



Restoring British Columbia's
Garry Oak
Ecosystems
PRINCIPLES AND PRACTICES

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Chapter 11

Conclusion



Brittany Dewar, GOERT co-op student, cuts Scotch Broom (*Cytisus scoparius*) out of the vicinity of rare plants.
Photo: Chris Junck

Garry Oak ecosystems are among the rarest in Canada, and because the area that they occupy continues to decline, their loss adversely affects many animal and plant species. In addition, the loss of these beautiful ecosystems has degraded quality of life for many people. While the need for restoration of Garry Oak ecosystems is urgent, caution is warranted. Before the restoration process can be initiated, an understanding (to the extent possible) must be gained regarding the ecosystem, the species that it supports, and the associated natural processes. This knowledge can then be used to create a clear and consensus-based restoration plan.

Garry Oak (*Quercus garryana*), or Oregon White Oak, is restricted to the western portion of North America, generally along the Pacific coast. In British Columbia, the natural extent of Garry Oak and associated ecosystems has been greatly reduced due to agricultural and urban development. Garry Oak

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ecosystem plant communities in B.C. include Garry Oak woodlands, maritime meadows, vernal pools, vernal seeps, coastal bluffs, and Douglas-fir plant communities. Several authors have described ecosystem classification of Garry Oak in B.C.; however, not all plant communities in associated ecosystems have been classified. In this publication, **Restoration Ecosystem Units** were developed to help restoration practitioners create new plant communities on sites that no longer have a significant cover of native flora. These units provide information that can be used at a broad scale; for further details, the other classification systems can be referenced (e.g., Roemer 1972, Erickson 1998). As well, successional information can be used to determine which vegetation communities or stages could occur on the site that is undergoing restoration. Various successional stages often exist in mosaics across the landscape, depending on disturbance history. Because Garry Oak communities are dynamic, considering processes and stages of succession can shed much light on the restoration process for these ecosystems.

Dynamic natural processes and disturbances such as fire, disease, herbivory, and climate change are important to consider when restoring a Garry Oak ecosystem site. The first step towards integrating natural processes and disturbances into restoration is to **understand the processes** that affected the site historically, and those that are currently occurring. Since the present conditions and community composition differ from the historical state, re-introducing disturbance may not produce the desired restoration results. Garry Oak ecosystems are defined largely by their open savannah structure, which historically was maintained by a variety of disturbances, including fire, harvesting of bulbs, disease, weather events, and environmental conditions. Tree and shrub encroachment on deeper soil Garry Oak habitat in Canada has been linked to a disruption in the historical fire regime, which has led to an increase in Garry Oak and Douglas-fir (*Pseudotsuga menziesii*) trees, and both native and introduced shrubs. However, re-introducing fire will not produce the same results as it would have historically because the current conditions and plant community composition are different. Understanding the important role of natural processes and disturbances will improve the success of your project by helping you develop a restoration goal that is well-suited to the site and its conditions.

Long-term commitment and planning are required for all ecological restoration. This maxim is especially true when restoration efforts could affect species or ecosystems at risk. Species at risk, where present on federal lands, are protected under the federal *Species at Risk Act* (SARA). Although the Province of British Columbia provides some protection, no single piece of **legislation** protects species at risk or their habitats. Municipal or regional government legislation for the protection of species at risk may also exist. **Permits** are likely required when conducting work in the vicinity of species at risk. **Expert advice** should be obtained from a qualified specialist when planning any restoration project. A **detailed species inventory** should be conducted and completed by a qualified biologist. All threats to the rare species or ecosystems, and other special considerations (e.g., natural limitations on the species) should be identified. Moreover, species and/or ecosystem monitoring protocols should be considered right from the planning stage and should reflect the goals of the restoration project. Restoration goals should fit with the long-term goals and/or objectives of the recovery strategy for the species. Recovery actions should include mitigating threats to the species and to suitable available habitat.

Every restoration project can benefit from having a plan; a **restoration plan is essential** for medium- to large-scale projects. To be effective, a restoration plan needs to be developed before any on-the-ground work is performed but after the goal is identified. This allows time to fully



establish the context, goals, and objectives for the site in consultation with any interested parties. Setting **clear and realistic goals** for the restoration project is essential for success because these goals will set the direction for the project. Once the direction is established, information about the site should be gathered through **site inventories**. The data collected during these inventories will inform the next stage of restoration planning: writing the plan. The plan will serve as the basis for further discussion with any interested parties. There may be further refinements prior to conducting on-the-ground work. The restoration plan will consist of a list of **goals, objectives, and tasks** to be carried out; **a schedule; a budget; and a monitoring plan**. Once the restoration plan is written and agreed upon, the on-the-ground work can begin with clear direction.

Successful restoration depends on the **support and values of the public and community**. A project that includes the community in its vision, goals, and objectives from the start is much more likely to have success and long-term stability. The benefits of public involvement are many: stewardship, funding, volunteers, environmental education opportunities, efforts on adjacent properties. To capitalize on this involvement, it is important to build a **strong communications/outreach strategy** into the restoration plan from the very beginning. In preparing this strategy, you must carefully consider the desired and possible level of public participation; do not offer participation opportunities you are not prepared to follow up on. Once the level of participation has been decided upon, there are a variety of tools and approaches to use in gaining that participation. **Engaging youth** is particularly important because restoration is a long-term process which must involve the next generation. It is important to **celebrate successes** because this reaffirms the reasons for conducting the restoration and builds strong community support, which is essential to the long-term success of the project.

Inventory and monitoring are other keys to long-term success in restoring Garry Oak ecosystems. Inventory **documents the current status of a site** and identifies what species are present and their abundance. Inventory is also the essential first step in the monitoring process: without a baseline, change cannot be measured. Inventory is important for characterizing reference ecosystems, which allows the specification of restoration targets and assessing restoration progress. Monitoring is the process of making repeated measurements of habitat metrics **to detect change over time**; this data allows progress to be measured and is the foundation of adaptive management. Four key principles guide inventory and monitoring: (1) setting clear objectives, (2) ensuring reliability, (3) matching effort with outcomes, and (4) adopting an ecosystem-based approach.

Ecological restoration is the process of assisting the recovery of ecosystems that have been degraded, damaged, or destroyed. How can we assist the recovery of Garry Oak ecosystems? The first step in the development of an **effective restoration plan** is to determine the factors that have caused, or continue to cause, the degradation or damage. In simple cases, this might entail removal of alien invasive species. However, most Garry Oak sites are suffering from a variety of degrading elements: in particular, the loss of fire used in the traditional management of these ecosystems has had a profound effect. Some alien invasive species may have changed soil chemistry and micro-biota. Creating conditions that reverse these changes can be difficult. In fact, even identifying all of the ecological, social, and cultural attributes that have contributed to the development of Garry Oak ecosystems can be difficult. However, recognizing that there is a variety of elements that influence these ecosystems, and that these elements may change across



a site, allows us to establish restoration treatments that re-create the conditions that initially allowed these ecosystems to develop.

We hope that this will be a living document that is updated with new information as the practice of restoration within Garry Oak and associated ecosystems continues.

With the increase in international trade, world travel, and a changing climate, new alien species will continue to enter Garry Oak ecosystems. The management of alien invasive species in Garry Oak ecosystems tends to revolve around alien invasive plants; however, alien species consist of a wide variety of organisms. **Alien invasive species management** strategies focus on **preventing** the introduction of such species, **early detection of newly introduced** alien species, **developing a rapid response** to eliminate these species, and **managing** those species that become established.

Obtaining appropriate native species for restoration can be challenging because many species may not be available. Maintenance of **genetic integrity** is important when planning the restoration project, and **ethical guidelines** are available for collecting native plant materials. Most native plant species can be propagated readily through either standard sexual or asexual propagation methods, and with enough lead time, will be ready for outplanting on the restoration site in less than a year or two. Along with the

establishment of production schedules, overall record keeping is an important aspect of species propagation and supply. Record-keeping should begin at the initial collection stage, and continue through all growing phases to outplanting and afterwards for monitoring of the success of the restoration project.

This publication is meant to be a comprehensive, clear, and reliable source of information that will assist restoration practitioners in the process of restoring Garry Oak ecosystems. It is intended to provide a synthesis of current knowledge and practice that will contribute to the successful restoration of these endangered ecosystems. However, restoration is large field of study which is rapidly growing and quickly evolving; therefore, no document can cover all topics or remain current for long. We hope that this will be a **living document** that is updated with new information as the practice of restoration within Garry Oak and associated ecosystems continues. We can all make a difference! Let us know how your restoration project has progressed, how this publication has assisted you in your project, and how it could be improved (send an email to info@goert.ca).

References

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Partial Glossary of Terms as used in this Publication

- ACCLIMATION:** physiological adaptation of plant material to a new climate or environment
- ADAPTIVE MANAGEMENT:** a problem-solving approach which takes existing knowledge, explores alternatives, makes predictions of their outcomes, selects actions to implement, and monitors to determine if the outcomes match the predictions; these results are then used as a learning exercise and a basis to adjust future management plans and policy.
- ADJACENCY ARRANGEMENTS:** configuration of a patch of habitat and its adjoining elements
- AFTERCARE:** any cultivation requirements such as watering or fertilizing once young plants or seedlings have been removed from their growing containers and planted in the ground
- AGRO-FORESTRY:** land-use involving the integrated production of trees, other forest plants, agricultural crops, and animals, usually in a manner compatible with the cultural patterns of the local population
- AGRONOMIC:** pertaining to agriculture
- AIRFLOW:** speed of air over a surface
- ALIEN SPECIES:** species that have been moved outside of their natural home range (= non-indigenous species)
- ALLELE:** a discrete form of a gene due to a mutation
- ANTHROPOGENIC:** caused by humans
- APICAL MERISTEM:** a meristem is the tissue in most plants consisting of undifferentiated cells (meristematic cells), found in zones of the plant where growth can take place. An apical meristem is in the buds and growing tips of roots in plants. Its main function is to begin growth of new cells in young seedlings at the tips of roots and shoots (forming buds, among other things).
- ASEXUAL [PROPAGATION]:** propagation of plants or animals without a sexual phase. For plants, vegetative method of propagating by non-sexual means and from a single parent that does not involve the exchange of genetic material, e.g., cuttings or division.
- ASPECT:** facing in a particular direction
- AUTECOLOGY:** the study of relationships of individual organisms or species to environmental conditions
- AXIL [LEAF]:** angle formed by a main stem and the leaf that is borne on it
- BALLAST WATER:** water taken on by ships and used for stability during a voyage, usually purged upon reaching destination
- BASAL PLATE:** bottom part of a bulb (base of the modified stems) that growth originates from
- BASILINE STUDY / SURVEY:** an inventory of the flora, fauna, and other components of a site's ecosystems before a project begins, to serve as a benchmark against which trends and changes in the site's characteristics can be measured
- BASIDIOCARP:** fruiting body with basidia (clublike structure that produces spores) in fungi belonging to the family *Basidiomycotina*
- BEDROCK:** solid rock, either exposed at the land surface or underlying surficial deposits



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BEST MANAGEMENT PRACTICES [BMPS]: methods, measures, or practices designed to prevent or reduce damage or harmful alteration to species or ecosystems. Usually, BMPs are applied as a system of practices.

BIODIVERSITY: the variety, distribution, and abundance of different plants, animals, micro-organisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, and/or landscape level

BIOENGINEERING: a multi-disciplinary, applied science that uses living plant material as a component of site engineering and landscape construction in order to stabilize and conserve soils

BIOGEOGRAPHY: the study of the geographical distribution of living or dead organisms

BIOGEOCLIMATIC ZONE: the Biogeoclimatic Ecosystem Classification (BEC) is a land classification system that groups together ecosystems with similar climate, soils, and vegetation. This classification was developed in British Columbia and is widely used as a framework for resource management as well as for scientific research. In British Columbia, there are 14 biogeoclimatic zones identified, which are further refined into subzones and variants.

BIOLOGICAL DIVERSITY: (see biodiversity)

BIOMASS: total dry weight of biological matter on a site

BIOTA: all living organisms

BIOTIC AGENT: a living organism

BENTONITIC CLAY SLURRY: a slurry of bentonitic clay that expands when wet to seal cracks and seepage in bedrock

BILTMORE STICK: metre stick marked with approximate diameter of a circle when held against a tree approximately 60 cm from the observer's eye. [Observer lines "o" end of stick on one edge of stem and reads the number on the stick best matching the other edge. Developed and named by the Biltmore Forestry School in the U.S.A.]

BLUE LIST: a listing of elements of special concern, as determined by the BC Conservation Data Centre. The Blue List includes any ecological community, indigenous species, and subspecies considered to be of special concern (formerly vulnerable) in British Columbia. Elements are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed elements are at risk, but are not Extirpated, Endangered or Threatened.

BOLE: the stem of a tree

BONEMEAL: ground animal bones used as a plant fertilizer

BOTTOM HEAT: propagation heating mat used to increase germination of seeds as well as rooting of stem cuttings

BROADCAST: a technique for sowing seeds which involves scattering or spreading the seeds widely, with or without the use of a mechanical spreader

BROWN ROT: wood decay caused by fungi that utilize cellulose and hemicellulose for food leaving brown-coloured lignin compounds in the remaining wood



- BRYOPHYTES:** e.g. mosses, hornworts, and liverworts; primitive plants in the plant phylum *Bryophyta*, lacking a vascular system (the xylem and phloem that transport water, nutrients, sugars, and minerals)
- BULBLETS:** small bulbs produced between the stem and top of the soil
- BULBOUS:** having a bulb
- BUNCHGRASS:** grasses that grow as single plants with several stems clustered from one root system in clumps, tufts, or bunches, rather than forming a sod or lawn
- CALLUS:** mass of unorganized plant cells usually formed after injury (such as at the base of a stem cutting) to seal off the wound; this area eventually gives rise to organized cells such as roots in the case of a stem cutting.
- CANKERS [FUNGAL]:** an area of diseased cortical (bark) tissue with a sharply delimited margin on a branch or the stem of a tree
- CAPILLARY ACTION:** attraction of water in to soil pores, causing the water to move through the soil
- CAPITULUM:** a flowering inflorescence with sessile (stalkless) flowers
- CAPSULES:** dry fruit of angiosperms (flowering plants) that open up (dehisce) when ready to release seeds
- CAPTIVE-REARED:** the collection of animals or insects from the wild to produce offspring that will be returned to the wild; a method sometimes used for the recovery of endangered species
- CELLULOSE:** the complex carbohydrate that is the principal chemical constituent (with lignin and hemicellulose) of the cell walls of higher plants
- CLAYPAN:** a layer of clay (fine-textured material less than 0.002 mm) that is nearly impermeable, formed by the cementation of soil particles, which holds water at or near the surface of the soil
- CHAFF:** thin membranous parts surrounding seeds, such as wings, husks, etc., separated from seeds during processing of collecting seed
- CHEESECLOTH:** loosely woven gauze-like cotton cloth
- CLIMAX ECOSYSTEM / COMMUNITY:** the culminating, self-perpetuating seral stage in plant succession that is relatively stable and persists for long periods relative to other seral stages.
- [COARSE] PERLITE:** a natural soil amendment used to hold water; derived from volcanic glass which is heated to expand; can be used for starting horticultural cuttings
- COARSE SAND:** sharp sand derived from non-saline environments used in horticulture as a soil amendment or propagation medium
- COLD FRAME:** small roofed structure built low to the ground and having either a glass or plastic cover that is used to protect plants from winter conditions
- COLLUVIAL:** pertaining to colluvium, which are materials that have reached their present position as a result of direct, gravity-induced mass movements
- COMMUNITY COMPOSITION [PLANT]:** proportion of species relative to total in a given area; can be expressed as a percentage of relative cover, or cover and frequency of occurrence



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- CONKS (FUNGAL):** the spore-producing structure of a fungus, causing wood decay
- COSEWIC:** Committee on the Status of Endangered Wildlife in Canada; a committee of experts that assesses and designates which wildlife species are in some danger of disappearing from Canada
- CORM(S):** type of underground plant storage organ that is composed of swollen stem bases
- CORMELS:** small corms produced from the basal area of new corms
- CRITICAL HABITAT:** according to the *Species At Risk Act*, critical habitat is the habitat that is necessary for the survival or recovery of a listed species and that is identified in the recovery strategy or action plan for the species
- CROSS-POLLINATE:** pollination between two genetically-different plants of the same species; transfer of pollen from the anther (male reproductive organ) of one plant to the stigma (female reproductive organ) of another plant
- CRYPTOGAMIC:** cryptogams include fungi, lichens, mosses, liverworts and algae; a cryptogamic crust is a thin layer consisting of these nonvascular species that forms on soil in dry grasslands
- CULTURALLY MAINTAINED DIS-CLIMAX ECOSYSTEMS:** ecosystems that are maintained in a specific condition by some cultural activity. Deep soil Garry Oak ecosystems were maintained as camas harvest meadows by First Nations burning, preventing them from shifting to Douglas-fir (*Pseudotsuga menziesii*) forests.
- DAMPING-OFF:** fungal-induced death of seeds or seedlings
- DECIDUOUS [TREES AND SHRUBS]:** shedding leaves; usually meaning all leaves each year, in the autumn season
- DEGRADED ECOSYSTEM:** an ecosystem that has suffered a degrading activity (e.g. cattle grazing or control of fire or ploughing) that has led to a decrease in natural composition, structures, and processes such that population levels, structural complexity, and diversity of organisms have been changed in an unnatural manner
- DENDROCHRONOLOGICAL ANALYSIS [DENDROCHRONOLOGY]:** the study of growth ring patterns in trees to determine the age and prevailing environmental factors (e.g. drought, fire) that affected the specimen during its lifetime
- DEHISCENCE:** natural opening of a fruit or other seed-bearing structure of a plant to release seed
- DIS-CLIMAX ECOSYSTEMS:** ecosystems that are maintained at an earlier seral (successional state) by some activity, either natural or cultural (see culturally maintained dis-climax ecosystems). Areas along rivers that are subjected to flooding and ice scouring or ocean shorelines that may show a particular vegetation cover (e.g. Sitka Spruce) due to salt spray are examples of dis-climax ecosystems.
- DESICCANT:** drying agent used to remove humidity; used to keep seeds at low moisture content during storage (e.g. silica gel)
- DIAPAUSE [INSECT]:** suspended growth in response to adverse environmental conditions
- DIBBLE:** pointed garden tool used to make holes in the soil for seeds or seedlings
- DIRECT SOWING:** the sowing of seeds, by hand or with machinery, directly onto a substrate instead of into containers



DISTRIBUTION [SPECIES]: the spatial arrangement of a species within its range; the manner, pattern, or relative frequency with which individuals and populations of a species are distributed over the landscape

DISTURBANCE [ECOLOGICAL DISTURBANCE]: any relatively discrete event in time that disrupts ecosystem, community or population structure and changes resource, substrate availability, or the physical environment. (Pickett and White 1985). Disturbance can be from natural causes (e.g. fire, wind, earthquake, insect outbreak) or can be human-caused (e.g. invasive species, a bulldozer, or preventing a natural disturbance such as fire).

DISTURBANCE-BASED ECOSYSTEM: an ecosystem that exhibits high levels of disturbance and in which disturbance is critical to the system

DISTURBANCE REGIME / PATTERN: the spatial and temporal arrangement of disturbances

DIVIDE/DIVISION: the propagation of plants by separating the parent plants (i.e. not by seed or cuttings) such as through simple dividing of herbaceous perennials

DORMANCY/DORMANT[OF SEED]: method by which a plant storage organ, in this case the seed, fails to grow even though environmental conditions are favourable; for seeds there are two types: physical and embryo dormancy; [of plant] period when a healthy plant is not growing

DRAINAGE HOLES: containers for plant propagation need holes in the base to provide drainage for water

DRUPES: a fleshy fruit usually with a hard stone inside, e.g. plum or cherry

EARLY SERAL: ecosystems that establish soon after a disturbance. These may consist of herbaceous species in ecosystems that would eventually become forests, e.g. Fireweed (*Epilobium angustifolium*) after a forest fire.

ECOLOGICAL DISTURBANCE: see Disturbance

ECOLOGICAL FILTERS: the things that prevent the full establishment of the ecosystem. Compaction or excessive erosion may serve as filters that prevent ecosystem recovery.

ECOLOGICAL GRADIENTS: ecological gradients occur along transitions from dry areas to wet areas or from areas with sandy soil to areas with silty soils

ECOLOGICAL RESTORATION: the process of assisting the recovery of ecosystems that have been damaged, degraded or destroyed

ECOLOGICAL SUCCESSION: a series of dynamic changes in ecosystem structure, function and species composition over time as a result of which one group of organisms succeeds another through stages leading to a potential natural community or climax stage. Primary succession (pioneering) occurs when organisms colonize a previously empty area (e.g. bare soil) and secondary succession occurs on sites that had previously been colonized but then disturbed in some manner. Note that succession theories are still being debated by ecologists.

ECOREGION [ECOLOGICAL REGION]: an ecologically and geographically defined area that is smaller than an ecozone and larger than an ecosystem



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ECOSYSTEM: a complex system of living organisms (plants, animals, fungi, and microorganisms), together with their abiotic environment (soil, water, air, nutrients) that function together to circulate nutrients and create a flow of energy which creates biomass, structure in the living community, and a change in ecosystem form and function over time

ECOSYSTEM-BASED APPROACH: a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way

ECOSYSTEM ENGINEER: an organism that creates or modifies habitats (alien invasive species are often ecosystem engineers)

EDAPHIC FACTORS: edaphic pertains to the biological influence of soil conditions, such as moisture or texture, on the surrounding natural plant community

EDAPHICALLY CONTROLLED DIS-CLIMAX ECOSYSTEMS: dis-climax communities that arise because of soil conditions; soil salinity may cause an edaphically controlled dis-climax community

EMBRYO: dormant immature plant within a seed, or earliest diploid stage of an animal post sexual combination

ENDANGERED: a species facing imminent extirpation or extinction

ENDEMIC: native; indigenous to a particular area, and often with a restricted geographic range

ENCROACHMENT (FOREST/CONIFER): progressive expansion of plant species into another ecosystem, e.g. Douglas-fir expansion in to a Garry Oak woodland, converting an open ecosystem into a closed forest

EPHEMERAL: lasting only a short time; in the case of streams or ponds, flowing or full only briefly in direct response to recent precipitation

EXCISE [EMBRYO FROM A SEED]: method by which the embryo within a seed is carefully removed to determine the viability

EXOTIC SPECIES: exotic species are those that have been moved outside of their natural home range (= alien or non-indigenous species)

EXTIRPATED: a species that no longer exist in the wild in Canada, but does occur elsewhere

EXTINCT: a species that no longer exists anywhere in the world

FACULTATIVE [PARASITE]: a species that lives under certain conditions or in certain habitats, but does not require them; that is, it could also live in other conditions or habitats. A facultative parasite can live either as a parasite or not. In fungi, it is a fungus which can develop in living host tissue but is capable of spending part of its life cycle in dead host tissue.

FILTER: (see Ecological filter)

FIBROUS-ROOTED [PERENNIALS]: plants that have small fine roots that are easily divided and lack major structural roots (e.g. grass vs. oak tree)

FIRE-ADAPTED VEGETATION: plants that evolved and persisted in fire-maintained ecosystems and possess various structural adaptations and life history strategies that enable them to tolerate frequent, low-intensity fires

FIRE REGIME: the pattern of fire that occurs over time e.g., the average interval between fires and/or fire severity when fires occur



- FIRE SUPPRESSION:** active human intervention to prevent fires from occurring or at least restricting them to small areas through fire fighting activities
- FLAILING:** a method to collect fruit, usually from trees or shrubs, whereby the branches are struck with a stick so that the fruit falls onto tarps spread underneath
- FLAT:** a type of container used for plant propagation that is usually made of black plastic and measuring 25 by 50 cm and 6 cm deep [10" by 20" and 2.4" deep]
- FLORETS:** a small or reduced flower such as in grasses
- FORB:** an herbaceous plant with broad leaves, excluding the grasses and grass-like plants
- FRAGMENTED LANDSCAPES/ FRAGMENTATION:** alteration or breaking up of the landscape into discrete or tenuously connected 'islands' as a result of modification or conversion of the landscape by management activities (e.g. logging, development)
- GENE POOL:** the collective genetic information within a population, that is, the totality of genes and alleles in an organism's local population
- GENETIC INTEGRITY:** the ability of a breeding population or group of breeding populations to remain adapted to its natural environment
- GENETICALLY HOMOGENOUS:** all individuals of a population containing the same genetic information (i.e. not genetically diverse)
- GENOTYPE:** the entire genetic constitution, expressed or latent, of an organism (which differs from the physical appearance)
- GERMINATE:** emergence of plant part(s) from a seed; when the dormant seed begins to grow, eventually producing a seedling
- GIRDLING:** a technique used to kill live trees without cutting them down, by cutting a continuous all the way around the trunk, thus preventing the movement of fluids and causing death
- GLACIOMARINE CLAY:** fine-textured sediments pertaining to processes, sediments, and landforms associated with glaciers developed in marine waters. Marine shells or shell cast may be present.
- GLACIOMARINE CLAY-LOAM:** processes, sediments, and landforms associated with glaciers developed in marine waters containing between 28 and 40 percent clay mixed with 20 and 45 percent sand
- GRAMINOID:** grass-like plants including grasses, sedges, and rushes
- GROWTH CHAMBER [PLANT GROWTH CHAMBER]:** temperature, light, and humidity controlled environmental chamber
- HABITAT:** the specific environmental conditions which an organisms needs, either directly or indirectly, to survive and carry out its life processes
- HABITAT FRAGMENTATION:** alteration or breaking up of habitat into discrete or tenuously connected 'islands' as a result of modification or conversion of the landscape by management activities (e.g. logging, development)
- HAND-MASHED:** manual method for removing the seeds from fleshy fruits by simply crushing or macerating the fleshy pulp off the seeds vs. a mechanical method such as a household blender



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- HAND-PICKING:** removing fruits from a plant by hand, as opposed to flailing or mechanical methods
- HAND-RUBBED:** manual method to remove the seeds from macerated fleshy fruits by placing the pulp and seeds on a screen and then pressing down and rubbing to force the seeds through a screen and leaving the pulp on top
- HARDEN-OFF [PLANTS]:** method by which young plants or seedlings that have been propagated in cold frames or greenhouses are gradually exposed to the outdoor elements. This is usually over a week to two weeks whereby the plants are given a short time outdoors each day, and returned to the cold frame, gradually lengthening the time outdoors each day.
- HARDPAN:** a distinct layer of soil, nearly impermeable, formed by the cementation of soil particles with organic matter, silica, calcium carbonate, or iron oxides
- HEMICELLULOSE:** a carbohydrate constituent (with cellulose and lignin) of woody cell walls
- HERB LAYER:** the herb layer includes all herbaceous species, regardless of height, and some low woody plants less than 15 cm tall
- HERBACEOUS:** vegetation that is usually forbs, grasses, or leafy plants
- HERBIVORY:** consumption of plants or parts by grazers, e.g. deer
- HISTORICAL RANGE:** range of a species at a point in time in the past; in Garry Oak ecosystems this often refers to the period immediately prior to settlement by Europeans
- HOLISTIC ECOLOGICAL RESTORATION:** Defined by Clewell and Aronson (2007) as restoration programs that include personal and cultural values as well as ecological and socio-economic values.
- HOLOPARASITE:** parasitic plants which lack chlorophyll and are therefore wholly dependent on their host plant for the supply of water, nutrients, and fixed carbon
- HOST PLANT:** plants used by butterflies (and other insects) for laying eggs which then provide food for the larvae after hatching
- HUMUS:** well-decayed organic matter near the soil surface (beneath the litter layer but above the mineral soil)
- HYDROLOGY:** the study of water, its properties and movement (cycling), over and under land
- HYDROLOGIC REGIME:** changes with time in the rates of flow of rivers and in the levels and volumes of water in rivers, lakes, reservoirs, and marshes. The hydrologic regime is closely related to seasonal changes in climate.
- HYGRIC:** wet
- [IMPERMEABLE] SEED COAT:** the outer covering of a plant seed, that has become hardened so that it is impermeable to water (which is needed for germination to occur); type of physical dormancy in seeds
- INBREEDING DEPRESSION:** reduced reproductive success resulting in a decreased ability [of a population] to adapt to environmental stress; may be caused by a reduced genetic diversity within the population
- INCREMENT BORER:** a mechanized or hand tool for removing a small diameter core of wood from the stem of a tree for measuring of growth or assessing soundness of the wood



- INDIGENOUS SPECIES:** species that occur naturally in an area
- INFLORESCENCE:** flower cluster or the arrangement of flowers on a stem
- INGROWTH (FOREST/SHRUB):** gradual increase in numbers of a species on a site, filling in an opening
- INVENTORY:** generally, the collection (as a verb) or a collection (as a noun) of information to describe the state of an ecosystem or ecosystem characteristics at a particular point in time. Typically includes a list of organisms and/or their numbers and health, vigour, etc.
- INOCULATE:** deliberately placing a pathogen in contact with a host; trees are sometimes inoculated with fungal pathogens to create wildlife trees
- INVASIVE SPECIES:** invasive species are those whose introduction or spread threatens the environment, the economy, or society; invasive species can be either alien (exotic) or indigenous
- LADDER FUEL:** fuel that provides a vertical connection between surface fuels and crown fuels in a forest stand (e.g. tall shrubs, small trees, branches, tree lichens), thus potentially enabling a ground fire to rise and become a crown fire
- LANDSCAPE CLOTH/FABRIC:** weed barrier usually made of woven polypropylene
- LATH HOUSE:** type of wooden-open screened house used to provide shade for protecting new plants
- LEAF NODE:** location on the plant stem from which the leaves originate
- LEAF PETIOLE:** leaf stalk; “stem” of a leaf, which attaches it to the branch
- LITTER:** the top layer of the forest floor that is composed of relatively undecomposed organic material in the form of leaves, twigs, and branches shed from plants and below-ground inputs from the death of fine-root material
- LIGNIN:** one of the principal constituents (with cellulose and hemicellulose) of woody cell walls
- LOAM:** a soil containing a mixture of sand, silt, and clay
- MACERATE:** make soft and separate into constituents by soaking. Seeds of fleshy fruits are separated from the pulp by soaking to soften, then mashing and squeezing by hand, or machine, or rubbing through a screen, or floating (seeds sink and pulp rises to the surface).
- MALAISE TRAP:** a large, tent-like structure used for trapping flying insects
- MAST-FRUITER:** plant that produces seeds in abundance at irregular intervals of more than a single year. Garry Oaks are mast-fruiters.
- MATRIX OR FABRIC:** the background ecological system of a landscape with a high degree of connectivity. The dominant component in the landscape.
- MESIC:** a term meaning intermediate; describes an environment that has moderate moisture levels, neither too wet nor too dry. Water removed somewhat slowly in relation to supply; soil may remain moist for a significant, but sometimes short period of the year. A plant requiring a moderate amount of moisture.
- MICROHABITAT:** an small, identifiably different portion of a larger discrete habitat. A small, localized habitat within a larger ecosystem used by an organism.



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MICRONUTRIENTS: seven nutrients essential to plant growth and health that are only needed in very small quantities. These are manganese, boron, copper, iron, chlorine, molybdenum, and zinc.

MICROSITE: an area where very local conditions—moisture, temperature, light exposure, or nutrients—create suitable habitat for species not found in the wider habitat type

MINERAL SOIL: any soil composed of mineral materials. Mineral soil characteristics reflect their creation by weathering processes rather than biological processes.

MIST/MIST BENCH/MIST NOZZLE: An intermittent mist system will, in many cases, speed up the rooting process and allow the rooting of normally difficult-to-root species. Mist is used to maintain a film of water on the cuttings without saturating the medium. System requirements vary in the size of desired droplets, amount of water used, mist pattern, duration of intermittent spray, and maintenance needs. The droplet size should be in the range of 0.002 to 0.004 inch. Small droplet size allows the mist to remain suspended as a cloud for a few seconds before landing on the surface of the cutting.

MOISTURE REGIME: the aggregate of phenomena responsible for the entry, movement, consumption, and utilization of soil moisture by plants. It is the most important factor in soil formation and fertility.

MONITORING: the systematic collection of ecological data in a standardized manner at regular intervals over time designed to provide information on the characteristics of the ecosystem and their changes with time.

MYCELIAL STRANDS: Mycorrhizal fungi often produce mycelial strands which grow out from the root into the surrounding soil. Rootlike strands of the diffuse, indefinite body of a multicellular fungus, which is composed of many fine, branching tubes called hyphae.

MYCORRHIZA: a mutualistic association between a fungus and a plant, occurring primarily in the roots. A mycorrhiza is a symbiotic association between a fungus and the roots of a vascular plant allowing nutrient exchange between plant roots and fungi.

NATURAL PROCESSES: dynamic interactions between abiotic and biotic elements

NECROTIC (AS IN NECROTIC SPOTS REPRESENTING FUNGAL DISEASE SYMPTOMS): prematurely dead cells and living tissue. Necrosis is caused by factors external to the cell or tissue, such as infection, toxins, or trauma.

NICKING: mechanical breaking of the seed coat to overcome physical seed dormancy by cutting, drilling or filing a small hole in the coat of each seed before sowing. Usually applied to large, hard-coated seeds.

NON-LOCAL GENOTYPE: natural selection, driven by local conditions, can determine which genotype is successful and can change the makeup of the local population gene pool. A non-local genotype is one that has developed over time in a different geographic location.

NON-INDIGENOUS SPECIES: species that have been moved outside of their natural home range (= alien, exotic)

NOVEL ECOSYSTEMS: ecosystems that, due to invasive species or some level of intervention, have not occurred before

NUTRIENT-RICH: nutrient rich growing medium contains an adequate supply of all the macro and micro nutrients in the correct balance required for the successful production of plant life



NUTRIENT TRANSFER AND/OR EXPORT: movement of nutrients from one ecosystem to another. Salmon bringing marine nutrients to the forests along spawning rivers would be one example of nutrient transfer.

OBLIGATE [PARASITE]: A species that is restricted to a very narrowly defined environment. An obligate parasite can only be a parasite and often only on one host species. An obligate fungal parasite can live and complete its life cycle only in the living tissues of the host. See also Facultative

OUTBREEDING DEPRESSION: decreased reproductive success due to introducing plants of the same species from different populations [e.g. through seed collection] resulting in less genetically adapted offspring than either parent and than offspring of crosses between individuals from the same population

OUTPLANTING: refers to planting of propagated stock into a restoration site

OVIPOSIT: the process of laying eggs.

PACKRAT MIDDEN: nest of a packrat, often built in small caves, which may contain organic material that can provide clues about an ecosystem in the past

PARENT MATERIAL: the unconsolidated and more or less weathered mineral or organic matter from which a soil profile develops

PATCHINESS: a characteristic of discontinuous and heterogeneous environments consisting of a 'patchwork' of rather different habitats, resources, and ecosystems, as opposed to homogeneous or uniform environments

PATHOGEN: a biological agent that causes disease or illness to its host or range of hosts

PATHWAYS ANALYSIS: identifying the main pathways that facilitate a pest's movement and dispersal

PATHWAYS OF INVASION: the ways in which alien invasive species are introduced or spread

PERENNIAL: lasting more than one year; of plant duration, a plant whose life span extends over more than two growing seasons

PERLITE: volcanic glass that expands greatly when heated. It is an industrial mineral and a commercial product useful for its light weight after processing. In horticulture perlite is used in soilless growing mixes for aeration and retention. For rooting cuttings, 100% perlite is used.

PETIOLE: the stalk of a leaf, i.e. that part below the blade or, if the leaf is compound, below the point of insertion of the leaflets

PHENOLOGY: the timing of developmental events such as flowering, germination, seed set, etc.

PHENOTYPE: the physical appearance of an organism (morphology, physiology, biochemistry, behaviour) due to both underlying heritable genetic variation and variation driven by environmental conditions

PHYTOTOXIN: refers to a substance that is harmful or lethal to plants

PINCH: to pinch the growing tip, which will include the terminal set of leaves, between thumb and forefinger twist, and remove it. It will then branch from below.



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- PLANT ASSOCIATION:** a plant community represented by areas of vegetation occurring in places where environments are so closely similar that there is a high degree of floristic uniformity in all the layers—that is, the same species are present in similar proportions and age/size classes
- PLUNGE:** for cuttings, to thrust into rooting medium to ensuring firm contact of the stem to the medium without leaving gaps or pockets under the surface
- POPULATION:** refers to all of the organisms that both belong to the same species and live in the same geographical area such that inter-breeding is possible between any pair within the area
- POPULATION VIABILITY:** the probability that a population will persist across its range despite normal fluctuations in population and environmental conditions
- POROUS MIXTURE:** porosity is a measure of the void (i.e., “empty”) spaces in a material. A porous growing medium has empty spaces that allow for the movement of water and air.
- POT-BOUND:** a pot-bound or root-bound plant is one whose roots have filled all of the available space in its container. A pot-bound plant will be unable to properly take up moisture and nutrients.
- POTTING-UP:** the action of re-potting a plant into a larger container once its root system has grown to the maximum capacity of its present one.
- PRE-CONTACT:** prior to European settlement in North America
- PRE-DIAPAUSE:** the developmental stage of an insect immediately before a normal suspension in growth in response to adverse environmental conditions (diapause)
- PRE-TREATMENT:** treatment of seeds prior to sowing in order to improve germination. The condition of a site prior to restoration treatment.
- PRESCRIBED BURNING:** fires deliberately set by managers to produce disturbances or conditions that are beneficial to an ecosystem or that achieve management objectives
- PRICKING-OUT:** the transplantation of seedlings from germination trays to containers for growing on. Seeds germinated in open flats may need to be separated to allow room for them to grow. Pricking out is done just as seedlings develop first true leaves and before root development is too tangled together.
- PROPAGULE:** any structure with the capacity to give rise to a new plant, e.g. a seed, a spore, or part of the vegetative body capable of independent growth if detached from the parent.
- PROVENANCE:** the place of origin of a plant or propagule
- PUPA:** the life stage, following larva and before adult, of those insects that undergo a complete metamorphosis—four life stages.
- QUARANTINE:** compulsory isolation, typically to contain the spread of something considered dangerous. There are three quarantine Acts of Parliament Acts_of_Parliament in Canada: *Quarantine Act* (humans) and *Health of Animals Act* (animals) and *Plant Protection Act* (vegetations). The first legislation is enforced by the Canada Border Services Agency after a complete rewrite in 2005. The second and third legislations are enforced by the Canadian Food Inspection Agency. If a health emergency exists, the Governor in Council can prohibit importation of anything that it deems necessary under the *Quarantine Act*.



RANDOM SAMPLING: sampling without bias by, e.g., using a random-number generator to choose among items or locations to assess or measure; every possible sample has an equal probability of being selected

RANGE: of a species—the geographical area where a species occurs

RECONNAISSANCE SURVEYS: quick surveys that provide initial data that can be used for planning more in comprehensive surveys

RECOVERY STRATEGY: Canada's *Species at Risk Act* requires recovery strategies for all endangered species. A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the subsequent action plan stage.

RECOVERY TEAM: a technical committee charged with developing a national recovery plan for nationally threatened and endangered species

RECRUITMENT: generally, the addition to a population from all causes (reproduction, immigration, stocking). Recruitment may refer more specifically to numbers born, hatched, germinated, or sprouted but may also refer to non-living components, e.g. recruitment of snags or of coarse woody debris.

RED LIST: listing of elements of special concern, as determined by the BC Conservation Data Centre (www.env.gov.bc.ca/atrisk/red-blue.htm). The Red List includes any ecological community, and indigenous species and subspecies that is extirpated, endangered, or threatened in British Columbia. Extirpated elements no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered elements are facing imminent extirpation or extinction. Threatened elements are likely to become endangered if limiting factors are not reversed. Red-listed species and sub-species may be legally designated as, or may be considered candidates for legal designation as Extirpated, Endangered or Threatened under the *Wildlife Act* (see www.env.gov.bc.ca/wld/faq.htm#2). Not all Red-listed taxa will necessarily become formally designated. Placing taxa on these lists flags them as being at risk and requiring investigation.

REFERENCE ECOSYSTEMS: an ecosystem that can serve a reference for restoration activities

REEMAY CLOTH: a proprietary brand name for thermally spunbond, non-woven polyester fabrics used as covers in horticultural applications for their ability to transmit light, insulate, allow air circulation, and stop insect and weed-seed intrusion

RESILIENCE: refers to the ability of a plant or community to withstand environmental stresses such as drought, disease, and herbivory

RESISTOGRAPH INSTRUMENT: An instrument that measures and records the resistance to penetration of a small diameter drill as it passes through wood. Resistance decreases when decay is encountered.

RESTORATION [ECOLOGICAL]: the process of assisting the recovery of ecosystems that have been damaged, degraded or destroyed

RESTORATION TARGET: the prescription for what your site should look like and how it should function after restoration



- RHIZOME:** a root-like stem in the ground: a slender to much swollen underground stem that grows more or less horizontally
- RHIZOMORPH:** a compact strand of fungal hyphae with a dark outer coat that is capable of apical growth through soil and assists in spread of the fungus from a host to a suspect
- RIPARIAN:** pertaining to anything connected with or immediately adjacent to the banks of a stream or other body of water
- RISK ASSESSMENT (OF INVASIVE ALIEN PLANTS):** the process by which potential alien invasive plants and plant pests are identified and evaluated. It includes pathways analysis and pest risk assessment
- SARA:** Canada's federal *Species at Risk Act* (2003). SARA is the federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity. The purposes of the *Species at Risk Act* (SARA) are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of extirpated, endangered and threatened species, and to manage species of special concern to prevent them from becoming endangered or threatened. The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either extirpated, endangered, threatened, or a special concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.
- SALVAGE:** salvage plants are those recovered for translocation from a site which is to be destroyed by construction or development to another site undergoing restoration
- SAMPLING:** the collection of material or data about a portion (the sample) of a population for measurement in order to make estimates or inferences about the entire population
- SAPROPHYTE:** a fungus that obtains its nutrients by decaying dead organic matter
- SATURATION:** the point at which all pore spaces in a growing medium are filled with water and no air remains
- SAVANNAH:** generally classified as a state between open prairie or meadow and closed-canopy woodland
- SCALE:** bulb scales are the reduced leaves that make up the layers of bulbs such as Lilies and Alliums
- SCARIFICATION:** the process of pre-treatment of seeds to overcome physical seedcoat dormancy by softening, puncturing, wearing away or splitting the seedcoat in order to render it permeable, without damaging the embryo and endosperm within. Includes physical and biological methods, dry heating and soaking in water or chemical solutions. Destruction of impermeability at a single point in the seedcoat is normally sufficient to allow imbibition and gas exchange and hence embryo growth (germination).
- SEASOIL:** a proprietary name for a composted fish and forest fines soil from Vancouver Island, created by composting a mixture of fish (waste product) and forest fines (a logging industry term for bark and the organics that fall off of logs during the sorting process); contains abundant amounts of macro-nutrients, micronutrients and trace elements to produce healthy plants; has weed-free status.



SECATEURS: a small pair of shears for pruning, designed to be used one-handed, having a pair of pivoted handles, sprung so that they are normally open. Usually compose of a either a single cutting blade that closes against a flat surface (anvil pruners—used for hard, woody stems), or one blade that crosses another fixed blade, with a scissor action (scissor or cross-cut pruners—for general use and soft stems)

SEEDCOATS [SEED COAT DORMANCY/EMBRYO DORMANCY ARE DEFINED IN THE TEXT]: outer protective covering of a seed. The seed coat develops from the integument of the ovule. Also called testa.

SEEDLOT: refers to seeds of a particular crop gathered at one time and likely to have similar germination rates and other characteristics

SEEP: an area where minor groundwater flows out onto the land surface or into a stream channel. Seeps do not produce runoff at a visible rate.

SEEPAGE ZONES: areas where water seeps from the slope causing a specific vegetation assemblage

SELF-POLLINATION: refers to the transfer of pollen from a male reproductive structure (an anther or male cone) to a female reproductive structure (a stigma or female cone) of the same plant or of the same flower

SELECTIVE SAMPLING: samples are deliberately chosen by using a sampling plan that screens out materials with certain characteristics and/or selects only material with other relevant characteristics; for example, a sampling plan that selects certain microhabitats for sampling, e.g. vernal pools, to ensure that they are not over-looked by a random or stratified sampling technique

SEMI-HARDWOOD: mature stems from the current season's growth of a woody plant collected before the plant goes dormant. Semi-hardwood cuttings are still flexible, bending before breaking. Hardwood cutting snap if bent.

SEMI-SHADE: refers to dappled sunlight, where the full force of the sun is broken by a partial canopy of overhead foliage or screening but not all direct light is absent

SENESCENCE: generally, the process of ageing; in deciduous plants, the process preceding leaf shedding

SERAL COMMUNITY: a stage in a successional sequence

SHADE/LATH HOUSE: a constructed shelter which screens part of the sun from plants held within. In older structures the shading is provided by a grid of wooden lath. In new structures shading is usually provided by a synthetic 'shade cloth' which can be purchased in different weaves which provided specific percentages of shade.

SILT: a soil textural class (between 0.004 and 0.062 mm in diameter) in which silt particles are very abundant

SOIL AMENDMENTS: refers to a substance added to soil to increase its nutritive value, friability, moisture retention, or some other aspect

SOILLESS: a growing medium that uses sand, bark, and/or other ingredients, but not any actual soil. Soilless mixes are usually sterile and free of weed seeds

SOIL HORIZON: a layer or zone of soil or soil materials lying approximately parallel to the land surface with physical, chemical, and biological properties or characteristics that are distinct from the adjacent, genetically related layers



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- SPECIAL CONCERN:** a species that may become threatened or endangered because of a combination of biological characteristics and identified threats
- SPECIES DIVERSITY:** the fundamental unit in which to assess the homogeneity of an environment; refers to both a) the number of different species found on a site, and b) diversity within a species, both phenotypic and genetic
- SPECIES' RESIDENCE:** according to Canada's *Species At Risk Act*, the specific dwelling place, such as a den, nest or other similar area or a place that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding, or hibernating
- SPECIES-TRUE:** plants which are genetically the same as plants in your target restoration area/ reference site. Hybrids are not species-true; selections and cultivars may be.
- SPOROPHORE:** a fungal structure producing and bearing spores
- STAND DYNAMICS:** both apparent changes in plant population over time AND factors affecting the preceding
- STOOL BED:** refers to a nursery bed where stock plants are held for the production of cuttings. Plants are 'stooled' back, cut back annually to near the crown to force production of new wood suitable for use as cuttings in the next season.
- STRATIFICATION:** a method of artificially overcoming seed dormancy by placing seeds in layers of moisture-retaining media and keeping under generally cool and moist conditions for a period of time (or alternating cold and warm conditions), so as to simulate winter conditions.
- STRATIFIED SAMPLING:** samples are selected after the population has been divided into parts (stratified); stratification is usually done by dividing the survey area into sub-areas on a map or through on-site interpretation and classification
- STRIKE CUTTINGS:** a cutting 'strikes' when it grows roots. By extension, to strike cuttings is to prepare and place them in a rooting medium
- STYROBLOCK:** a proprietary name for Styrofoam growing containers, primarily used in forestry. The blocks are approximately 600 x 350cm and vary in depth from 50mm to 200mm. Blocks have from 8 to 540 cylindrical cells, partially open at the bottom depending on the species to be grown. They allow for relatively easy removal of seedlings with minimal root damage.
- SUBHYGRIC:** moist or imperfectly drained; water removed slowly enough to keep soil wet for a significant part of growing season; some temporary seepage and possibly mottling below 20 cm. Water source is from precipitation and seepage
- SUB-POPULATION:** a definable subdivision of a population, whether created artificially or naturally, with common, distinguishing characteristics
- SUBSPECIES:** a naturally-developed and recognised division of a species, either morphologically or genetically, that usually arises as a consequence of geographical isolation within a species
- SUCKER:** a secondary shoot produced from the base or roots of a woody plant that gives rise to a new plant



SUCKERING SHOOT: a strong shoot that arises in a mature plant from a root, rhizome, or the base of the main stem

SUCCESSION: a series of dynamic changes in ecosystem structure, function and species composition over time as a result of which one group of organisms succeeds another through stages leading to a potential natural community or climax stage. Primary succession (pioneering) occurs when organisms colonize a previously empty area (e.g. bare soil) and secondary succession occurs on sites that had previously been colonized but then disturbed in some manner. Note that succession theories are still being debated by ecologists.

SUCCESSIONAL STAGES: see Seral Communities

SUCCESSIONAL TRAJECTORY: the pathway an ecosystem takes from a bare site (pioneering) to a late successional (mature) state. This pathway is considered to occur within a defined framework of seral stages for a particular disturbance regime and ecosystem type, that is, it is a mostly predictable sequence of communities.

SUITABLE HABITAT: habitat that meets the species' requirements but does not contain the species

SWALE: a slight depression in generally level ground that may be slightly swampy

SWAMPING: a) suppression of a species by rapid invasion by one or more other species; b) [genetic]domination of introduced genetic material into a natural population, potentially causing outbreeding depression and reduce genetic diversity in the original (smaller) population.

SWOT ANALYSIS: a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project. It involves specifying the objective of the project and identifying the internal and external factors that are favorable and unfavorable to achieve that objective.

TALUS: angular rock fragments accumulated at the foot of a steep rock slope and being the product of successive rock falls; a type of colluvium

TAMP: to pack down [soil media] with repeated, even blows to firm before sowing seeds or inserting cuttings

TETRAZOLIUM TEST: a chemical test which provides a quick estimate of seed viability by staining with tetrazolium chloride. Viable embryos will stain reddish in colour.

THREATENED: a species that is likely to become endangered if limiting factors are not reversed

TILL: material deposited by glaciers and ice sheets without modification by any other agent of transportation

TOLERANT: able to withstand stress and function suitably

TRANSECT: a line followed across a study area while assessing its attributes

TRANSITIONAL ECOSYSTEM: a) a geographic boundary or transition zone between two different ecosystems. The term has been used to denote transitions at different spatial scales or levels of analysis, and may refer to any one of several attributes of the organisms involved. Also called an 'ecotone'; b) a mid-successional state or ecosystem (i.e., between two seral stages)



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TRANSLOCATION [including augmentation, introduction and re-introduction]: the capture and/or collection, transport and release, or introduction or reintroduction of plants, animals, or habitat from one location to another

TRANSPLANT: to lift and reset a plant in another soil or situation

UNDERSTOREY: canopies of trees and other woody species growing under larger adjacent trees and woody growth

UNFILLED SEED: a seed that is lacking an embryo and so cannot grow. Usually resulting from not being fertilized.

UNGULATE: hoofed grazing animals

UTM: Universal Transverse Mercator, a geographic coordinate system that is based on a 2-dimensional Cartesian coordinate grid used to specifying locations on the surface of the Earth

VARIANCE: numerical expression of variability in a data sample

VASCULAR: those plants that have lignified tissues for conducting water, minerals, and photosynthetic products through the plant. Vascular plants include the clubmosses, horsetails, ferns, gymnosperms (including conifers) and angiosperms (flowering plants).

VEGETATION STRUCTURE: the various horizontal and vertical physical elements of the community, i.e. the different sizes, branching structures, shapes

VERMICULITE: a natural mineral that expands with the application of heat and used in horticulture as a soil conditioner for its ability to increase porosity of a growing medium

VERNAL POOL: small pools appearing in the winter or early spring caused by winter rains, that dry out later in the summer

VIABLE: capable of sustaining life; in plants, viable seed has the ability to germinate; see also Population viability

VIGOUR: the capacity for survival or strong healthy growth in a plant or animal

VIRULENCE: a quantitative measure of the amount of disease caused by a parasite

VOUCHER SPECIMEN: a specimen that serves as a basis of study, for expert identification, and is retained as a reference; a voucher specimen should be archived in a permanent collection (usually in a museum, an institution with a mandate to preserve materials indefinitely). It serves as physical evidence of occurrence at time and place and of any identifications and descriptions based on it, always assuming that it is archived with adequate collection data. (Even if it is not stored in an accessible, permanent collection, a specimen collected for identification or analysis remains a voucher specimen).

VULNERABLE: a vulnerable species is one that may be close to extirpation or extinction

WHITE ROT: wood decay caused by fungi that utilize mainly lignin, leaving white cellulose compounds

WHIP: a slender, unbranched shoot or plant used to vegetatively propagate deciduous woody shrubs

WHIP CUTTINGS: dormant cuttings taken from slender, straight, unbranched stems of deciduous woody shrubs



WHOLE TREE FAILURE: the tree is alive, with foliage, but because many of its structural roots are dead and decayed, there are not enough roots to support the weight of the above-ground parts. The tree falls over with or without help from wind.

WILDLIFE HABITAT AREAS: In British Columbia, the Identified Wildlife Management Strategy (IWMS) establishes two categories of wildlife which require special management attention to address the impacts of forest and range activities on Crown land. These two categories are the Category of Species at Risk and the Category of Regionally Important Wildlife. Wildlife habitat areas (WHAs) are mapped areas that are necessary to meet the habitat requirements of an Identified Wildlife element. WHAs designate critical habitats in which activities are managed to limit their impact on the Identified Wildlife element for which the area was established.

WINNOWING: to clean debris (chaff) from seed by a current of air; to blow seed coats, remains of flowers, and other light debris from heavier seed

WINTER ANNUAL: a plant that germinates in autumn or winter, lives through the winter, then blooms in winter or spring

WOODY CUTTING: cutting taken from a mature, woody stem

WOODY DEBRIS: a term used for fallen dead trees and the remains of large branches on the ground in forests

WOODY PLANT: with the stems and limbs containing lignin

WOODY STEM: mature stem, hardened and usually with bark

XERIC: Water removed very rapidly in relation to supply; soil is moist only for brief periods following precipitation. For a plant, of, or adapted to, an extremely dry habitat.

YELLOW LIST: species and ecosystems in British Columbia that are considered secure as determined by the BC Conservation Data Centre



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