia vittata (Ach.) Röhl.

USNEACEÆ

Alectoria nadvornikiana.
Alectoria sarmentosa Ach.
Alectoria tortuosa.
Cornicularia tenuissima (L.) Zahlbr.
Evernia prunastri (L.) Ach.
Ramalina spp.
Thamnolia vermicularis (Sw.) Schær.
Usnea comosa (Ach.) Röhl.
Usnea dasypoga (Ach.) Röhl.

TELOSCHISTACEÆ

Xanthoria polycarpa (Hoffm.) Oliv.

For further reading, *see* Howard, 1950, in the Bibliography.

FUNGI

MYXOMYCETES

Ceratiomyxa sp.
Lycogola epidendron (L.) Fries.
Physarum sp.
Stemonites splendens.
Tubifera casparyi (Rost.) Macbr.

PEZIZIACEÆ

Aleuria aurantia (Pers.) Fuckel.
Otidea smithii Kanouse.
Peziza sylvestris (Boud.) Sacc.
Pithya vulgaris Fuckel.
Pseudoplectania fulgens (Pers.) Fuckel.
Sarcosphæra coronaria (Jacq.) Schrœt.

HELVELLACEÆ

Helvella crispa (Scop.) Fr.
Helvella lacunosa (Afz.) Fr.
Morchella esculenta (L.) Pers.
Verpa conica (Mull.) Swartz.

OSTROPACEÆ

Strictis radiata (L.) Pers.

HELOTIACEÆ

Chlorosplenium æruginascens (Nyl.) Karst.
Helotium citrinum (Hedw.) Fr.
Helotium virgultorum (Vahl.) Fr.

GEOGLOSSACEÆ

Trichoglossum hirsutum Pers.

PHACIDIACEÆ

Coccomyces dentatus (Schw. ex Fr.) Sacc.
Coccomyces quadratus (Schm. & Kze.) Karst.
Rhytisma punctatum Pers. ex Fr.

ALLANTOSPHÆRIACEÆ

Diatrype sp.

OPHIOSTOMATACEÆ

Tilachlidium brachiatum (Batch.) Petch.

XYLARIACEÆ

Xylaria hypoxylon (L. ex Fr.) Grev.

MYCOSPHÆRELLACEÆ

Mycosphærella maculiformis (Pers. ex Fr.) Schroet.

ERYSIPHACEÆ

Erysiphe sp.

UREDINALES

Puccinia crandallii Pam. & Hume.
Puccinia heterodermus Syd.
Puccinia jonesii Peck.
Pucciniastrum goodyera (Tranz.) Arth. II.

DACRYMYCETACEÆ

Calocera cornea (Fr.) Loudon.
Calocera viscosa (Fr.) Fr.

TREMELLACEÆ

Tremella mesenterica Fr.
Phlogiotis helvelloides (Fr.) Martin.
Protohydnum gelatinosum Schrad. ex Fr.

THELEPHORACEÆ

Aleurodiscus amorphus (Pers.) Reb.
Aleurodiscus candidus (Schw.) Burt.
Corticium petrophilum Bourd. & Galz.
Peniophora aurantiaca (Bres.) H. & L.
Peniophora incarnata (Fr.) Karst.
Stereum hirsutum (Willd. ex Fr.) S. F. Gray.
Stereum ostrea (Blume & Nees ex Fr.)
Stereum purpureum (Pers. ex Fr.) Fr.
Thelephora palmata Scop. ex. Fr.

CLAVARIACEÆ

Clavaria abietina Pers.
Clavaria formosa Pers.
Clavaria cinerea Fr.
Clavaria stricta Fr.
Clavariadelphus pistillaris Donk.
Clavicorona taxophila (Thom.) Doty.

CANTHARELLACEÆ

Cantharellus subalbidus Smith & Morse.

HYDNACEÆ

Auriscalpium vulgare S. F. Gray.
Hydnum repandum L. ex Fr.
Odontia aspera Bourd. & Galz.
Phellodon atratus Harrison.
Phlebia mellea Overh.
Phlebia merismoides Fr.
Phlebia radiata Fr.

MERULIACEÆ

Merulius confluens Schw.
Merulius corium Fr.
Merulius niveus Fr.
Merulius tremellosus Schrad. ex. Fr.

POLYPORACEÆ

Cryptoporus volvatus Peck.
Dædalea confragosa Bolt ex. Fr.
Fomes pini (Thore ex Fr.) Karst.
Fomes pinicola (Fr.) Cke.
Fomes subroseus (Weir) Overh.
Ganoderma applanatum (Pers.) Pat.
Ganoderma oregonensis Murr.
Lenzites sæpiaria Wulf. ex Fr.
Polyporus abietinus Dicks ex. Fr.
Polyporus elegans Bull. ex Fr.
Polyporus fragilis Fr.
Polyporus guttulatus Peck.
Polyporus hirsutus Wulf. ex Fr.
Polyporus melanopus Fr.
Polyporus pargamenus Fr.
Polyporus perennis L. ex Fr.
Polyporus picipes Fr.
Polyporus schweinitzii Fr.
Polyporus tephroleucus Fr.
Polyporus versicolor L. ex. Fr.
Poria ferrea (Pers.) Bourd. & Galz.
Poria subacida (Peck) Sacc.
Poria versipora (Pers.) Romell.

BOLETACEÆ

Boletinus amabilis(?) (Peck) Snell.
Boletinus lakei (Murr.) Sing.

AGARICACEÆ (WHITE-SPORED)

Amanita pantherina (DC. ex Fr.) Secr.
Armillaria mellea Fr.
Clitocybe aurantiaca (Fr.) Studer.
Clitocybe flaccida (Fr.) Kummer.
Clitocybe gigantea Fr.
Clitocybe multiceps Peck.
Collybia acervata Fr.
Collybia albipilata Pk.
Collybia confluens Fr.
Cystoderma amianthina (Scop. ex Fr.) Fayod.
Cystoderma fallax Smith & Singer.
Cystoderma granulosum (Batch. ex Fr.) Fayod.

Hygrophorus conicus Fr.
Hygrophorus nitidus Berk. & Curt.
Laccaria laccata var. *amethystina*.
Laccaria laccata (Scop.) Berk & Br.
Laccaria ochropurpurea (Berk.) Peck.
Lactarius deliciosus (L. ex Fr.) S. F. Gray.
Lactarius subdulcis Fr.
Lepiota cærulescens Peck.
Lepiota cristata (A. & S.) Fr.
Leucopaxillus albissimus (Pk.) Sing.
Leucopaxillus amarus (Alb. & Schw.) Kühner.
Marasmius bellipes Morg.
Marasmius candidus Fr.
Marasmius copelandi Peck.
Marasmius felix Morg.
Mycena adonis (Fr.) S. F. Gray.
Mycena amabillissima (Peck) Sacc.
Mycena hæmatopa Fr.
Mycena galericulata (Fr.) S. F. Gray.
Mycena pura (Fr.) Quél.
Omphalina cyathella Fauvre & Sweers.
Omphalina luteicolor Murr.
Panus stypticus Bull. ex Fr.
Paxillus involutus Fr.
Pleurotus sapidus Kalchbr.
Russula fœtens Fr.
Tricholoma atrosquamosum (Chev.) Sacc.
Tricholoma personatum (Fr. ex Fr.) Quél.
Xeromphalina campanella (Fr.) Kühner & Maire.
Xeromphalina fulvipes (Murr.) Smith.

AGARICACEÆ (PINK-SPORED)

Entoloma cyaneum Peck.
Leptonia lampropoda Fr.
Nolanea fuscogrisella Peck.
Pluteus cervinus (Schaeff. & Secr.) Fr.

AGARICACEÆ (PURPLE-SPORED) OR (PURPLE-BROWN)

Agaricus hæmorrhoidius (Schulz.) Fr.
Agaricus placomyces Peck.
Agaricus silvaticus Schaeff.
Nœmatoloma capnoides (Fr.) Karst.
Nœmatoloma fasciculare (Huds. ex Fr.) Karst.
Psathyrella candolleana (Fr.) Smith.
Stropharia ambigua (Peck) Zeller.
Stropharia stercoraria Fr.

AGARICACEÆ (RUSTY-BROWN SPORED)

Cortinarius (of many unidentified species).
Cortinarius cinnamomeus Fr.
Crepidotus fulvotomentosum Peck.
Crepidotus versutus Peck.
Galerina hypnorum (Fr.) Singer.
Hebeloma crustuliniforme (Fr.) Quél.
Inocybe lilacina (Boud.) Kauffm.
Pholiota aurivella (Batsch. ex Fr.) Kummer.

AGARICACEÆ (BLACK-SPORED)

Coprinus comatus (Müll. ex Fr.) S. F. Gray.
Coprinus micaceus (Bull. ex Fr.) Fr.
Gomphidius glutinosus (Schaeff.) Fr.
Gomphidius subroseus Kauffm.

GEASTRACEÆ

Astræus hygrometricus (Pers.) Morg.
Geastrum coronatum Pers.
Geastrum triplex Jungh.

SCLERODERMATACEÆ

Scleroderma aurantium Pers.

NIDULARIACEÆ

Crucibulum levis (DC.) Kambly & Lee.
Nidularia pulvinata (Schw.) Fr.

LYCOPERDACEÆ

Lycoperdon perlatum Pers.

FUNGI IMPERFECTI

SPHÆROPSIDACEÆ

Diplidia maculata Cke. & Hark.

TUBERCULARIACEÆ

Tubercularia vulgaris Tode.

MYCOSPHÆRELLACEÆ

Mycosphærella maculiformis (Pers. ex Fr.) Schroet.

For further reading, *see* Groves, 1962; Lange, 1963; and Smith, 1963; in the Bibliography at end of this report.

MOSSES

Amphidium sp.
Anacolia menziesii (Turn.) Paris.
Andreæa rupestris Hedw.
Antitrichia californica Sull.
Antitrichia curtipendula (Hedw.) Brid.
Atrichum undulatum var. *hausknechtii* (Jur. and Milde) Frye.
Aulacomnium androgynum (Hedw.) Schwaegr.
Aulacomnium palustre (Hedw.) Schwaegr.
Barbula sp.
Bartramia pomiformis Hedw.
Brachythecium sp.
Bryum sp.
Camptothecium megeptilum Sull.
Ceratodon purpureus (Hedw.) Brid.
Claopodium bolanderi Best.
Claopodium crispifolium (Hook.) R. & C.
Claopodium whippleanum (Sull.) R. & C.
Dendroalsia abietina (Hook.) E. G. Brit.
Dicranoweisia cirrhata (Hedw.) Lindb.
Dicranum fuscescens Turn.
Dicranum scoparium Hedw.
Dicranum strictum Schleich.
Drepanocladus uncinatus (Hedw.) Warnst.
Encalypta sp.
Eurhynchium oreganum (Sull.) Jaeb. & Sauerb.
Euryhynchium stokesii Turn.
Fontinalis sp.
Funaria hygrometrica Hedw.
Grimmia torquata Hornsch.
Grimmia trichophylla Grev.
Hedwigia ciliata (Hedw.) P. Beauv.
Homalothecium lutescens (Hedw.) Robinson.
Homalothecium megaptilum (Sull.) Robinson.
Homalothecium nuttallii (Wils.) Grout.
Homalothecium pinnatifidum Sull. & Lesq.
Hylocomium splendens (Hedw.) B. S. G.
Hypnum circinale Hook.
Hypnum subimponens Lesq.
Isothecium brewerianum (Lesq.) Macoun.
Isothecium stoloniferum (Hook.) Brid.
Leucolepis menziesii (Hook.) Steere.
Mnium glabrescens Kindb.
Mnium insigne Mitt.
Mnium spinulosum B. & S.
Mnium venustum Mitt.
Neckera douglasii Hook.
Neckera menziesii Hook.
Orthotrichum lyellii Hook. & Tayl.
Orthotrichum speciosum Nees.
Physcomitrium megalocarpum Kindb.
Plagiothecium denticulatum (Hedw.) B. S. G.
Plagiothecium piliferum (Sw.) B. S. G.
Pogonatum sp.
Pohlia sp.
Polytrichum juniperinum Hedw.
Polytrichum piliferum Hedw.
Porothamnium bigelovii (Sull.) Fleisch,
Pseudobraunia californica (Lesq.) Broth.
Pterogonium gracile (Hedw.) B. S. G.
Rhacomitrium canescens Brid.
Rhacomitrium heterostichum (Hedw.) Brid.
Rhacomitrium lanuginosum (Hedw.) Brid.
Rhytidiadelphus loreus (Hedw.) Warnst.
Rhytidiadelphus triquetrus (Hedw.) Warnst.
Scleropodium sp.
Timmia austriaca Hedw.
Tortella tortuosa (Hedw.) Limpr.
Tortula sp.
Tripterocladium brewerianum (Lesq.) Fl.
Zygodon viridissimus (Dicks.) Brid.

Liverworts

Frullania sp.
Gymnomitrion obtusum (Lindb.) Pearson.
Lepidozia sp.
Porella navicularis (Lehm. & Lindb.) Lindb.
Porella platyphylla (L.) Lindb.
Scapania bolanderi Aust.

For further reading, *see* Conard, 1944, and Grout, 1947, in the Bibliography at end of this report.

Ferns and Fern-allies

Equisetaceæ (Horsetail Family)

Equisetum arvense L. Common horsetail.
Equisetum hiemale L. Scouring-rush.

Ophioglossaceæ (Adder's Tongue Family)

Botrychium virginianum (L.). Sw. Rattlesnake fern.

Polypodiaceæ (Fern Family)

Athyrium filix-femina (L.) Roth. Lady fern.
Cystopteris fragilis (L.) Bernh. Fragile fern.
Dryopteris austriaca (Jacq.) Woynar. Spiny wood-fern.
Pityrogramma triangularis (Kaulf.) Maxon. Golden-back fern.
Polystichum munitum (Kaulf.) Presl. Western swordfern.
Polystichum munitum f. imbricans (D. C. Eaton) Clute. Sun form of swordfern.
Polypodium vulgare L. Licorice fern.
Pteridium aquilinum (L.) Kuhn. Bracken.
Woodsia oregana D. C. Eaton. Oregon woodsia.

Selaginellaceæ (Spike-moss Family)

Selaginella wallacei Hieron. Wallace's selaginella.

For further reading, *see* Taylor, 1963, in Bibliography at the end of this report.

Herbaceous Plants

Typhaceæ (Cat-tail Family)

Typha latifolia L. Broad-leaved. Cat-tail.

Sparganiaceæ (Bur-reed Family)

Sparganium simplex Huds. Simple-stemmed bur-reed.

Najadaceæ (Pondweed Family)

Potamogeton amplifolius Tuck. Large-leaved pondweed.
Potamogeton gramineus L. Grass-leaved pondweed.

Gramineæ (Grass Family)

Agrostis palustris Huds. Creeping bent-grass.
Agrostis tenuis Sibth. Colonial bent-grass.
Aira præcox L. Little hair-grass.
Alopecurus geniculatus L. Water foxtail.
Anthoxanthum odoratum L. Sweet vernal grass.
Bromus mollis L. Soft chess.
Bromus racemosus L. Smooth-flowered soft cheat.
Bromus rigidus Roth. Ripgut grass.
Bromus tectorum L. Downy chess.
Bromus vulgaris (Hook.) Shear. Narrow-flowered brome-grass.
Cynosurus echinatus L. Bristly dog's-tail grass.
Dactylis glomerata L. Orchard-grass.
Distichlis spicata (L.) Greene. Saltgrass or alkali grass.
Elymus glaucus Buck. Western rye-grass or blue wild rye.
Glyceria borealis (Nash) Batch. Northern manna-grass.
Holcus lanatus L. Velvet grass.
Lolium perenne L. Perennial ryegrass.
Phalaris arundinacea L. Reed canary-grass.
Phleum pratense L. Timothy-grass.
Poa bulbosa L. Bulbous bluegrass or meadow-grass.

Cyperaceæ (Sedge Family)

Carex arcta Booth. Northern clustered sedge.
Carex aurea Nutt. Golden-fruited sedge.
Carex flava L. Yellow carex.
Carex illota Bail. Small-headed sedge.
Carex inops Bail. Long-stoloned sedge.
Carex kelloggii Booth. Kellogg's sedge.
Carex obnupta Bail. Slough sedge.
Carex phæocephala Piper. Hare sedge.
Carex rostrata Stokes. Beaked sedge.
Eleochæris palustris (L.) R. & S. Creeping spike-rush.
Scirpus acutus Muhl. Viscid bulrush.
Scirpus paludosus A. Nels. Marsh bulrush.

Juncaceæ (Rush Family)

Juncus bolanderi Engelm. Bolander's rush.
Juncus bufonius L. Toad rush.
Juncus effusus L. Common rush.
Juncus ensifolius Wiks. Three-stamened rush.
Juncus occidentalis (Cov.) Wieg. Western rush.
Luzula multiflora (Retz) Lejeune. Wood rush.

ARACEÆ (ARUM FAMILY)

Lysichitum americanum Hult. & St. John. Yellow skunk-cabbage.

LEMNACEÆ (DUCKWEED FAMILY)

Lemna minor L. Lesser duckweek.

LILIACEÆ (LILY FAMILY)

Allium acuminatum Hook. Hooker's onion.
Brodiæa coronaria (Salisb.) Engler. Harvest brodiæa.
Triteleia hyacinthina (Lindl.) Greene. Fool's onion.
Camassia leichtlinii (Baker) S. Wats. Great camas.
Camassia quamash (Pursh.) Greene. Common camas.
Disporum hookeri (Torrey) Britt. Hooker's fairy bell.
Erythronium oregonum Applegate. White easter lily.
Fritillaria lanceolata Pursh. Chocolate lily.
Lilium columbianum Hanson. Columbia lily.
Maianthemum dilatatum (Wood) Nels. & McB. False lily-of-the-valley.
Smilacina racemosa (L.) Desf. False Solomon's seal.
Smilacina stellata (L.) Desf. Star-flowered Solomon's seal.
Streptopus amplexifolius (L.) DC. Twisted-stalk.
Trillium ovatum Pursh. Western trillium.
Zygadenus venenosus S. Wats. Death camas.

IRIDACEÆ (IRIS FAMILY)

Sisyrinchium douglasii A. Dietr. Satin flower.
Sisyrinchium sarmentosum Suksd. Blue-eyed grass.

ORCHIDACEÆ (ORCHID FAMILY)

Calypso bulbosa (L.) Oakes. Calypso or fairy slipper.
Corallorhiza maculata Raf. Spotted coral-root.
Corallorhiza mertensiana Bong. Merten's coral-root.
Corallorhiza striata Lindl. Striped coral-root.
Goodyera oblongifolia Raf. Green-leaved rattlesnake orchid.
Habenaria unalascensis (Spreng.) S. Wats. Spender-spire orchid.
Habenaria unalascensis var. *elata* (Jepson) Correll. Wood rein-orchid.
Listera cordata (L.) R. Br. Heart-leaved twayblade.
Spiranthes romanzoffiana Cham. Hooded ladies' tresses.

URTICACEÆ

Urtica dioica var. *lyallii* (Wats.) C. L. Hitchc. Western stinging nettle.

POLYGONACEÆ (BUCKWHEAT FAMILY)

Polygonum amphibium. L. Water smartweed.
Polygonum convolvulus L. Bindweed.
Polygonum lapathifolium L. Willow weed.
Polygonum persicaria L. Spotted knotweed.
Polygonum spergularæiforme Meisn. ex Small. Fall knotweed.
Rumex acetosella L. Sheep sorrel.
Rumex crispus L. Curly-leaved dock.
Rumex obtusifolius L. Broad-leaved dock.
Rumex occidentalis Wats. Western dock.

PORTULACACEÆ (PURSLANE FAMILY)

Calandrinia ciliata var. *menziesii* (Hook.) Macbr. Red maids.
Montia dichotoma (Nutt.) Howell. Dwarf montia.
Montia howellii Wats. Howell's montia.
Montia linearis (Dougl.) Greene. Narrow-leaved montia.
Montia parvifolia (Moc.) Green. Small-leaved montia.
Montia perfoliata (Donn.) Howell. Miner's lettuce.
Montia perfoliata glauca (Nutt.) Ferris. Glaucous montia.
Montia siberica (L.) Howell. Western spring beauty.

CARYOPHYLLACEÆ (PINK FAMILY)

Arenaria macrophylla Hook. Large-leaved sandwort.
Arenaria serpyllifolia L. Thyme-leaved sandwort.
Cerastium arvense L. Field chickweed.
Cerastium semidecandrum L. Little mouse-eared chickweed.
Cerastium vulgatum L. Mouse-eared chickweed.
Dianthus armeria L. Deptford pink.
Sagina occidentalis Wats. Western pearlwort.
Sagina procumbens L. Procumbent pearlwort.
Scleranthus annuus L. Knawel or German knot-grass.
Silene antirrhina L. Sleepy catchfly.
Silene gallica L. Small-flowered catchfly.
Spergula arvensis L. Corn spurry.
Stellaria crispa C. & S. Crisped chickweed.
Stellaria media (L.) Cyrill. Common chickweed.

NYMPHACEÆ (WATER LILY FAMILY)

Brasenia schreberi Gmel. Water shield.
Nuphar polysepalum Engelm. Western yellow pond lily.

CERATOPHYLLACEÆ (HORNWORTH FAMILY)

Ceratophyllum demersum L. Hornworth.

The nature sanctuary at Seymour Hill, from the west side of Lower Thetis Lake.

A typical spring aspect on Seymour Hill.

RANUNCULACEÆ (BUTTERCUP FAMILY)

Actea rubra (Ait.) Willd. Western baneberry.
Anemone lyallii Britt. Lyall's anemone.
Aquilegia formosa Fisch. Columbine.
Delphinium menziesii DC. Menzies' larkspur.
Ranunculus flammula L. Creeping spearworth.
Ranunculus occidentalis Nutt. Western buttercup.
Ranunculus orthorhynchus var. *platyphyllus* Gray. Western swamp buttercup.
Ranunculus repens L. Creeping buttercup.
Ranunculus uncinatus D. Don. Small-flowered buttercup.

BERBERIDACEÆ (BARBERRY FAMILY)

Achlys triphylla (Smith) DC. Vanilla-leaf.

PAPAVERACEÆ (POPPY FAMILY)

Meconella oregana Nutt. White meconella.

FUMARIACEÆ (FUMITORY FAMILY)

Dicentra formosa (Andr.) Walpers. Western bleeding-heart.

CRUCIFERÆ (MUSTARD FAMILY)

Arabis glabra (L.) Bernh. Tower mustard.
Arabidopsis thaliana (L.) Schur. Wall-cress.
Athysanus pusillus (Hook.) Greene sandweed.
Barbarea vulgaris R. Br. Yellow rocket.
Brassica juncea (L.) Coss. Indian mustard.
Capsella bursa-pastoris (L.) Medic. Shepherd's purse.
Cardamine oliogosperma Nutt. Western bitter cress.
Cardamine pennsylvanica Muhl. Pennsylvania bitter cress.
Cardamine pulcherrima var. *tenella* (Pursh.) C. L. Hitchc. Toothwort.
Draba verna L. Vernal whitlow-grass.
Erysimum cheiranthoides L. Wormseed mustard.
Lepidium campestre (L.) R. Br. Field cress.
Rorippa nasturtium-aquaticum (L.) Schinz. & Thell. Watercress.
Rorippa islandica (Oeds.) Barbás. March cress.
Teesdalia nudicaulis (L.) Br. Teesdalia or shepherd's cress.
Thysanocarpus curvipes Hook. Lace-pod or fringe-pod.

CRASSULACEÆ (STONECROP FAMILY)

Sedum spathulifolium Hook. Broad-leaved stonecrop.

SAXIFRAGACEÆ (SAXIFRAGE FAMILY)

Heuchera micrantha var. *diversifolia* (Rydb.) R. B. & L. Small-flowered alum-root.
Lithophragma parviflora (Hook) Nutt. Small-flowered fringe-cup.
Saxifraga cæspitosa L. Tufted saxifrage.
Saxifraga integrifolia Hook. Early or western saxifrage.
Tellima grandiflora (Pursh.) Dougl. Tall fringe-cup.
Tiarella trifoliata L. Three-leaved coolworth or foam flower.

ROSACEÆ (ROSE FAMILY)

Alchemilla occidentalis Nutt. Lady's mantle.
Fragaria chiloensis (L.) Duchesne. Coast strawberry.
Fragaria vesca var. *bracteata* (Heller) Davis. Western wood strawberry.
Geum macrophyllum Willd. Large-leaved avens.
Potentilla anserina L. Silver-weed.
Potentilla palustris (L.) Scop. Marsh or purple cinquefoil.
Sanguisorba occidentalis Nutt. Annual burnet.

LEGUMINOSÆ (PEA FAMILY)

Lathyrus latifolius L. Perennial pea.
Lathyrus nevadensis Wats. Purple Nevada pea.
Lotus micranthus Benth. Small-flowered lotus or bird-foot lotus.
Lupinus bicolor Lindl. Bicoloured lupine.
Medicago arabica (L.) Huds. Spotted medic.
Trifolium depauperatum Desv. Low clover or poverty clover.
Trifolium hybridum L. Alsike clover.
Trifolium microcephalum Pursh. Saucer or woolly clover.
Trifolium microdon H. & A. Cup or thimble clover.
Trifolium oliganthum Steud. Few-flowered clover.
Trifolium pratense L. Red clover.
Trifolium procumbens L. Low hop clover.
Trifolium repens L. White clover.
Trifolium tridentatum Lindl. Lance clover or sand clover.
Vicia american Muhl. American vetch.
Vicia hirsuta (L.) Koch. Hairy vetch.
Vicia sativa L. var. *sativa*. Spring vetch or common vetch.
Vicia sativa var. *angustifolia* (L.) Wahlb. Smaller common vetch.
Vicia tetrosperma (L.) Moench. Slender vetch or four-seeded vetch.

GERANIACEÆ (GERANIUM FAMILY)

Erodium cicutarium (L.) L'Her. Stork's bill.
Geranium bicknellii Britt. Geranium.
Geranium dissectum L. Cut-leaved geranium.
Geranium molle L. Dove's-foot geranium.
Geranium pusillum Burm. Small-flowered geranium.

HYPERICACEÆ (ST. JOHN'S-WORT FAMILY)

Hypericum anagalloides C. & S. Bog St. John's-wort.

VIOLACEÆ (VIOLET FAMILY)

Viola adunca Smith. Hooked violet or western long-spurred violet.
Viola glabella Nutt. Yellow woodland violet.
Viola howellii Gray. Howell's violet.
Viola palustris L. Marsh violet.
Viola sempervirens Greene. Evergreen violet.

ONAGRACEÆ (EVENING PRIMROSE FAMILY)

Boisduvalia densiflora (Lindl.) Wats. Densely-flowered boisduvalia.
Boisduvalia stricta (Gray) Greene. Stiff boisduvalia.
Circæa alpina L. Enchanter's nightshade.
Clarkia amœna (Lehm.) Nels. & Macbr. Wild clarkia or summer's darling.
Epilobium paniculatum Nutt. ex T. & G. Tall annual willow-herb.
Epilobium watsonii Barbey. Western willow-herb.

UMBELLIFERÆ (PARSLEY FAMILY)

Daucus pusillus Michx. Cow parsnip.
Lomatium dissectum (Nutt.) Math. & Const. Chocolate-tips or lace-leaved leptotænia.
Lomatium nudicaule (Pursh.) Coult. & Rose. Indian consumption plant.
Lomatium utriculatum (Nutt.) Coult. & Rose. Spring gold.
Œnanthe sarmentosa Presl. Water parsley.
Osmorhiza chilensis H. & A. Sweet cicely.
Sanicula crassicaulis Pœpp. ex DC. Western snake-root.
Sanicula bipinnatifida Dougl. Purple snake-root.
Sanicula graveolens Poepp. ex DC. Sierra snake-root.

ERICACEÆ (HEATH FAMILY)

Chimaphila umbellata (L.) Bart. Western prince's pine or pipsissewa.
Monotropa uniflora L. Indian pipe.
Pterospora andromeda Nutt. Pinedrops.
Pyrola aphylla Smith. Leafless wintergreen.
Pyrola asarifolia Michx. Large wintergreen.
Pyrola secunda L. One-sided wintergreen.

PRIMULACEÆ (PRIMROSE FAMILY)

Dodecatheon hendersonii Gray. Broad-leaved shooting-star.
Lysimachia thyrsiflora L. Tufted loosestrife.
Trientalis latifolia Hook. Broad-leaved star-flower.

GENTIANACEÆ (GENTIAN FAMILY)

Centaurium muhlenbergii (Griseb.) Wight ex Piper. Muhlenberg's centaury.

APOCYNACEÆ (DOGBANE FAMILY)

Apocynum androsæmifolium L. Spreading dogbane.

POLEMONIACEÆ (PHLOX FAMILY)

Collomia grandiflora Dougl. ex Lindl. Buff gilia.
Collomia heterophylla Hook. Varied-leaved collomia.
Linanthus bicolor (Nutt.) Greene. Bicoloured linanthus.
Microsteris gracilis (Hook.) Greene. Slender gilia.
Navarretia intertexta (Benth.) Hook. Needle-leaved navarretia.
Navarretia squarrosa (Esch.) H. & A. Skunk weed.

HYDROPHYLLACEÆ (WATERLEAF FAMILY)

Nemophila parviflora Dougl. ex Benth. Small-flowered nemophila or grove-lover.
Nemophila pedunculata Dougl. ex Benth. Spreading nemophila.

BORAGINACEÆ (BORAGE FAMILY)

Myosotis discolor Pers. Yellow-and-blue scorpion-grass.
Myosotis laxa Lehm. Water forget-me-not.
Plagiobothrys scouleri (H. & A.) Johnst. Scouler's plagiobothrys.

LABIATÆ (MINT FAMILY)

Lycopus uniflorus Michx. Bugleweed.
Mentha arvensis L. Field mint.
Prunella vulgaris L. Heal-all.
Satureja douglassii (Benth.) Briq. Yerba buena.
Stachys mexicana Benth. Hedge nettle.

SCROPHULARIACEÆ (FIGWORT FAMILY)

Castilleja angustifolia (Nutt.) G. Don. Indian paintbrush.
Collinsia grandiflora Lindl. Blue-eyed Mary or large-flowered collinsia.
Mimulus alsinoides Dougl. ex Benth. Little monkey-flower.
Mimulus guttatus DC. Common monkey-flower.
Mimulus moschatus Dougl. Musk. Monkey-flower.
Orthocarpus attenuatus Gray. Narrow-leaved orthocarpus.
Orthocarpus pusillus Benth. Dwarf orthocarpus.
Parentucellia viscosa (L.) Car. Yellow bartsia.
Veronica americana Schwein. ex Benth. Brookline or American speedwell.
Veronica arvensis L. Corn speedwell.
Veronica peregrina L. Neckweed or purslane speedwell.
Veronica scutellata L. Marsh speedwell.
Veronica serpyllifolia L. Thyme-leaved speedwell.

OROBANCHACEÆ (BROOM-RAPE FAMILY)

Orobanche uniflora var. *purpurea* (Heller) Achey. One-flowered cancer-root.

LENTIBULARIACEÆ (BLADDERWORT FAMILY)

Utricularia vulgaris L. Common bladderwort.

PLANTAGINACEÆ (PLANTAIN FAMILY)

Plantago lanceolata L. Narrow-leaved plantain.
Plantago major L. Common or broad-leaved plantain.

RUBIACEÆ (MADDER FAMILY)

Galium aparine L. Cleavers.
Galium trifidum L. var. *pacificum* Wieg. Small bedstraw.
Galium triflorum Michx. Sweet-scented bedstraw.

VALERIANACEÆ (VALERIAN FAMILY)

Plectritis congesta (Lindl.) DC. Sea blush.

CAMPANULACEÆ (HAREBELL FAMILY)

Campanula rotundifolia L. America harebell.
Campanula scouleri Hook. ex A. DC. Scouler's campanula.

COMPOSITÆ (SUNFLOWER FAMILY)

Achillea millefolium L. Yarrow.
Adenocaulon bicolor Hook. Silver-green adenocaulon.
Agoseris glauca (Pursh) Raf. Pale agoseris.
Agoseris heterophylla (Nutt.) Greene. Varied-leaved agoseris.
Anaphalis margaritacea (L.) B. & H. Pearly everlasting.
Antennaria neglecta Greene. Howell's everlasting.
Aster subspicatus Nees. Douglas' aster.
Balsamorhiza deltoidea Nutt. Northwest balsamroot.
Bellis perennis L. Perennial daisy.
Bidens cernua L. Stick-tight.
Chrysanthemum leucanthemum L. Ox-eyed daisy.
Cirsium arvense (L.) Scop. Canada thistle.
Cirsium edule Nutt. Edible thistle.

Easter lily *(Erythronium oregonum,* syn. *E. grandiflorum),* abundant throughout the sanctuary on forest sites.

Douglas fir and Easter lily.

Cirsium vulgare (Savi.) Airy-Shaw. Common thistle.
Crepis capillaris (L.) Wallr. Smooth hawksbeard.
Eriophyllum lanatum (Pursh.) Forbes. Common woolly sunflower.
Gnaphalium palustre Nutt. Lowland cudweed.
Gnaphalium purpureum L. Purplish cudweed.
Grindelia integrifolia DC. Gumweed.
Hieracium albiflorum Hook. Hawkweed.
Hypochæris glabra L. Smooth cat's-ears.
Hypochæris radicata L. Hairy cat's-ears.
Lactuca muralis (L.) Fresen. Wall lettuce.
Madia sativa Mol. Sagg. Chilean tarweed.
Matricaria matricarioides (Less.) Porter. Pineapple-weed.
Microseris bigelovii (Gray) Schultz-Bip. Coast hawkbit.
Petasites frigidus (L.) Fries var. *palmatus* (Ait.) Cronq. Coltsfoot.
Senecio vulgaris L. Common groundsel.
Solidago canadensis L. Narrow goldenrod.
Sonchus arvensis L. Annual sow-thistle.
Sonchus asper (L.) Hill. Spiny sow-thistle.
Sonchus oleraceus L. Common sow-thistle.
Taraxacum officinale Weber. Dandelion.

Woody Plants

Pinaceæ (Pine Family)

Abies grandis (Dougl.) Lindl. Grand fir.
Juniperus communis L. Common juniper.
Pinus contorta Dougl. Shore pine.
Thuja plicata Donn. Western red cedar.
Tsuga heterophylla (Raf.) Sarg. Western hemlock.
Pseudotsuga menziesii (Mirb.) Franco. Douglas fir.

Taxaceæ (Yew Family)

Taxus brevifolia Nutt. Pacific yew.

Salicaceæ (Willow Family)

Salix hookeriana Barr. Hooker willow.
Salix lasiandra Benth. Pacific willow.
Salix rigida var. *mackenziana* (Hook.) Cronq. Mackenzie willow.
Salix scouleriana Barr. Scouler willow.
Populus tremuloides Michx. Trembling aspen.
Populus trichocarpa T. & G. Black cottonwood.

Myricaceæ (Sweet Gale Family)

Myrica gale L. Sweet gale.

Betulaceæ (Birch Family)

Alnus rubra Bong. Red alder.

FAGACEÆ (BEECH FAMILY)

Quercus garryana Dougl. Garry oak.

SAPINDACEÆ (SOAPBERRY FAMILY)

Æsculus hippocastanum L. Horse-chestnut.

BERBERIDACEÆ (BARBERRY FAMILY)

Mahonia aquifolium (Pursh.) Nutt. Tall mahonia.
Mahonia nervosa (Pursh.) Nutt. Oregon grape.

GROSSULARIACEÆ

Ribes bracteosum Dougl. Stink currant.
Ribes divaricatum Dougl. Wild gooseberry.
Ribes sanguineum Pursh. Red-flower currant.

HYDRANGEACEÆ

Philadelphus lewisii Pursh. Mock orange.

ROSACEÆ (ROSE FAMILY)

Amelanchier florida Lindl. Serviceberry.
Cratægus douglasii Lindl. Black hawthorn.
Cratægus oxyacantha L. English hawthorn.
Holodiscus discolor (Pursh.) Maxim. Ocean-spray.
Osmaronia cerasiformis (Torr. & Gray) Greene. Indian-plum or bird-cherry.
Physocarpus capitatus (Pursh) Ktze. Ninebark.
Prunus emarginata (Dougl.) Walpers. Bitter cherry.
Pyrus fusca Raf. Pacific crabapple.
Rosa gymnocarpa Nutt. Dwarf rose.
Rosa nutkana Presl. Common wild rose.
Rubus leucodermis Dougl. Blackcap.
Rubus parviflorus Nutt. Thimbleberry.
Rubus spectabilis Pursh. Salmonberry.
Rubus thyrsanthus Focke. Himalayan blackberry.
Rubus ursinus Cham. & Schl. Trailing blackberry.
Spiræa douglassi Hook. Hardhack.
Sorbus aucuparia L. European mountain-ash or rowan tree.

CELASTRACEÆ (STAFF-TREE FAMILY)

Pachystima myrsinites (Pursh.) Raf. False-box.

LEGUMINOSÆ (PEA FAMILY)

Cytisus scoparius (L.) Link. Scotch broom.

ACERACEÆ (MAPLE FAMILY)

Acer glabrum var. *douglasii* (Hook.) Dipp. Douglas maple.
Acer macrophyllum Pursh. Broadleaf maple.

RHAMNACEÆ (BUCKTHORN FAMILY)

Rhamus purshiana DC. Cascara.

ELEAGNACEÆ (OLEASTER FAMILY)

Shepherdia canadensis (L.) Nutt. Buffaloberry or soopolallie.

CORNACEÆ (DOGWOOD FAMILY)

Cornus nuttallii Audub. ex T. & G. Western flowering dogwood.
Cornus stolonifera var. *occidentalis* (T. & G.) C. L. Hitchc. Western dogwood.

ERICACEÆ (HEATH FAMILY)

Arbutus menziesii Pursh. Arbutus or madrona.
Arctostaphylos uva-ursi (L.) Spreng. Kinnikinnick.
Gaultheria shallon Pursh. Salal.
Vaccinium parvifolium Smith. Red huckleberry.
Vaccinium ovatum Pursh. Evergreen huckleberry.

CAPRIFOLIACEÆ (HONEYSUCKLE FAMILY)

Linnæa borealis L. Twinflower.
Lonicera ciliosa (Pursh.) DC. Orange honeysuckle.
Lonicera hispidula (Lindl.) Dougl. Purple honeysuckle.
Lonicera involucrata (Richards.) Banks. Black twinberry.
Symphoricarpos albus (L.) Blake. Snowberry or waxberry.
Symphoricarpos mollis var. *hesperius* (G. N. Jones) Cronq. Creeping snowberry.
Sambucus racemosa var. *arborescens* (T. & G.) Gray. Pacific red-berry elder.

The initial plant survey was carried out in 1957/58 by Dr. L. J. Clark, Mrs. A. E. Blakeney (née Anne Gorham, botanist at Victoria College), and M. C. Melburn. The plant survey has been continued each year by M. C. Melburn with assistance from members of the association. The nomenclature of the vascular plants is, in most cases, based on that of Hitchcock *et al.* in " Vascular Plants of the Pacific Northwest."

For further reading, *see* Garman, 1963; Henry, 1915; Hitchcock *et al.*, 1955–64; Lyons, 1954; Szczawinski, 1959, 1962; and Taylor, 1966, in the Bibliography at the end of this report.

MISCELLANEOUS INVERTEBRATES

The microscopic life named here is but a small part of what could be found if a survey was made over a period of time. This list is the result of but a few visits to the lake.

Protozoans

Actinophrys sol.
Actinosphærium.
Amœba spp.
Difflugia (four or more species).
Lachrymaria lor (*see* Lowe, 1963).
Paramœcium.
Stentor.
Stylonychia.
Vorticella.

Gastrotrichs

Chætonotus.

Rotifers

Anuræa.
Floscularia.
Microdon.
Milicerta.
Noteus.
Notholca.
Philodina.
Polyarthra.
Rattulus.
Rotifer.
Stephanocerus.

Water Fleas

Alono guttata Sars.
Bosmina longispina Leydig.
Chydorus sphæricus (O. F. Müller).
Daphnia longispina (O. F. Müller).
Diaphanosoma brachyurum (Liéven).
Pleuroxus uncinatus Baird.
Simocephalus vetulus (O. F. Müller).

Copepods

Canthocamptus sp.
Cyclops albidus Jurine.
Cyclops bicuspidatus Claus.
Cyclops prasinus Fischer.
Diaptomus bakeri Marsh.
Epischura nevadensis Lilljeborg.
Eurycercus sp.

Cœlenterates

Hydra (green).

Tardigrades

Macrobutus sp.

For further reading, *see* Boyer, 1927; Lowe, 1963; and Needham, 1962, in Bibliography at the end of this report.

BUTTERFLIES

Anyone taking a walk through the district is not likely to see all the butterflies listed here in any one visit. They need to be waited and searched for, at the right time of the season, depending on the species.

Most butterflies visit the wild-flower blooms; therefore, a patient search around these is often rewarded by the sight of one or more. Some butterflies are great wanderers and may cover miles of territory in a single day; others are very local and will be found only near their favourite food plants.

The summit of a rock or open space is a good place to watch, as they are often carried up by the thermal currents of air. Still others are abundant one year and almost absent in another. In every case they are creatures of bright sunshine.

A knowledge of the flora give a lead as to what to expect in the butterfly line. To this end the food plants are mentioned in the following annotated list of 37 species.

It is hoped that by conservation and protection of the flora there will always be butterflies to delight future generations of human beings.

For a guide to identification, *see* Alexander B. Klots, 1958, in Bibliography.

Papilio zelicaon Luc. Mountain swallowtail. April to August. Umbelliferæ species such as *Daucus* (carrot), *Lomatium nudicaule* (Indian consumption plant), *Heracleum lanatum* (cow parsnip), etc. The caterpillar is green, ringed with black on each segment.

Papilio rutulus Luc. Western swallowtail. April to June. *Salix* (willows), *Populus* (aspen), *Prunus* (cherry), etc. The caterpillar has a couple of large eye-like spots on front segment (sometimes called niggerhead).

Papilio eurymedon Luc. Black and white swallowtail. April to June. *Alnus* (alder), *Holodiscus discolor* (ocean-spray), and other shrubs. The caterpillar is similar to *rutulus,* but the eye-spots are more elongate.

Anthocharis sara flora Wright. Western orange-tip. April to June. Crucifer species, *Arabis glabra* (tower mustard). The caterpillar is green, resembling the midribs of the leaves. The chrysalis looks like a thorn or sharp twig due to a long point on the head end.

Colias occidentalis Scud. Western sulphur. May to July. Leguminosæ (pea family). The caterpillar is greenish and matches the colour of the food plant.

Neophasia menapia F. & F. Pine white. July to September. On coniferous trees. The caterpillar is dark green with three white stripes, rendering it very inconspicuous among the needles.

Pieris rapæ L. Cabbage white. April to June and July to September. Cruciferæ (cabbage family).

Cœnonympha inornata insulana McD. Vancouver ringlet. May to October. Gramineæ (grass family). The caterpillar is greenish or brownish.

Œnis nevadensis F. & F. Great arctic. May to July. Gramineæ (grass family). The caterpillar is brownish, striped with a lighter colour. A strong flier.

Speyeria bremneri Edw. Bremner's silver-spot. July to August. *Viola* spp. The caterpillar is black with grey lines, and covered with branched spines.

Boloria epithore Edw. Western meadow fritillary. May to June. *Viola* spp. (violets). The caterpillar has branched spines on a more or less dark background. The meadow fritillary is a weak flier.

Euphydryas taylori Edw. Taylor's checker-spot. April to May. *Plantago* (plantain), *Camassia* (camas), *Plectritis* (sea blush). The caterpillar is dark grey with a series of branched spines covering the body. A characteristic butterfly of the area.

Phyciodes campestris Behr. Meadow crescent-spot. May to July. *Aster* spp.

Polygonia satyrus Edw. Angle-wings. July to September and after hiberation, March to June. *Urtica* (nettle). The caterpillar has a broad white band along the back.

Polygonia oreas silenus Edw. Silenus angle-wings. Flight period as in *satyrus. Ribes* (currant).

Nymphalis californica Bdv. Californian tortoise-shell. Flight as in the preceding species. *Ceanothus* (wild lilac) typically. The caterpillar is velvet black, having branched spines, the bases of which are yellow. Migrant only; it does not breed here.

Nymphalis milberti Godt. Milbert's tortoise-shell. June to September and after hibernation, April and May. It feeds on *Urtica* (nettle). The caterpillar is dark grey above, greenish-yellow beneath.

Nymphalis antiopa L. Mourning cloak. In the fall and again after hibernation in the spring. *Salix* (willows), *Populus* (aspen and cottonwood). The caterpillar is blackish with a row of red spots along the back. One of our commonest butterflies.

Vanessa atalanta L. Red admiral. July to September, and sometimes after hibernation. *Urtica* (nettle). A handsome butterfly, of wide distribution. The caterpillar's colour is variable, greenish-grey or yellowish.

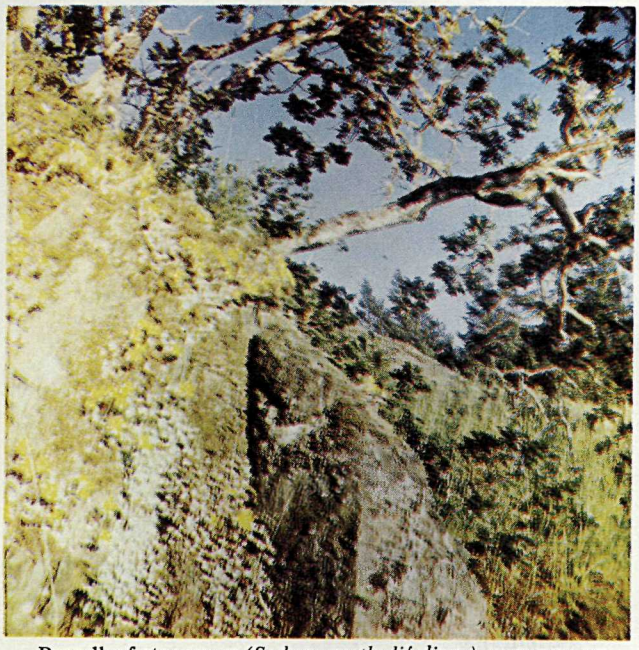
Vanessa cardui L. Painted lady. June to November. *Circium* (thistles). The caterpillar is variable, grey-green to blackish. It is cosmopolitan in distribution.

Vanessa carye Hbn. West coast lady. July to August, and occasionally in the spring after hibernation. *Malva* (mallow), *Urtica* (nettle). The caterpillar is blackish with orange blotches.

Basilarchia lorquini burrisonii Mayn. White admiral. June to August. *Salix* (willow), *Populus,* (poplar), *Prunus,* (cherry), *Holodiscus* (ocean-spray), and others. The caterpillar is well camouflaged by humps and a patchy colouring of grey and white.

Strymon melinus atrofasciata McD. Common hair-streak. April to May and again in July to August. *Rubus* (blackberry). Hops, beans, etc., where it feeds in the pods. The caterpillar is slug-shaped. Purplish-white to green, it is very variable in colour.

Strymon sylvinus Bdv. Bronze hair-streak. July to September. *Salix* (willow), dogbane, pearly everlasting, etc. The caterpillar is slug-shaped.



Broadleaf stonecrop *(Sedum spathulifolium)*, common on volcanic rock in association with Garry oak.

Northwest balsamroot *(Balsamorhiza deltoidea)*, an attractive plant of well-drained sites.

Mitoura nelsoni Bdv. Nelson's hair-streak. April to June. *Thuja plicata* (red cedar). The slug-shaped caterpillar is variegated-greenish.

Incisalia iroides Bdv. Salal butterfly. March to June. *Arctostaphylos* (bearberry), *Gaultheria* (salal), arbutus. The slug-like caterpillar is velvety green.

Incisalia mossi Hy. Edw. Moss elfin. March to June. *Sedum spathulifolium* (stonecrop). The slug-shaped caterpillar varies in colour from greenish to vinaceous.

Incisalia eryphon Bdv. Marbled elfin. April to June. *Pinus contorta* (lodgepole pine). The caterpillar is slug-like, and green.

Lycæna helloides Bdv. Purple copper. May to September. *Polygonum* (knotgrass) species. The caterpillar is slug-shaped and green, a common butterfly.

Everes amyntula Bdv. Western tailed blue. April to June. Lupines and vetches. The caterpillar is slug-shaped and variably grey-greenish with obscure dark markings. One of our commonest blues.

Glaucopsyche lygdamus columbia Skin. Columbia blue. April to June. Lupines and vetches. The slug-like caterpillars are coffee-coloured with oblique whitish dashes. Usually abundant.

Lycænopsis pseudargiolus echo Edw. Echo blue. April to June. *Holodiscus discolor* (ocean-spray). The slug-like caterpillar is pale greenish with creamy markings. One of our most abundant blues.

Thorybes pylades Scud. Northern cloudy-wing. May to June. *Trifolium* species. Common in oak glades and on hillsides.

Pyrgus ruralis Bdv. Two-banded skipper. April to June. *Potentilla* spp. (cinquefoil). The caterpillars of this group are large-headed with roughish bodies. This butterfly frequents dusty roads.

Erynnis propertius Scud. & Burg. April to May. *Quercus garryana* (Garry oak). The caterpillar is grey-green, with a large blackish head.

Hesperia comma manitoba Scud. July to September. Gramineæ (grasses). The caterpillar is grey-green to putty colour, and feeds within a tent of grasses spun together.

Ochlodes sylvanoides Bdv. Woodland skipper. June to September. Grasses, aster, thistle, etc. The caterpillar is similar in habits to *manitoba*.

VERTEBRATES

Fishes

Salmo gairdneri Richardson. Rainbow trout.

Ictalurus nebulosus (LeSueur). Brown catfish.

Lepomis gibbosus (Linnæus). Pumpkinseed, sunfish.

Amphibians

Taricha granulosa granulosa Skilton. Pacific Coast newt.

Ambystoma macrodactylum Baird. Long-toed salamander (possibility).

Plethodon vehiculum (Cooper). Western red-backed salamander.

Hyla regilla Baird and Girard. Pacific tree-toad.

Rana aurora aurora Baird and Girard. Red-legged frog.

Reptiles

Gerrhonotus cœruleus principis (Baird and Girard). Northern alligator lizard.

Thamnophis elegans nigrescens Johnson. Coast garter snake.

Thamnophis ordinoides (Baird and Girard). Puget Sound garter snake.

Thamnophis sirtalis trilineata Cope. Striped garter snake.

Descriptive references in the Bibliography are Carl, 1959, 1960, and 1966.

Birds

Common loon (*Gavia immer*). To be seen on the lake adjacent to the sanctuary in the winter months. It possibly nests here as it was present in June or July.

Horned grebe (*Podiceps auritus*). A winter visitor only.

Pied-billed grebe (*Podilymbus podiceps*). There is little doubt nests could be found in Prior and Thetis Lakes.

Double-crested cormorant (*Phalacrocorax auritus*). A winter visitor.

Great blue heron (*Ardea herodias*). Resident. There are two or three heronries close to Thetis, and possibly inside its boundaries.

Canada goose (*Branta canadensis*). Pairs of these birds nest in many of the lakes in this region, including Thetis.

Mallard (*Anas platyrhynchos*). An abundant resident, nesting in most of the local lakes, including Thetis.

American widgeon (Baldpate) (*Mareca americana*). Winter resident.

Ring-necked duck (*Aythya collaris*). A few of these ducks can be found in both lakes during the winter months.

Greater scaup (*Aythya marila*). Winter visitor in good numbers.

Common goldeneye (*Bucephala clangula*). Winter visitor in fair numbers.

Bufflehead (*Bucephala albeola*). Most of these wintering ducks arrive from their northern nesting-grounds during September and October and remain here until some time in April.

Hooded merganser (*Lophodytes cucullatus*). Winter visitor, although a few pairs have been found during the summer months and young families have been seen toward the end of June.

Common merganser (*Mergus merganser*). Winter visitor to Thetis Lake; breeding on most sizeable rivers on the Island.

Sharp-shinned hawk (*Accipiter striatus*). Fairly common resident.

Cooper hawk (*Accipiter cooperii*). Fairly common resident.

Red-tailed hawk (*Buteo jamaicensis*). Fairly common resident. It is hoped their small numbers will increase.

Rough-legged hawk (*Buteo lagopus*). A rare visitor. One record.

Golden eagle (*Aquila chrysætos*). An uncommon visitor to Vancouver Island.

Bald eagle (*Haliætus leucocephalus*). Seen fairly often over the park. At least five nesting-sites are known within 20 miles of Victoria.

Osprey (*Pandion haliætus*). One nesting-site known close to Thetis Lake.

Pigeon hawk (*Falco columbarius*). A winter visitor in fair numbers.

Blue grouse (*Dendragapus obscurus*). Resident in the sanctuary.

Ruffed grouse (*Bonasa umbellus*). Resident in the sanctuary. Neither of these grouse is in its former numbers.

California quail (*Lophortyx californicus*). A fairly common introduced bird.

Mountain quail (*Oreortyx pictus*). Introduced and uncommon in the park.

Ring-necked pheasant (*Phasianus colchicus*). A fairly common introduced bird.

American coot (*Fulica americana*). A winter visitor which has been known to nest in the Victoria district.

Glaucous-winged gull (*Larus glaucescens*). Our resident gull, and abundant.

Mew or short-billed gull (*Larus canus*). A common winter resident from August to April.

Herring gull (*Larus argentatus*). A winter visitor in fair numbers.

Band-tailed pigeon (*Columba fasciata*). A migrant and occasional winter visitor. Breeds in the park.

Screech owl (*Otus asio*). A resident nocturnal owl. More often heard than seen.

Common nighthawk (*Chordeiles minor*). A migrant, generally first seen early in June. Not seen in former numbers, but probably nests in the park.

Rufous hummingbird (*Selasphorus rufus*). To be looked for on the flowering maples and the red-flowering currant, the males in March and females in April.

Belted kingfisher (*Megaceryle alcyon*). A fairly common resident, nesting in most suitable habitats.

Red-shafted flicker (*Colaptes cafer*). Abundant resident.

Pileated woodpecker (*Dryocopus pileatus*). Resident in fair numbers throughout the coniferous woods.

Hairy woodpecker (*Dendrocopos villosus*). Resident in fair numbers.

Downy woodpecker (*Dendrocopos pubescens*). Resident in good numbers.

Northern 3-toed woodpecker (*Picoides tridactylus*). Observed in the sanctuary by four competent observers in 1959, but this species is rarely seen in the Victoria area.

Traill flycatcher (*Empidonax trailii*). Summer resident, mostly nesting in open spaces near water. Arrives about the middle of May.

Western flycatcher (*Empidonax difficilis*). Our most abundant flycatcher, arriving early in April and breeding throughout the district.

Olive-sided flycatcher (*Nuttallornis borealis*). Summer resident. Arrives early in May and breeds in wooded areas. Fairly common to the park.

Violet-green swallow (*Tachycineta thalassina*). Summer resident from the first week in March to early September. Our most abundant swallow.

Barn swallow (*Hirundo rustica*). A summer resident, arriving toward the middle of April and the last swallow to return south.

Purple martin (*Progne subis*). A summer resident, arriving early in April. Not common, but they do nest in the Highland District, so possibly also in Thetis Park.

Steller jay (*Cyanocitta stelleri*). A resident and often seen in Thetis, but whether they nest there has still to be proved.

Raven (*Corvus corax*). A resident, often nesting in coniferous trees.

Northwestern crow (*Corvus caurinus*). An abundant resident bird.

Chestnut-backed chickadee (*Parus rufescens*). Resident in good numbers and nesting wherever a suitable hole can be found in the trees.

Common bush-tit (*Psaltriparus minimus*). A small grey tit. It builds a hanging nest about 8 inches long and 2 inches in diameter, often from a branch of spirea.

Red-breasted nuthatch (*Sitta canadensis*). Resident in good numbers.

Brown Creeper (*Certhia familiaris*). Resident in good numbers in the park, with a nest generally built under the loose bark of a dead balsam or alder tree.

House wren (*Troglodytes ædon*). A migrant and summer resident, arriving toward the beginning of May. Fairly common in the park.

Winter wren (*Troglodytes troglodytes*). A common resident.

Bewick wren (*Thryomanes bewickii*). A resident found in fair numbers except in the deeper woods.

American robin (*Turdus migratorius*). A resident and a migrant in large numbers.

Varied thrush (*Ixoreus nævius*). Winter resident. Unpredictable in its numbers and dates of arrival.

Hermit thrush (*Hylocichla guttata*). A winter visitor, sometimes arriving at the end of August. Rather uncommon.

Swainson thrush (*Hylocichla ustulata*). Summer resident in good numbers.

Golden-crowned kinglet (*Regulus satrapa*). A winter resident, and a migrant, in good numbers but is rare in the summer, as only a few stay to nest here.

Ruby-crowned kinglet (*Regulus calendula*). A common winter resident, but, as far as is known, does not nest in the region.

Cedar waxwing (*Bombycilla cedrorum*). A resident, but erratic in its appearance. Nests over the area, generally in August or September.

European starling (*Sturnus vulgaris*). Their numbers have rapidly increased since first appearing in 1957. They nest in holes wherever possible, displacing our native birds.

Solitary vireo (*Vireo solitarius*). Summer resident, arriving early in April. While never numerous, the two vireos are fairly well distributed over the park.

Warbling vireo (*Vireo gilvus*). Summer resident, generally first seen early in May. More often heard than seen.

Orange-crowned or lutescent warbler (*Vermivora celata*). Summer resident, arriving early in April; possibly the commonest of the warblers.

Yellow warbler (*Dendroica petechia*). Summer resident, arriving about a month later than the orange-crowned, and in good numbers.

Audubon warbler (*Dendroica auduboni*). Summer resident, nesting in open country on bushes as do the two foregoing species.

Townsend warbler (*Dendroica townsendi*). Summer resident, arriving early in April. This warbler nests in coniferous trees and prefers a forested area.

MacGillivray warbler (*Oporornis tolmiei*). A late arrival in fair numbers, and nests sparsely throughout the park.

Wilson warbler (black-cap) (*Wilsonia pusilla*). Arrives about the beginning of May, and nests on the ground in bushy areas.

Brown-headed cowbird (*Molothrus ater*). A parasitic migrant, occasionally now found in winter. Rare prior to 1955, but has increased noticeably since.

Western tanager (*Piranga ludoviciana*). A summer visitor, arriving around the middle of May. Not common, but usually nests in the kind of habitat this park provides.

Purple finch (*Carpodacus purpureus*). Resident and fairly common in the park and undoubtedly nesting there.

Pine siskin (*Spinus pinus*). A resident and a migrant. Fluctuates in numbers. Sometimes seen in large flocks in winter, and probably nests in the park.

American goldfinch (*Spinus tristis*). A summer resident, occasionally found in winter. Generally first seen the third week in April.

Red crossbill (*Loxia curvirostra*). A bird of irregular habits, but in most years found in the park in fair numbers.

Rufous-sided towhee (*Pipilo erythrophthalmus*). Resident in good numbers. Generally nests in the open areas near the park entrance.

Oregon junco (*Junco oreganus*). Resident in good numbers. Nests in the park wherever suitable habitat occurs, generally on the ground.

Chipping sparrow (*Spizella passerina*). Summer resident, arriving about the middle of April. Formerly abundant, now seen less frequently.

White crowned sparrow (*Zonotrichia leucophrys*). Summer resident, arriving at the end of March. Also winters in small flocks throughout the district.

Fox sparrow (*Passerella iliaca*). Winter resident in fair numbers.

Song sparrow (*Melospiza melodia*). A common resident bird. In the park it frequents the more open areas.

Some of the birds which should be found in the sanctuary as they occur in territory adjacent are bluebird, lesser scaup, killdeer, pygmy owl, red-breasted sapsucker, myrtle warbler, evening grosbeak, house sparrow, green-winged teal, sparrow hawk, snipe, black swift, wood peewee, yellow-throated warbler, Savannah sparrow, wood duck, Virginia rail, spotted sandpiper, Vaux swift, red-winged blackbird, golden-crowned sparrow.

For a field guide, *see* Peterson, 1961, in the Bibliography.

Mammals

All of the species here listed have not necessarily been recorded within the actual boundaries of Thetis Park Nature Sanctuary. However, the close proximity of the areas in which they were taken or observed leaves little doubt that these species have occurred, and, in varying degree, still do occur there.

Shrews

Sorex vagrans vancouverensis Merriam. Wandering shrew.

Bats

Corynorhinus townsendi (Cooper). Western big-eared bat.

Eptesicus fuscus bernardinus Rhoads. Big brown bat.

Eptesicus fuscus pallidus Young. Pallid brown bat. (In migration.)

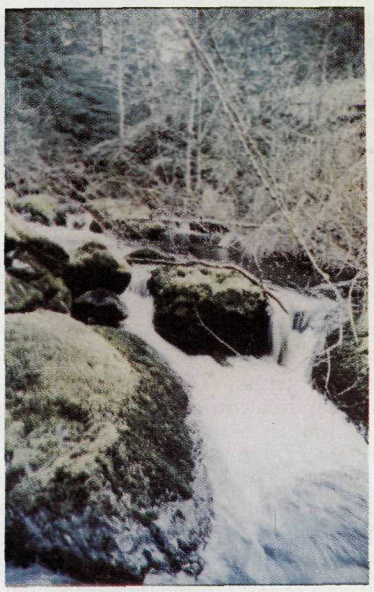
Lasiurus cinereus (Beauvois). Hoary bat.

Myotis californicus caurinus Miller. California myotis.

Myotis evotis pacificus Dalquest. Long-eared myotis.

Myotis lucifugus alascensis Miller. Little brown myotis.

Skunk-cabbage or yellow arum *(Lysichitum americanum)*, of marsh and stream habitats.



A stream habitat at Craigflower Creek on the eastern boundary of the sanctuary.

RODENTS

Microtus townsendi tetramerus (Rhoads). Townsend vole.

Ondatra zibethica osoyoosensis (Lord). Muskrat.

Peromyscus maniculatus angustus Hall. White-footed mouse.

Tamiasciurus hudsonicus lanuginosus (Backman). Red squirrel.

CARNIVORES

Mustela vison evagor Hall. Mink.

Procyon lotor vancouverensis Nelson and Goldman. Raccoon.

UNGULATES

Odocoileus hemionus columbianus (Richardson). Black-tail deer.

Like all faunal lists, the above is not necessarily complete. The river otter, the cougar, and the Vancouver Island water shrew are potentials in the park, as are the Old World rats and mice and additional species of bats.

For a guide to identification of these animals, *see* Cowan and Guiguet, 1965, in the Bibliography that follows.

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