A photograph of a dense forest with tall, thin trees. In the lower-left foreground, a person with long hair, wearing a dark jacket and a backpack, is sitting on the ground and looking at a notebook. The forest floor is covered in green ferns and other vegetation. The background is filled with more trees, creating a sense of depth and a lush environment.

AN ECOLOGICAL FRAMEWORK FOR RESOURCE MANAGEMENT

BRITISH COLUMBIA'S rich natural resources have sustained human life and cultures for thousands of years. Only through careful management will this wealth of nature be sustained to meet the needs of future generations. Ecosystem classification provides a scientific framework to manage the province's diverse ecological systems.

Applying Ecosystem Classification in British Columbia

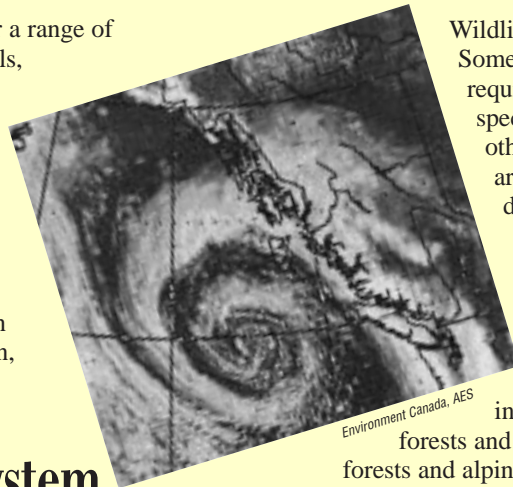
British Columbia's vast landmass encompasses a complex diversity of ecosystems, including some of the planet's most impressive forests, wildlife, and fisheries. Scientists use the process of "ecosystem classification" to make sense of this complexity. A wide variety of ecological information — about plants, animals, soils, landforms, climate — is used to describe, name, and classify the full range of ecosystems found in the province. This classification system provides an ecological framework to guide natural resource management.



Scales of Management

Ecological information is organized over a range of scales, from provincial and regional levels, to individual watersheds or landscapes, and down to specific sites within a landscape.

Land use and conservation goals are set at a provincial or regional level using broad scale climate and terrain information. At a local level, on the other hand, logging, reforestation and other management practices are based on site-specific information about vegetation, soils, and other ecological conditions.

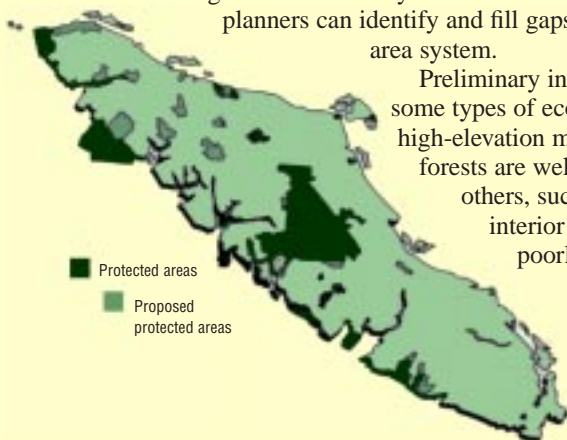


A Protected Areas System

One approach to maintaining biodiversity is to establish a system of protected areas, such as parks and ecological reserves, that represent the range of ecological diversity found in the province.

Using broad scale ecosystem classification, resource planners can identify and fill gaps in this protected area system.

Preliminary indications are that some types of ecosystems, such as high-elevation mountain hemlock forests are well protected while others, such as southern interior grasslands, are poorly represented.



Vancouver Island Protected Areas
Ecosystem classification was useful in identifying 23 new areas for preservation on Vancouver Island, including some Douglas-fir ecosystems, which are poorly represented in the existing protected areas system.

Managing Wildlife Populations

Wildlife management also takes place at various scales. Some small animals, such as frogs and salamanders, require only small patches of a specific habitat type, while others range over large areas and use many different habitats.

The home range of a Caribou herd in southern British Columbia, for example, spans several ecological zones —

in winter they feed on lichens in high-elevation forests and in summer they move between lower-elevation forests and alpine meadows.

Other species, such as Snow Geese, migrate across entire continents, and spend only part of the year in British Columbia. Managing these wide-ranging species requires broad scale ecological information and often involves co-operation between different provinces or nations.



The maintenance of biological diversity (biodiversity) has emerged as a fundamental goal of natural resource management. Managing for biodiversity means maintaining the diversity of native genes, species, and ecosystems.

Managing the Landscape

Local resource planning at a landscape level requires a more detailed approach. Through information provided by the ecosystem classification framework, the variety of different ecosystems in a landscape can be identified and mapped. Additional ecological data, reflecting specific land use objectives, can be incorporated into this framework.

For example, in community watersheds where water quality and quantity are a concern, information about soil stability, sensitivity to management practices, and fisheries values may be collected. For other land use objectives, such as maintaining biodiversity, it may be necessary to identify and map groups of ecosystems for a landscape.



Dennis Demarchi

Landscapes are composed of a mosaic of different ecosystems that are shaped by factors such as climate, topography, and natural disturbances.

Landscapes usually cover many thousands of hectares.

A Network of Representative Ecosystems

To maintain biodiversity in a particular landscape, resource managers may design a network of ecosystems for protective or restricted management. In forested landscapes, this may mean establishing Forest Ecosystem Networks (FEN) which encompass representative tracts of older forests, rare and sensitive ecosystems such as wetlands and streamside areas, and unlogged corridors that connect these areas.

Information collected through ecosystem classification helps resource managers to identify the ecosystems that should be included in such a network.



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Following Nature's Design

Natural disturbances such as wildfire, insect infestations, and windstorms shape complex patterns of ecosystems of varying sizes and ages across the landscape. For example, extensive tracts of young forest are common in ecological zones where frequent



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wildfires occur. Where wildfire is rare, trees die individually or in small groups leaving small patches of young forest within a landscape dominated by old forest. These landscape patterns change and shift over time, producing a mix of plant and animal species.

Within the ecosystem classification framework, researchers are studying the origin of these patterns and are learning how to create managed landscapes that more closely resemble natural landscapes. Wildlife biologists and ecologists are now using information about natural disturbance regimes to help foresters design logging practices that maintain a diversity of forest patches or stands in managed landscapes.



Managing Ecosystems

Site-specific classification of ecosystems is guiding the management of smaller units of land within a landscape. Foresters use the

ecosystem framework to manage forest stands by collecting data on tree and understory plant species present, stand age, soil type, soil nutrients, and soil moisture. With this information, specific treatments for the stand are prescribed, including the type of logging system and reforestation methods to be used.



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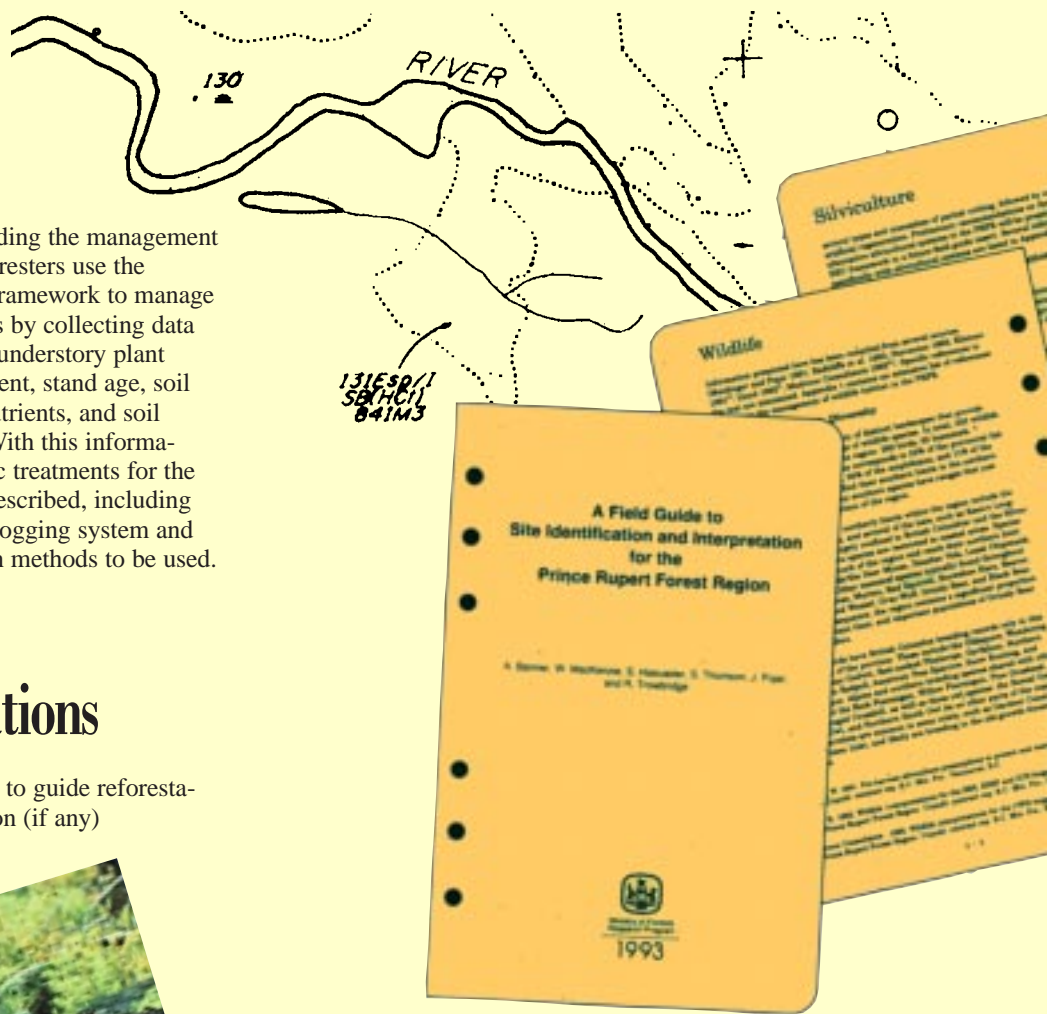
Reforestation Considerations

The ecological characteristics of a site are used to guide reforestation practices such as the type of site preparation (if any) to be applied, whether the burning of logging slash is to be permitted, and the species of tree to be planted.

While slashburning may be acceptable on wetter sites with deep layers of organic matter, it could damage sites with shallow or dry soil types.



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Future Applications

The usefulness of the ecosystem framework will increase as more ecological information is collected and incorporated. For example, data on woody debris (e.g., snags and fallen logs) are now being collected. This information will help to devise guidelines that specify the amount of woody debris to be retained in specific forest ecosystems. Woody debris has an important role in nutrient cycling as well as providing food and cover for a variety of wildlife.

Plants, animals and other forms of life interact with each other and with their physical environment — soil, air, and water — to form an ecosystem. Although an ecosystem may be as small as a rotten log or as large as the planet, scientists often define an ecosystem as an area with uniform soil, vegetation, and organisms.



Bill Swan



Ecosystem Classification in British Columbia

Resource managers use two different but complementary ecosystem classification systems to understand, manage, and communicate about British Columbia's natural diversity. The Ecoregion Classification system describes broad regional ecosystems based on the interaction of climate and landforms and is mostly used for conservation and wildlife management purposes. The Biogeoclimatic Ecosystem Classification system delineates ecological zones by vegetation, soils, and climate and is more commonly used in forestry.

Mapping British Columbia's Diversity

Ecoprovinces, Ecoregions, and Ecosystems

The Ecoregion Classification system divides the province into 10 large units called ecoprovinces, each having distinct climate and landforms. Ecoprovinces are divided into smaller units called ecoregions and ecosystems by further differences in climate and landforms.

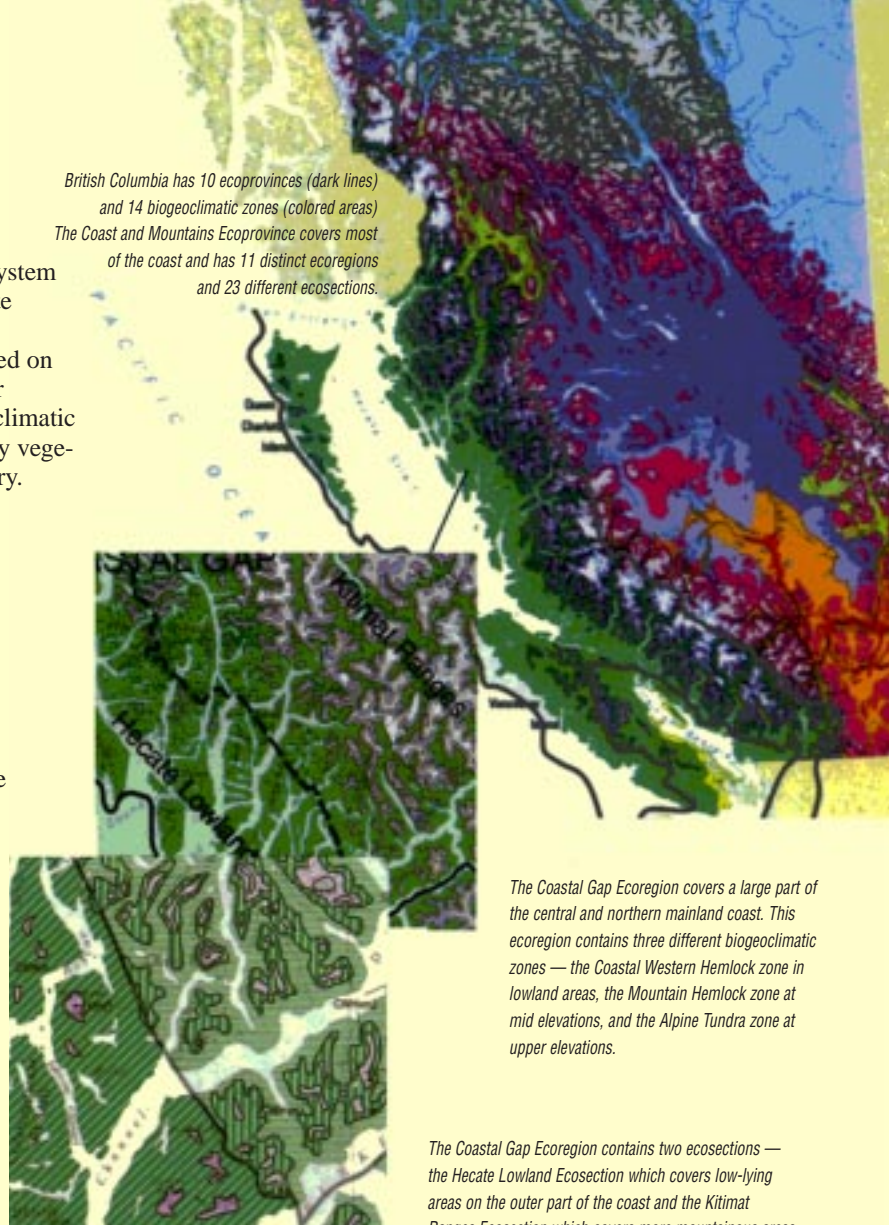
Biogeoclimatic Zones, Subzones, and Variants

The Biogeoclimatic Ecosystem Classification system divides the province into 14 different biogeoclimatic zones, each with different climate and vegetation. Biogeoclimatic zones are then divided into smaller units called subzones and variants based on further differences in climate, soils and vegetation. These biogeoclimatic units describe variation in climate, vegetation, and site conditions occurring within ecosystems.

Site Classification

Within each smaller unit, such as subzones or variants, the landscape contains a mosaic of ecosystems created by varying site conditions. For example, a lower slope site where the soil is deep and moisture plentiful supports a different type of ecosystem than does a ridge-crest site where soil is shallow and water drains away rapidly. At the site level, ecosystems are described on the basis of vegetation, soil, and site characteristics.

British Columbia has 10 ecoprovinces (dark lines) and 14 biogeoclimatic zones (colored areas). The Coast and Mountains Ecoprovince covers most of the coast and has 11 distinct ecoregions and 23 different ecosystems.



The Coastal Gap Ecoregion covers a large part of the central and northern mainland coast. This ecoregion contains three different biogeoclimatic zones — the Coastal Western Hemlock zone in lowland areas, the Mountain Hemlock zone at mid elevations, and the Alpine Tundra zone at upper elevations.

The Coastal Gap Ecoregion contains two ecosystems — the Hecate Lowland Ecosystem which covers low-lying areas on the outer part of the coast and the Kitimat Ranges Ecosystem which covers more mountainous areas further inland. Each ecosystem contains its own unique pattern of biogeoclimatic subzones and variants.



CWHvm2 Landscape Profile



Tony Hamilton

Mountains and sea dominate the landscape of the Coastal Gap Ecoregion. Rising from the sea, lower elevations are cloaked in dense and productive rainforests while higher areas support parkland and alpine ecosystems.

Ecological information, organized through the ecosystem classification framework, is used to guide the conservation and use of British Columbia's diverse and abundant natural resources. In many ways, however, natural resource management is a young science and to a large extent the workings of nature remain a mystery. Research is slowly filling the gaps of our ecological knowledge. Resource management practices will continue to evolve as our understanding of the natural world grows.

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