Management Plan for the

Coats Millstone Reserve

Gabriola Island

Approved by Trust Fund Board
(Resolution #TFB 94/12)
February 1994

Revised by the Trust Fund Board
(Resolution #TFB 97/ 153)
September 1997

Management Plan for the
Coats Millstone Reserve on Gabriola Island

A. INTRODUCTION

A.1 Islands Trust Fund Vision

The object of the Islands Trust is

> ". . . to preserve and protect the trust area and its unique amenities and environment for the benefit of the trust area of British Columbia generally, in cooperation with municipalities, regional districts, improvement districts, other persons and organizations and the government of British Columbia."

The *Islands Trust Act (Act)* establishes an Islands Trust Fund, "for the purposes of carrying out the object of the Trust." The *Act* also establishes a Trust Fund Board (Board), "to administer the trust fund and to manage the real and personal property assets of the trust fund." The Board is authorized to acquire and hold money, land, and interests in land within the Trust area for purposes of carrying out the object of the Islands Trust. The Islands Trust Fund Plan (TFP), prepared by the Board and approved by the Minister of Municipal Affairs and Housing in 2002 in accordance with the requirements of Section 37 of the *Act*, outlines the vision, priorities, goals, and policies of the Board and actions which will be taken to support the object of the Islands Trust.

The **vision** of the Trust Fund Board is to create a legacy of special places, protecting both natural and cultural features in perpetuity, in order to help sustain the unique character and environment of the Islands Trust Area.

The **mission** of the Islands Trust Fund, as an active regional land trust, is to protect special places by encouraging, undertaking, and assisting in voluntary conservation initiatives within the Islands Trust Area.

These voluntary conservation initiatives include:

E. conservation education,

F. land donations to create protected areas, and

G. private land stewardship through conservation covenants and similar tools.

Lands with characteristics of interest to the Trust Fund Board must have one or more of the following features of significance:

- rare, threatened, vulnerable, exceptional or representative plants and plant communities,

- Garry oak, Arbutus, Douglas-fir and Western hemlock woodlands or forests,
- wildlife habitat or corridors,
- streams, lakes, wetlands, marshes or land associated with a body of fresh water,
- watershed or groundwater recharge values,
- shorelines, including beaches, rock outcrops and islets,
- coastal and inland cliffs,
- buffer areas adjacent or in close proximity to protected lands,
- unusual features or anomalies within the Islands Trust Area,
- archaeological sites,
- historic or cultural landscapes of significance,
- mixed rural landscapes such as farms or other rural areas that contain a mix of woodlands, creeks, wetlands, heritage orchards and cleared lands,
- opportunity for nature study or nature education programs,
- opportunity for low intensity, low-impact nature-related recreation, or

  scenic amenities or outstanding views.

It is the Board's policy to prepare management plans for properties held or occupied by the Trust Fund Board (2002). These plans vary according to the specific characteristics, needs, and proposed use(s) of the property. Local community groups may be requested to enter into management agreements with the Trust Fund Board regarding management operations and responsibilities on Board-owned properties.

Generally, management plans will address the following matters:

- purpose and objectives for the site,
- background information including the site history and local and regional context,
- environmental inventory,
- management issues such as the extent and nature of protection required, appropriate uses and level of use, research guidelines, risk management, special needs at the site, and

- strategies and actions to achieve the purpose and objectives for the site and to address management issues and needs.

This document presents an updated management plan for the Coats Millstone Reserve.

A.2 Background Summary

Acquisition History

The subject property was a donation to the Trust Fund Board by long time owner Mr. Clyde Coats. The Trust Fund Board has accepted the donation recognizing of the historic significance of the property to Gabriola Island and its natural and scenic values.

General Description

The Coats Millstone Reserve is approximately 0.25 hectares in size and encompasses part of a ridge rising to the south above Descanso Bay. The property is an old quarry which has created two rising tiers of exposed sandstone rock. A rough roadway runs parallel to Easthom Road several meters inside the boundary of the property. The southern two sides of the boundary roughly follow the top of a small cliff which makes up the highest portion of the property. This cliff face drops steeply to a rock shelf containing two groupings of about 30 millstone pools. This shelf drops steeply to a fairly level cleared 'landing' above the steep drop to Easthom Road. Rock boulders and unused, flawed millstones are piled in several locations on the property. A west facing view point along the access trail provides panoramic views of Vancouver Island, Texada Island, and the Coast Mountains.

Value to the Community

The property has considerable historic significance to Gabriola Island. Sandstone quarried from the property in the 1920's was used in the construction of some notable buildings. Pulp grinding mill stones quarried in the property during the 1930's supplied B.C. mills and were exported to Scandinavia. Groupings of vertical round holes from millstone removal have filled with water, creating aesthetically pleasing pools on flat quarried rock shelves.

B. RESERVE DESCRIPTION

B.1 Purpose

The purpose of the Coats Millstone Reserve is to preserve and protect, in perpetuity, the historical, natural and scenic values of the site.

B.2 Management Objectives

To achieve the Reserve purpose, the following management objectives have been established:

- preserve and protect a historic site of community significance;
- minimize effects of human activities within the reserve;
- minimize negative effects from surrounding land uses on the site; and
- allow natural ecological processes to continue

B.3 Project Partners

Management and maintenance responsibilities of the natural and historic site may be undertaken by a local group(s) approved by the Board through a Management Agreement.

B.4 Conservation Covenant

A Conservation Covenant, held jointly by the Nanaimo Area Land Trust and the Gabriola Historical Society is registered on the title to the Coats Millstone property.

C. PHYSICAL AND NATURAL FEATURES DESCRIPTION

C.1 Location

The Coats Millstone Reserve is located on Gabriola Island, one of the Gulf Islands in the Strait of Georgia directly east of Nanaimo on southeastern Vancouver Island. The property overlooks Descanso Bay in the northwest corner of the Island.

C.1.1 Legal Description

The property is 0.248 hectares in size and is described as:

Lot 5, Sec. 20, Gabriola Island, Nanaimo District, Pl. VIP57861 {PID#018-560-601}

C.1.2 Map Location

Map sheets 92G 011 (1:20,000) and 92G/4 (1:50,000).

Latitude: 49^{o} 11' Longitude: 123^{o} 53' UTM Coordinates: 376 473

Aerial Photo Line BCB 91021 Photo Numbers 44 and 45 Scale 1:10,000

C.1.3 Directions to Site

From the ferry landing at Descanso Bay, turn immediately right at Easthom Road. A small parking lot is located almost immediately after the turn on the left side of the road. From the parking lot, walk a short distance south along Easthom Road and follow a rough roadway which rises up from the left (east) side of the road.

The rough roadway leads onto the property from Easthom Road crossing the adjoining property outside the Coats Millstone Reserve. An easement across the property in favour of the Trust Fund Board has been registered by Mr. Coats to provide access to the Reserve.

C.2 Site Description

C.2.1 Climate

The climate of the Gulf Islands has been described by Chilton (1975) and reviewed by Oswald (1977) and Kenney *et al.* (1990). While there is some minor local variation, climatic averages are relatively consistent throughout the area. Since Gulf Island weather stations record only temperature and precipitation, the similar but more comprehensive records from the city of Nanaimo (Pojar and Meidinger 1991) are used to describe the climate of the region.

Climate in the southern portion of the Strait of Georgia exhibits a characteristic pattern of warm dry summers and mild wet winters. The maritime influence tends to moderate the effects of elevation, latitude, and aspect on local temperature and precipitation.

Temperature in the Nanaimo area can range from 40^{o}C to -17^{o}C but is generally much more moderate. The mean daily maximum temperature of the warmest month is about 23^{o}C and mean daily minimum temperature in the coldest month is about -0.4^{o}C. The frost free period is just over 185 days.

Annual precipitation is approximately 1125 mm. Precipitation generally increases from sea level to hilltops, and about 80 percent falls between October and March. Only a small percentage of winter precipitation falls as snow, which rarely lasts more than a few days on the ground. July is the driest month.

Warm temperatures and low precipitation in the summer months lead to a pronounced drought or moisture deficit. Moisture deficits are influenced by aspect, slope, vegetation cover, and the ability of the soil to retain moisture. The moisture deficit usually begins in June and ends with the autumn rains in September.

C.2.2 Physiography

The property rises between 40 and 80 meters above sea level (Map 2). The escarpment along the western boundary rises steeply above Easthom Road. Quarrying has produced two tiers of sheer exposed sandstone rock faces fronted by relatively flat benches (Map 3). The first tier is relatively small, running less than the width of the property. The second tier is much larger and is backed by a steep sandstone ridge that makes up the southern portions of the property boundary. Slopes on the property face northwest. Visitors must be cautious in the vicinity of the rock cliffs.

C.2.3 Geology and Soils

Gabriola Island is entirely underlain by the sedimentary formations of the Nanaimo Group, dating from 80 million years before present (Oswald 1977, Kenney *et al.* 1990). Most of the property is underlain by sandstone, but siltstone or shale may be found on the escarpment along the western boundary. The sandstone on the property was particularly valuable for millstones because of a horizontal grain (Coats, 1993).

Two soil types are found on the property (Map 4) (Kenney *et al.* 1990). Galiano soils on the escarpment on the western boundary are shallow (<50 cm to bedrock) and very gravelly with a coarse fragment content greater than 50%. Slopes exceed 70%. Saturna soils are sandy loams, or loamy sand, which have developed on colluvial and glacial drift

materials over sandstone bedrock. Depth to bedrock is typically around 50 cm with a coarse fragment content over 50%. The humus layer can be up to 10 cm deep. Both soil types are well drained and moist throughout the rainy season, but becomes droughty during summer. When these soils are saturated, subsurface water flow will occur.

Relatively steep slopes and rock faces, poorly developed soils, and boulder piles reduce the range of uses the property is able to support. Generally, well drained sandy loams with a coarse fragment content below 50% present little impediment to either concentrated or dispersed recreational use (Block and Hignett 1982). However, steep slopes and a higher percentage of coarse fragments and shallow soil makes trail construction difficult and limit site suitability for public use. Vegetation on thin soils and rock outcrops is quite susceptible to damage from trampling.

C.2.4 Hydrology

Water flow on the Coats Millstone Reserve property drains north and northwest into Descanso Bay (Hydrology Map 5). The round millstone holes have filled with water. Although these pools are thought to be connected, drainage appears to be restricted in most pools and the water is stagnant. There are no streams on the property, but surface and subsurface runoff and winter overflow from the millstone pools, collects at the base of rock faces. Groundwater recharge may occur through faults and contact zones between rock types in underlying bedrock.

C.2.5 Vegetation and Landscape Classification

The property is located within the Coastal Douglas-fir moist maritime (CDFmm) biogeoclimatic zone (Klinka *et al.* 1979, Meidinger and Pojar 1991). This zone is characterized by forests dominated by coast Douglas-fir (*Pseudotsuga menziesii* var *menziesii*) with a shrub understory of salal (*Gaultheria shallon*) and dull oregon grape (*Mahonia nervosa*). Vegetation communities are most strongly differentiated by available soil moisture, depth, and nutrient status. Western red cedar (*Thuja plicata*), grand fir (*Abies grandis*) and red alder (*Alnus rubra*) occur on moister sites. Garry oak (*Quercus garryana*) and arbutus (*Arbutus menziesi*i) are most often restricted to dry rocky sites on hilltops and along the coast.

Oswald (1977) integrated topography, exposure, slope, soils, drainage and vegetation to designate ten landscape units or categories for the Gabriola Island. This landscape unit framework is extremely useful in assessing site activity and development limitations. The property is dominated by the shallow soil landscape unit.

C.2.6 Flora and Fauna

The vegetation descriptions provided in this section are based on the landscape description of Oswald (l977) and site visits in November l993, l996 and during the spring flowering period in May l997.

The logging and fires associated with human settlement of Gabriola Island have resulted in a mosaic of different forest age classes and structures. Early logging typically removed the most valuable and accessible Douglas-fir and western red cedar, although a number of later 'passes' may have resulted in the removal of the majority of

mature trees on the site. The flora on the property has been extensively disturbed by quarrying. Many of the Douglas-firs which regenerated after the quarry site was abandoned have been recently thinned. Forest cover on surrounding lands has also been disturbed. The site provides some limited browsing for deer and drinking water in the millstone pools.

Remnant forest cover on the property is dominated by Douglas-fir. The thin soils have a low cover dominated by salal and oregon grape although creeping snowberry (Symphoricarpus spp.), kinnikinnick (Arctostaphylos uva-ursi), honeysuckle (Lonicera spp.), trailing blackberry (Rubus ursinus) and yerba buena (Saturja douglasii) also occur. There is a high cover of mosses such as Rhytidiadelphus spp. and Kindbergia spp.,Whitish fruticose (branched) lichens are present and on rocky outcroppings Stonecrop (Sedum spp.) is apparent. Willows (Salix sp.) and some thistles (Circium spp.) have become established by the upper millstone ponds. The escarpment along the western boundary is dominated by Douglas-fir, broadleaf maple (Acer macrophyllum) and some young cedars. A small stand of western red cedar with some patches of swordfern (Polystichum munitum) is found in the concave seepage area at the base of the cliff along with Little Monkey Flower (Mimulus Alsinoides), and various groupings of Mountain heliotrope (Valeriana sitchensis) sheltered at the base of the rock cliff.

Very different vegetation occurs around the lower millstone pools and in a seepage area at the base of the lower cliff in the centre of the property. The area around the lower pools is dominated by a stand of young red alder and broadleaf maple. The adjacent rock supports small lady fern (Athyrium felix-femina), wall lettuce (Mycelis muralis), fireweed (Epilobium augustfolium), the introduced grasses Poa pratensis and Dactylis glomerata, and various moss species. Duckweed (Lemna spp.) covers the water surface in the pools. The small seepage area at the base of the cliff supports alder, broadleaf maple, evergreen huckleberry (Vaccinum ovatum), salmonberry (Rubus spectabilis), mountain heliotrope, horsetail (Equiseum spp.) rushes, swordfern and lady fern, buttercup (Ranunculus spp.), wall lettuce, pearly everlasting (Anaphalis margaritacea), and a thick grass cover.

Thistles and Scotch Broom (Cystisus scoparius) are well established in some areas and could form the basis of an eradication program. Several exotic grasses, which are not yet all identified, would need some maintenance or control if site management included maintaining a native plant habitat.

C.2.7 Ecological Processes

Fluctuating climate since the last glacial advance has shaped the recolonization rates and species composition of plant and animals in the Gulf Islands. Each climatic period in the last 10,000 to 15,000 years has favoured specific species mixes over others. Present vegetation associations have located along a general gradient of moisture and nutrients, but natural disturbances, such as fire and windthrow also play a major role. Pools and seepage areas support moisture loving plant species, and may provide breeding habitat for some amphibian and insect species.

Human alterations to natural disturbance regimes, extensive landscape alterations, and the introduction of exotic species have substantially changed the composition and

character of remnant natural and semi natural areas. Rock outcrop and open upland forest vegetation communities are particularly vulnerable to invasions of exotic grasses, forbs such as thistles, and the shrub Scotch broom. These community types are also vulnerable to damage from grazing by sheep and cattle and recreational use.

After fire, or disturbances such as logging, tree establishment occurs in the newly available growing space, often for decades after the event. Smaller established trees not killed by the disturbance may be 'released' from the shading of the canopy and become the new site dominants. Once regenerating trees are large enough for the forest canopy to close, competition for light and nutrients becomes intense. Overtopped trees become stressed and may be killed by shading, insects, or disease. Standing dead and fallen trees from all sources play an important role in the ecology of the forest as sources of nutrients, soil stabilization, sites for plant establishment, and wildlife habitat. However, where stands are dense and there is little vertical separation between woody debris and the forest canopy, the risk of a major fire increases. This risk gradually decreases as the density of the stand decreases and the trees grow taller.

C.2.8 Key Environmental and Ecological Factors

Few environmental factors are relevant to the management of the property for historic interpretation and interest however, maintenance of natural values requires consideration and protection of areas sensitive to damage (Sec. C.2.3). . Mosses and lichens are very sensitive to damage from trampling. Soils, and vegetation, in seepage areas are also susceptible to damage from visitor access. There appears to be considerable potential for tree growth around the millstone pools which will limit views. The steep slopes and deep pools on the property are natural hazards.

C.2.9 Scenic/Aesthetic

The property has three major scenic features: the view of Vancouver and Texada Islands and the Coast Mountains, the unique round rock pools and lush vegetation, and the remnant millstones piled amongst the boulder rubble.

D. CULTURAL FEATURE DESCRIPTION AND BACKGROUND

D.1 Historical

The Coats Millstone Reserve property has considerable historical interest. The property was purchased by the Coats family in the 1920's and remained in the family until the time it was donated to the Trust Fund Board. Sandstone rock quarried from the property in the 1920s is said to have been used in the construction of Gabriola House in Vancouver, the San Francisco Mint, and repairs on the parliament buildings in Victoria. Pieces of old machinery, and the presence of blasting holes drilled in the rock are visible reminders of the quarrying process. Millstones quarried from the property in the 1930's were used in early pulp mills in B.C. and Scandinavia.

The millstones were created by vertically coring up to 1.5 m length cylinders as a plug in the bedrock. These plugs were extracted, trimmed and shipped to pulp mills. Discarded stones and empty millstone holes exist on the Coats Millstone Reserve. Approximately 30 holes exist on site.

The site illustrates aspects of industrial quarrying in British Columbia and is linked with the construction of significant buildings. This adds to the cultural significance to the property. The property is relatively close to the site of the Gabriola Island museum and could be linked to the museum programs through partnership arrangements.

D.2 Community Planning

D.2.1 Official Community Plan

The fundamental goal of the Gabriola Island Community Plan (Official Community Plan Bylaw No. 4, Schedule A, 1993) is to fulfill the "preserve and protect" objective of the *Islands Trust Act*. To accomplish this mandate, a number of environmental and social goals have been developed. Two of these goals are particularly relevant to the subject property. These are:

> "To preserve the natural beauty of the Trust Area and recognize that areas of sensitivity or unique value require special protective measures."
>
> "To ensure that access and opportunity, now and in the future, are provided for the public to enjoy and appreciate the Trust Area in harmony with the natural environment and existing communities."

Although criteria for areas of special significance (due to natural or human related features) have been developed for Gabriola and surrounding islands, sites of historic significance are not specifically mentioned.

D.3 Zoning

The property is currently zoned Park and Public Recreation in the Gabriola Island Zoning Bylaw No. 7 (1993). According to the bylaw, the purpose of this zone is to "protect existing parkland from the intrusion of incompatible uses and to designate land for the future development of public parks and public recreation facilities". The only designated uses are public parks, public recreation facilities and ecological reserves, and the only structures permitted are buildings, signs, and fences accommodating these uses. The zoning bylaw also requires that provision for off road parking be made in accordance with Section 4.7.

D.4 Surrounding Land Uses

Surrounding lands are generally residential in nature. The lands immediately adjacent to the property are currently being developed for residential use. Lands north and south of this reserve are zoned Residential 3 (R3) and subdivided into relatively small lots. Lands to the east are zoned Residential 2 (R2).

E. MANAGEMENT ISSUES

In the 10 years between the acquisition of the Coats Millstone Property and the revision of this plan in 2004, management of the Reserve has not encouraged or facilitated use of the site by the public. However, the management plan adopted in 1994 and revised

in1997 identified a number of management issues, and contained a number of objectives and strategies, that assumed use of the Reserve by the public.

Currently the Islands Trust Fund has inadequate resources available both for the development of the infrastructure needed to ensure safe access to, and use of, the site , and for ongoing management and maintenance needs.

Development of public access to some areas of the property may be possible in the future if more resources become available and particularly if a management group is willing to actively manage the site and raise funds for the development and upkeep of the infrastructure needed to make the site accessible to the public.

A number of management issues have been identified for the Coats Millstone Reserve. These include:

- steep cliffs;
- millstone hole pools
- trails and viewpoints
- physical access to property;
- trail closures;
- falling trees
- invasive plant species and exotic grasses; and
- fire potential.

Steep Cliffs

Steep cliffs are found at various points throughout the property. Any development of the site for use by the public would need to consider the risks associated with the cliffs. Although some areas may be avoided by channeling visitor use and discouraging exploration beyond designated trails, several natural view points exist above cliffs. Barriers and/or signs need to be considered at these natural view points.

Millstone Hole Pools

Although the millstone holes pools are an aesthetic attraction on the property, they pose a concern due to the depth (1.3 m) of the pools and the straight and slippery sides of the holes. The millstone holes occupy much of the area of the upper ledge on the site. Space for walking in this area is limited and in places moist surfaces are slippery. Getting to this area from the lower more accessible part of the property is difficult. For many years unauthorized access to the holes has been through the private property to the south.

Trails and Viewpoints

Physical characteristics of the site such as steep cliffs, slippery surfaces, and poor footing would make development of safe trails on the property difficult and expensive. Trail

development is not recommended with out careful consideration and planning to address safety, maintenance, and liability issues.

Trail Closures

In the spring of 2004 the Trust Fund Board decided to close the Coats Millstone Reserve to the public due to safety concerns. A sign, stating that the Reserve is closed was placed near the point where the access off Easthom Road enters the property. In November 2004 several large rocks were placed on the existing trail to prevent vehicles from entering the site and to block access to the adjacent lot to the south.

Physical Access to the Property

The reserve is physically accessible via a rough roadway leading off Easthom Rd. which crosses the property adjoining the Reserve property. No sign exists to identify the site. In 2004 a sign was placed near the point where the access road enters the Coats Millstone property stating that the Reserve is closed to public access.

Falling Trees

Tree stands in parts of the Coats Millstone Reserve have been extensively thinned over the history of the property. Remnant trees may be subject to wind throw or wind break. It is the policy of the Islands Trust Fund Board to allow natural processes to occur unless a safety hazard exists.

Invasive Plant Species and Exotic Grasses

Thistles and the exotic shrub Scotch broom (*Cytisus scoparius*) have become established in portions of the property.

Fire Potential

The vegetative cover on-site poses some fire potential. No fires should be allowed on the site.

F. OBJECTIVES AND MANAGEMENT STRATEGIES

F.1 Objectives

The purpose for the Coats Millstone Reserve is to preserve and protect, in perpetuity, the historic community significance, natural, and scenic values of the site.

The management objectives to achieve this goal include:

- protection of a historic site of community value;
- protection of the natural features of the site;
- minimizing negative effects from surrounding land uses on the site; and
- allowing natural ecological processes to continue.

F.2 Management Strategies

To achieve the objectives, the following strategies **may be** undertaken:

- if resources permit work with Gabriola Island Museum or other local group re: potential for interpretation of the site's historic significance on-site and/or at the Gabriola museum;
- maintain signage informing public that site is closed due to safety concerns
- discourage access from adjacent properties
- discourage activities that present a fire or safety risk; and
- monitor the property to identify any unauthorized use, or encroachment from surrounding lands.

G. MANAGEMENT AGREEMENT

The Trust Fund Board may contract a management group, by Agreement, to manage the Reserve for the Reserve purposes identified in this Management Plan. This Management Plan will form a Schedule to the Management Agreement.

BIBLIOGRAPHY

Agee, J. K. 1990. The historical role of fire in Pacific Northwest forests. Pages 25-38 *In* J. D. Walstad, S. R. Radosevich and D. V. Sandberg (eds.). *Natural and prescribed fire in Pacific Northwest forests.* Oregon State University Press, Corvallis.

Benn, D.R. 1975. Natural areas inventory: islands of the Strait of Georgia, Howe Sound, and Haro Strait, British Columbia. Nature Conservancy of Canada. Islands Trust.

Block, J. and V. Hignett. 1982. Outdoor recreation classification for British Columbia. APD Technical Paper 8. Assessment and Planning Division. B.C. Ministry of Environment. Victoria, B.C.

Chiltern, R. 1975. Climatology of the Gulf Islands Trust area. Appendix D *In* D.R. Benn. Natural areas inventory: islands of the Strait of Georgia, Howe Sound, and Haro Strait, British Columbia. Nature Conservancy of Canada. Islands Trust.

Coats, C. 1993. Owner of the subject property. Personal communication. November, 1993.

Coats, C. 1994. Owner of the subject property. Personal communication. February, 1994.

Gabriola Island Trust Committee (GITC). 1993. Gabriola Island Official Community Plan Bylaw No. 4.

GITC. 1993. Gabriola Island Zoning Bylaw No. 7.

GITC. 1993. Gabriola Island Subdivision Bylaw No. 8.

Islands Trust Fund Board. 1992. The Islands Trust Fund Plan. Islands Trust. Ministry of Municipal Affairs, Recreation and Housing. Victoria, B.C.

Kenney, E.A., van Vliet, L.P.J., and A.J. Green. 1990. Soils of the Gulf Islands of British Columbia: Volume 4. Soils of Gabriola and lesser islands. Report No. 43. British Columbia Soil Survey. Research Branch. Agriculture Canada. Ottawa, Ontario.

Klinka, K., F.C. Nuszdorfer, and L. Skoda. 1979. Biogeoclimatic units of central and southern Vancouver Island. B.C. Ministry of Forests. Victoria, B.C.

Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. Special Report Series 6. Research Branch. B.C. Ministry of Forests. Victoria, B.C.

Oswald, E.T. Gabriola Island and neighbouring islands: a landscape analysis. Canadian Forestry Service. Pacific Forest Research Centre Information Report No. BC-X-168. Victoria, B.C.