menziesia

Newsletter for the NPSBC Native Plant Society of British Columbia
Spring 2002 Volume 7, Issue 2

NPSBC workshops 2002

The intent of the NPSBC workshops is to share the knowledge of native plants that exists in our province (and sometimes beyond), and encourage the use of native plants in our landscape and in our home gardens. We strive to provide a variety of workshop topics that are suitable for home gardeners, naturalists, and professionals. Our goal is to provide those looking to expand their knowledge of native plants with the opportunity to learn from both academically trained instructors and self-taught botanists who bring an area of native plant expertise to the participants. Preliminary handout material may, in some cases, be made available so that participants can come prepared to get the most out each workshop. Information will be evenly balanced with hands-on, practical field or lab experience. Light lunches are included in the registration fee, as well as all handout material. A social, no-host dinner will also be planned for the Saturday evening.

The workshop hours will normally be Friday, 7:00 p.m. – 9:30 p.m.; Saturday 9:00 am – 5:00 p.m. and Sunday 9:00 am – 3:00 p.m. although exact times will vary with individual workshops.

Registration fee: Most rates are $100 for members, $120 for non-members. Make cheques payable to "The Native Plant Society of B.C."

Number of participants: Minimum of 12, maximum of 20.

Refund policy: Full refunds will be given up to 30 days prior to the workshop.

How to register: A coordinator and contact number is listed for each workshop. Please contact the coordinator for each workshop for further information and workshop registration.

Whether your interest in native plants is for the home or civic garden, or for professional application, the NPSBC Native Plant Society of BC hopes that these workshops will inspire you to encourage, promote and protect native plants and habitats.

Here is the list of exciting workshops planned for 2002:

May 17-19

An Introduction to Mosses and Liverworts

Instructor: Dr. Wilf Schofield and Shona Ellis

Registration coordinator: Brenda Ramsay Tel: (250) 638-8436 Fax: (250) 638-8436 email: bramsay@kermode.net

Participants are asked to bring a hand lens and Dr. Schofield's field guide, *Some Common Mosses of BC*. We will work with available keys and literature, getting a feel for the species variability in the bryophytes. Be prepared to spend time in the field. An opportunity will be provided to assemble your own named reference collection.

See 'Workshops' on page 3

What's inside

Events

Vancouver, Sun, Apr 7

Pacific Northwest Native Plant Sale. Participating nurseries will sell directly to the public, with an extensive collection of containerized trees, shrubs and perennials for purchase. Educational demonstrations on native plant propagation and other topics will take place in the pavilion inside the botanical garden. These will complement other, continuing features of the sale: exhibits by organizations with an intrest in native plants and habitats, horticultural information on native, and tours of the BC Native Garden.Organized by the Native Plant Society of BC and the Friends of the Garden. UBC Botanical Garden, 6804 SW Marine Drive. 11 am – 4 pm. For information, email npsbc@hotmail.com

Richmond, Wed, Apr 17

Biological and Other Motivations for Reserve Designs on the BC Central Coast. Speaker: Dr. Peter Arcese, Department of Forest Sciences, FRBC Chair in Conservation Biology, University of British Columbia. Part of the Conservation Biology Lecture Series, sponsored by the UBC Department of Geography and the Richmond Nature Park Society. 7:30 pm in the nature centre. Call 273-7015 for further information. Admission by donation.

Vancouver, Thurs, Apr 18

Seaweeds: What can they tell us about coastal refugia during the last ice age. Speaker: Sandra Lindstrom, an adjunct professor at the University of British Columbia and the University of Alaska. She has been interested in the biology of seaweeds for 30 years and is co-author of North Pacific Seaweeds, as well as numerous scientific papers. Her research focuses on the biogeography, phylogeny and systematics of seaweed flora of the Northeast Pacific, with emphasis on areas that were glaciated. She has also participated in a number of ecological assessments, including an 8-year study of the effects of Exxon Valdez oil spill on the inter-tidal biota of Prince William Sound. Dr. Lindstrom received an M. Sc. in marine biology and a Ph.D. in botany from the University of British Columbia. Sponsored by the Botany Section of the Vancouver Natural History Society and the NPSBC. 7:30 pm, Kitsilano Room of the Vancouver Museum, 1100 Chestnut Street. Program coordinators: Eva Nagy 604-929-4286 and Olivia Lee 604-602-4700.

Victoria, Thurs, Apr 18

Native Grasses of the Garry Oak Ecosystem by Carrina Maslovat, M.Sc. Sponsored by the Victoria Native Plant Study Group. 7 pm in room C108 of the D.F.Strong Building at UVic. For information, contact Rossalynn Woodgate at 250-748-2558 or rwoodgate@shaw.ca (*Please note change of date from that mentioned in the last newsletter*.)

Vancouver, Sat, Apr 27

Native Plants for Urban Gardens with Eva Antonijevic. Discover the natural beauty and versatility of our native BC plants. Sharpen your identification skills and learn about the best native plants for landscaping. You will take home seeds collect at VanDusen to grow in your garden. VanDusen Botanical Garden. 10 am to 12:30 pm. Member: $29 Non-member: $34. Info: 604-257-8151 or www.vandusengarden.org

Vancouver, Sun, Apr 28

25th Aniversary Plant Sale. 10 am – 4 pm. If you would like to volunteer for the native plant section, contact Frank Skelton at 604-228-8879 or fskelton@telus.net

Victoria, Thurs, May 16

The Nature Conservancy and the Elkington Garry Oak Nature Conserve by Tim Ennis, the Nature Conservancy, Manager, Elkington Property, and Andrew MacDougall, doctoral candidate, UBC. Sponsored by the Victoria Native Plant Study Group. 7 pm in room C108 of the D.F.Strong Building at UVic. For information, contact Rossalynn Woodgate at 250-748-2558 or rwoodgate@shaw.ca

Castlegar, June 16-19

The joint meeting of **Botany BC and Botany Washington** will take place at the Selkirk College in Castlegar, British Columbia. Watch for further announcements posted on the NPSBC-l email discussion list, or at the BEN web site: http://www.ou.edu/cas/botany-micro/ben

Invermere, BC - July 7-13

2002 Wetlands Institute: Glaciers to Goosenest. Offered by the BC Wildlife Federation, Wetland Education Program. Cost $400. Develop in-field wetland mapping, surveying, identification and data compilation techniques while learning about the importance of wetlands in relation to human health. Email wetlands@netidea or call (250) 354-1088 for more information.

'Workshops' cont'd from page 1

Victoria, June 7-9

Identification of Grasses
Instructors: Dr. David Blundon and Perry Grilz.
Coordinator: Susan Bastin Tel/Fax: (250) 361-3122
You will never look at grass in the same way again! This workshop will give you the opportunity to learn up close and personal, the characteristic differences between grasses that are found in and around Victoria (*and around the world*). Dr. Blundon is an instructor at Camosun College and Perry is a Range Specialist with the Prince George Forest Region. Don't miss this opportunity to *enjoy* learning about what can be a complex group of plants to sort out.

Vancouver, June 8-10

Plant Identification, Plant Collection, Pressing and Mounting
Instructors: Shona Ellis, Fred Ganders and Olivia Lee.
Spring flowers are irresistible! Discover from the experts how to identify, collect, and correctly press and mount your samples for a personal herbarium or framing. Learn how to use a dichotomous key for step by step identification of plants.
Registration coordinator: Brenda Ramsay Tel: (250) 638-8436 Fax: (250) 638-8436 email: bramsay@kermode.net

Vancouver, June 21-23

Flower Photography for Everyone
Instructors: Ron Long and David Williams
Learn practical hints and techniques for improving your photography, whether you are a beginner or advanced. Bring a selection of your slides or prints for critiquing on Saturday afternoon. Join the instructors for a "shoot" in the Botanical Garden. A quick turn-around of film developing will allow for a critiquing session of our photographs on Sunday morning. Additional cost for this workshop: $9.99 + taxes for film developing
Registration coordinator: Brenda Ramsay Tel: (250) 638-8436 Fax: (250) 638-8436 email: bramsay@kermode.net

Victoria, Oct 11-13

An Introduction to Lichens
Instructor: Dr. Irwin Brodo
Assisted by: Patrick Williston
Cost: $150
Don't miss this rare opportunity to learn about lichens from one of the world's leading lichenologists and author of *Lichens of North America*, published by Yale University Press in 2001. Includes laboratory instruction and field excursions.
Registration coordinator: Patrick Williston Tel. (250)-877-7702 email: pwilliston@bulkley.net

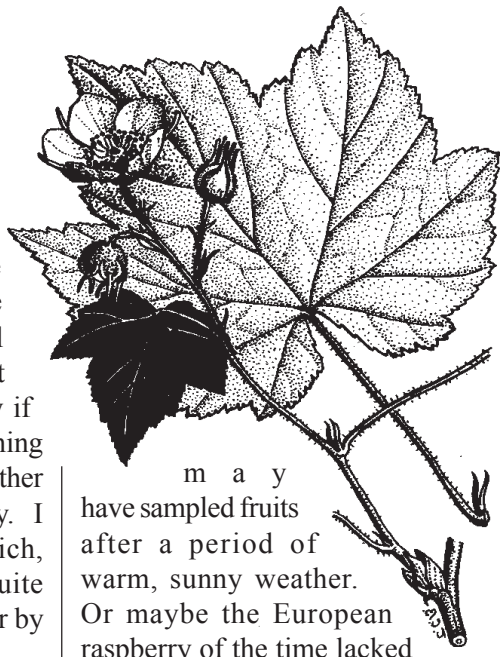
Cowichan Lake, Oct 14-16

Lichen Foray
Facilitated by: Dr. Irwin Brodo
Assisted by: Patrick Williston
Cost: $175 (includes meals and accommodations).
This foray is intended for lichen enthusiasts with previous experience of lichen study and identification. It will provide opportunities for field-based collections and discussions with Dr. Brodo but will not include formal instruction.
Registration coordinator: Patrick Williston Tel. (250)-877-7702 email: pwilliston@bulkley.net

Vancouver, Oct 18

What is a Herbarium?
Instructor: Ms. Olivia Lee, Herbarium Assistant Curator, U.B.C.
Registration coordinator: Brenda Ramsay Tel: (250) 638-8436 Fax: (250) 638-8436 email: bramsay@kermode.net
The UBC herbarium is full of pressed and mounted *and correctly identified* plant specimens. Learn how the herbarium is organized by professionals and accessed by naturalists, home gardeners, students and professionals.

Thimbleberry
Rubus parviflorus



By Hugh Daubeny

Thimbleberry, like salmonberry, almost seems to be ubiquitous throughout coastal regions of the Pacific Northwest. However, it is more winter hardy than salmonberry and is also widely distributed east of the mountains. In British Columbia it occurs as far north as Fort St. John. It grows up to elevations of 840 m at the coast and up to 1200 m in the Interior. The vigorous, shrubby plant is easily identified not only because of its large, five-lobed maple-like leaves, often as much as 20 cm across, but also because of its striking, parchment-like, five-petaled white flowers, as much as 4 cm across. These show up dramatically from May to July, depending on elevation and latitude, against the thick canopy of interlocked alternate leaves.

Thimbleberry plants usually prefer damp and shady or only partly sunny habitats. They grow in dense thickets in damp places along road edges, creek and river banks, and forest openings. Like salmonberry plants, they sometimes stabilize sloping banks where there is water seepage through parts of the year. In the Interior, plants are sometimes found in drier habitats such as Ponderosa pine ecosystems.

Plants produce smooth ("unarmed") canes which can be as much as three or more metres in length. These are green when immature but become reddish-brown and flaky upon aging. The extensive root systems sucker profusely resulting in dense cane production.

The aggregate fruit, more like a "cap" than a "thimble", detachs readily from the receptacle (core) which remains as a white "thimble". Some people even call the plant "capberry," rather than "thimbleberry." The bright red fruits are soft and have both small drupelets (individual fruit) and seeds. Sometimes fruit have a sweet flavour, particularly if exposed to warm sun over the ripening period. More often the flavour is rather bland and the texture a bit mushy. I have had thimbleberry jam which, when sweetened by sugar, is quite tasty. Fruits are much sought after by birds and by bears.

The first known description of *Rubus parviflorus* was that of John Mears published in 1791 in *Voyages Made In The Years 1788 and 1789 From China To The Northwest Coast Of North America*. Lewis Clark quotes part of the description in *Wild Flowers Of British Columbia* as follows:
"On the rocky islands and in the woods (of Nootka and Barkley Sounds)... is a species of raspberry of the most delicious flavour, and far superior to any fruit of that kind we had ever before tasted. It grows on a larger bush than our European raspberry, and is free of thorns: but the fruit itself is so delicate, that a shower of rain washes it entirely away."

I agree about the "delicate" nature of the fruit but question Meares's description of flavour. However, he may have sampled fruits after a period of warm, sunny weather. Or maybe the European raspberry of the time lacked the particularly distinctive flavour we have come to expect from modern day raspberry cultivars such as 'Tulameen' and 'Chilliwack.' Certainly the flavour of such cultivars owes something to their derivation from the 'Lloyd George' cultivar, a selection made in the early part of the 20th century from a population of the native European red raspberry, *Rubus ideaeus*, growing in Dorsetshire, England.

The specific name, *parviflorus*, is sometimes considered an anomaly. In Latin "Parvus" means either few in number or quantity or small in size or extent. However, the flowers are amongst the largest of any of our native Pacific Northwest species. Justification in the name may arise from the fact there are only three to five flowers per cluster. Thimbleberry plants and fruits have long been popular with First Nations peoples. New shoots are eaten in the early spring, often with half-dried salmon eggs. Bark from mature canes are boiled and used as soap. The fruits are eaten fresh and sometimes mixed with those of blackberry (the trailing native *Rubus ursinus* is preferred). Fruits also are dried and then used in baking. Mature leaves are sometimes boiled and drunk as tea that is reputed to cure anemia and to strengthen the

Illustration: T. Christopher Brayshaw, *Trees and Shrubs of British Columbia*

blood. Dried leaves are said to alleviate the pain of burns and to help prevent subsequent scarring. They also are burnt and the ashes then mixed with grease to help reduce swellings.

Thimbleberry leaves also seem popular with deer. I have extensive thickets of canes on my Ryder Lake property in the Chilliwack River Valley. As soon as the canes leaf out in the spring, deer start to nibble on the young, succulent leaves and are more likely to ignore the early growth of various shrubs, perennials and bulbs in the garden itself.

Unlike salmonberry, thimbleberry has not been useful in raspberry breeding programs. It is not as closely related to raspberry, being in the *Rubus* subgenus *Anoplobatus* whereas both raspberry and salmonberry are in the subgenus *Idaeobatus*. Sterility is common in crosses between thimbleberry and raspberry. Seedlings in the first generation often flower profusely but fail to set fruits. This is unfortunate since thimbleberry could be a source of useful traits such as spinelessness (thornlessness), winter hardiness, and cane disease resistances.

Plants from a double-flowered mutant, found near Squamish, are now established in the University of British Columbia Botanical Garden. Flowers of this do not have quite as many petals as the double-flowered mutant of salmonberry. The stamens and petals in the middle of the flower are still quite visible. The mutant does have larger flowers than those of the normal thimbleberry.

I highly recommend thimbleberry as attractive landscaping plants, especially for poorly drained, heavier soil types. Moreover, despite the deciduous habit, plants make effective hedges that might even offer some deer protection.

A few native plant nurseries list thimbleberries. If the nurseries are not conveniently located to where you live, I suggest searching in the wild. Be sure to take plants that might otherwise be destroyed by road work, logging, or other human activity. You might want to raise plants from seed which are easily separated from the fleshy part of the individual drupelets. Seeds are sown in a pot which can be left outside for stratification (cold treatment) over the winter. After germination in the spring, each seedling can be placed into an individual pot and left until a reasonable size for transplanting to the designated area of the garden.

Hugh Daubeny is Emeritus Research Scientist at the Pacific Agriculture Research Centre.

Photos: Hugh Daubeny

Opinions on the flavour of thimblerries can vary widely!

Call for images! - for a new NPSBC online image library of BC native plants

We are beginning to collect images of BC native plants for use in an online archive to be housed on the new NPSBC website. We need beautiful, high quality digital images, print photographs or slides of BC native plants, their parts and their habitats. As much image information as possible should be included, such as: plant name, location, time of year, etc. Images will be used for educational/non-commercial purposes only. Copyright remains with the photographer. However, in future we may use these images to produce a CD-ROM of BC native plants as a fund raiser for the society.

We may also provide higher resolution scans of these images to researchers and other charitable or non-profit organizations on a cost recovery basis. By donating your images you agree to allow them to be used for these purposes. Commercial inquiries will be referred to the photographer. If you have prints or slides you can donate copies for us to keep in a hard copy archive or we can scan them and send them back to you. All images will be credited on the website and in the CD-ROM.

If you have some great images of BC native plants that you would like to share with the society and the world, we would love to see them. Please get in touch with us before sending images. Gary Lewis garylewis@shaw.ca (604) 738-7539 or Frank Skelton feskelton @telus.net (604) 228-8879. Mailing address: Gary Lewis, 1509 W. 32nd Ave., Vancouver, BC, V6J 3A5

Mushroom ecology

By Terry Taylor

Why do mushrooms suddenly and mysteriously materialize in the autumn? In actual fact, they do not - no more than a rose suddenly appears in the summer. The rose develops from a bud which gradually grows from a rose bush. A mushroom also develops from a bud, but the bud is very minute, and is buried under the soil, and the bud also grows from what can be considered a bush, but the bush is microscopic or almost so, and is also concealed from view within the soil. Mushrooms are equivalent to flowers - flowers of the fungi. Molds are fungi, but the fungi that we usually call molds are the primitive ones that do not produce mushrooms, especially the detrimental kinds such as bread mold and various mildews. If you turn over the rotting leaves on the forest floor you will probably see some of these mushroom precursors as fine white threads on the underside of the leaf layer.

Like a flower the mushroom eventually produces what corresponds to seeds, but these seeds cannot be seen without a microscope. They are called spores, and are one hundredth of a millimetre or less in diameter. They line the faces of the plates, called gills, which radiate outwards from the stem along the underside of the cap. When mature the spores are forcibly discharged into the spaces between the gills, and from there are disseminated by air currents, like dandelion seeds on the wind. The average mushroom produces millions of spores. To see those spores, pick several different kinds of mushrooms, cut off the caps, and place those caps gill-downwards on a sheet of paper. Leave them overnight, and next day there will be powdery deposits like spokes beneath the gills. How many spores does a mushroom produce? A search through the literature turns up a number of different figures, all of which are very large, but one estimate for a nice big cap is 100 million per hour! As you hike through the woods on a fall day you are breathing in the spores of myriads of different fungus species.

The poisonous* Amanita muscaria*/fly agaric, with its white-spotted red cap, is often found growing beneath birch trees.

Photos by Rosemary Taylor

Fungi form the invisible web that binds terrestrial ecosystems together. It is an invisible web upon which our whole existence depends. Some of these fungi keep trees alive by supplying them with water and dissolved minerals. Others rot down needles, leaves and debris, returning their components to the soil so that they can again be used by plants. Still others obtain their living from logs, also rotting them down and incorporating their constituents back into the ground. Both of these groups are termed saprophytes. And at the extreme opposite end of the spectrum are the parasites. They are the organisms that take their food supplies from still living plants and animals.

The fungi that keep trees, and many other plants alive, are called mycorrhizal fungi. Mycorrhiza means fungus root, and they grow in association with roots. There are a number of different kinds of mycorrhizae, but the most important type in temperate forests forms long thin threads that spread outwards into the soil. Those threads seek out water, and soluble nutrients such as phosphorus, nitrogen, and calcium, delivering them to the trees to which they are attached. In return the fungi take from the tree 10 to 20% of the glucose produced by its canopy of leaves. This symbiotic relationship is so important that almost all our trees are dependent upon it. There would be no forest but for its mycorrhizal inhabitants. Not all of them produce mushrooms, but many of them do. The largest mushrooms are usually those produced by the fungi involved in these tree root associations, probably because of the copious amounts of food supply available to them. The big red *Amanita*

muscaria, with its white spots, belongs here. Notice how it often grows beneath birch trees. The boletes, the mushrooms with the spongy layer, rather than gills, on the underside of the cap are also mycorrhizal, as are brittlegills (*Russula*), a common group of mushrooms that easily break apart.

When the fall rains arrive in October the needle beds under the coniferous trees are covered with innumerable little mushrooms with bell-shaped caps. These are the fairy helmets (*Mycena*), of which there are many different kinds. They belong to the group that rots down small pieces of debris, needles, and leaves. Their small size is probably due to their more limited food supply, but they make up for this by the large number of individual mushrooms produced. Other small mushrooms sprout from moss carpets, acquiring their nutrition from the layer of dead moss stems beneath the carpet.

Examples of the wood decayers are the angel wings (*Pleurotus porrigens*), and the oyster mushroom (*Pleurotus ostreatus*). They grow like wings from the sides of rotten logs and dead snags. Because the log is round they need not go to the trouble of building a stem, but can caste their spores directly into the air. The angel wings is the pure white species often seen in large numbers on very rotten hemlock logs, and the oyster mushroom is a similar but more grayish one that occurs on old alder stumps and logs. Old wood contains very little nitrogen, which is an indispensable component of proteins. The small animals which inhabit rotten wood, however, are rich in nitrogen, and some fungi, including oyster mushrooms are partially carnivorous, killing and digesting microscopic nematode worms.

Most of the parasitic fungi are microscopic or almost so. Many of them attack leaves, extracting their

Pleurotus porrigens*/angel wings grows from the sides of rotten logs and dead snags.*

nutritional requirements from them. Among those are many of the rust fungi, which often produce orange spots on the leaf surface, and the powdery mildews. The mildews are very apparent during a wet summer, when the leaves of many different plants become covered with a dusty grayish coating. Many coniferous trees that fall in our forests do so because of a group of fungi called root rots. They weaken trees by impairing the ability of roots to take up water, and also lessening the ability of those roots to hold onto the soil surface. During heavy storms when the ground is saturated, or there is a heavy snow load such trees become very susceptible to blowdown.

Other parasitic fungi form the big bracket fungi - the hard woody shelves that are often seen projecting from logs and tree trunks. The most frequently seen species is the red belt bracket (*Fomitopsis pinicola*), which is white below, and brown with an orange band above. The red belt usually lives on the heartwood of the tree, that central area of a tree trunk which is no longer alive. It makes its living by eating cellulose, the same substance that we use to make paper. Cellulose is made of glucose, a sugar. The fungus digests the cellulose to get that sugar. It continues to grow on fallen logs until eventually exhausting the food supply. This and similar fungi are responsible for the crumbling reddish stumps found throughout the forest. The reddish component is lignin, the cement that glues cellulose fibres together. Other fungi are able to utilize the lignin, and eventually the entire tree is returned to the forest floor.

The fungi are truly the mediators of the ecosystem. Enabling plants to grow, sending their constituent parts back into the soil again, and controlling their numbers and distribution through parasitism, fungi do indeed form a web that binds nature together. As you wander through the woods on nature walks remember that hidden away in the soil, logs and trees are the thousands of fungi that govern to a great extent the plants you see around you. ❀

'Botrychium' cont'd from page 15

Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. British Columbia Ministry of Forests, Research Branch Special Report 6, Victoria. 330p.

Wagner, W.H. and F.S. Wagner. 1981. New species of moonworts, *Botrychium* subg. *Botrychium* (Ophioglossaceae), from North America. American Fern Journal. 71: 20-30.

Wagner, W.H., and F.S. Wagner. 1993. Ophioglossaceae C. Agardh: Adder's-tongue family. *In*: (Flora of North America Editorial Committee eds.) Flora of North America, North of Mexico. Vol. 2: Pteridophytes and Gymnosperms. Oxford University Press, New York. Pp. 85-106.

Whittier, D.P. 1981. Spore germination and young gametophyte development of *Botrychium* and *Ophioglossum* in axenic culture. American Fern Journal 71: 13-19.

Thinking like a dynamic mosaic:

Conservation planning for the plant species at risk in northern Garry oak landscapes in BC, part two

By Gordon Brent Ingram, Ph.D.

Understanding landscape ecology for plant conservation

A substantial portion of the plants most at risk in Canada survive in and around the Garry oak ecosystems (GOEs) of Vancouver Island, the Gulf Islands and the Lower Mainland. In the coming years, the discussions over critical habitat of plant species, and related conflicts between land use and plant protection, will increasingly involve these species. Why will this ecosystem take up so much of the efforts for plant (and biodiversity) conservation in BC? The simplest explanation is that this relatively rich flora, with overlapping biogeographical affinities to the south and to the east, is in the middle of a region of rapid and high impact urbanization. But this is only part of the story. Disruptions to the landscape ecology of northern GOEs, over the last 150 years, also make many of these already marginal plant occurrences particularly vulnerable. This article outlines some of the initiatives necessary for planning a network of protected areas that maintain the full plant, as well as vertebrate and invertebrate, species diversity. By making decisions to maintain viable numbers of plant populations with adequate population sizes, in sufficiently protected, managed and restored landscape units, we may be able to ensure their continuing survival in Canada.

In beginning to look at the landscape patterns of northern GOEs, in Canada, some key characteristics emerge. Nearly all of the GOEs, in their northern margins, are in the driest parts of the Strait of Georgia on the southwestern side of the Strait of Georgia. These areas are nearly all in rain shadows created by the Olympic and (Vancouver) Island Ranges. Even the two mainland populations in BC, on south-facing mountains at Sumas and Yale, follow a similar pattern in their locations throughout the entire western slope of the Cascades. Except for those mainland locations, all of the GOEs locations in BC are on islands. Island biogeography (with more species diversity tending to be maintained on larger islands) has direct implications for conservation strategies. Not all the species that occur on Vancouver Island exist, and many ever have existed, on some of the smaller islands. Six biogeographical groupings of northern GOEs become evident:

1. Vancouver Island around Victoria, Saanich and Metchosin where large areas of GOEs dominated the landscape,
2. other parts of Vancouver Island, such as the Cowichan Valley and along the coast to the Comox Valley, where recent occurrences of GOEs have tended to not be the dominant element in the landscape,
3. the larger Gulf Islands,
4. smaller islands (>5 hectors to <100 hectares),
5. rocks and islets (< 5 hectares), and
6. the mainland populations which, while tiny in BC, become progressively larger with large areas of GOEs around such cities as Tacoma, Olympia and in the Willamette Valley.

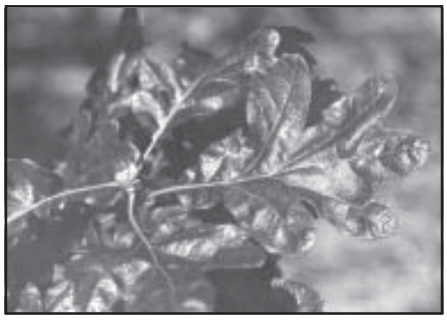
A particularly intact herbaceous layer, Downes Point, Hornby Island, June 1979.

All photos by Gordon Brent Ingram.

Our island ecosystems in BC will provide varying levels of long-term security. Rocks and islets are particularly vulnerable to rising sea levels and GOEs on Vancouver Island increasingly under threat from urbanization and invasive species. In addition, this 'insularity' links most GOEs at their northern margins through marine and shore ecosystems which again are vulnerable to suburbanization and rising sea levels. Nearly all GOEs in BC occur on flat or southwestern slopes. The southwestern aspect is a major clue here about the ecosystem because it is the optimal solar energy in the fall, winter and spring seasons that allows many of these plant species to have a long growing season. The rich diversity of plant species is in part because there is an overlap of two different kinds of species. There are those that can grow through the winter (on sunny sites) but tend to be dormant in the summer drought, and plants that are dormant in the winter but survive the long water deficit, often on better-watered and less dry sites. GOEs in BC rarely occurs on new, igneous parent material – if only because the acidity is so constraining for nutrient uptake. Rather, GOEs at their northern margins tend to occur on sites with decomposing metamorphic rock (such as the sandstones, conglomerates and gravel washes) with higher soil Ph. Most GOEs at their northern margins occur on exceptionally well-drained sites. But there are a few exceptions and there are more pronounced phenotypes of mesic and 'riparian' Garry oaks in Washington and Oregon.

So we can almost predict where GOEs occur in BC. There really are not that many exceptions – which suggest that these are the populations that have been able to survive in the cool and damp climatic phase of the last several thousand years. What is not so predictable is the nature of the dynamic mosaics for particular landscapes. This is a reflection of the size of the landscape unit, the topography, aspects, geology, microclimate, soil, biogeography, fire regimens and human history. Each island and watershed has its own story. We are just beginning to understand the reasons for the patterns and locations of the plant occurrences in Garry oak ecosystems. The following often play crucial roles:

1. **the size of patches** dominated by oaks, Douglas-fir and grasslands, their ages and extent of accumulation of living and dead biomass (including extent of canopy and tree and snag size) (Dramstad et al. 1996: 20 – 23);
2. **edges** (their heights and extent of their contrasts and widths) between oak and Douglas-fir, oak and grassland, and different sites with different grassland dominants (Ingram 2000; (Dramstad et al. 1996: 28 – 31);
3. the nature of **fragmentation factors** for particular ecosystems and communities;
4. more stable ecological **corridors** that sometimes can continue to function as landscape linkages (Dramstad et al. 1996: 36 - 38);
5. the **rate** of disturbance (and stability) factors, such as fire, and how these influence the size and shape of patches and the length, height and width of edges; and
6. the cumulative forces behind the formation of the **landscape matrix** (the ecosystem formation that touches on more other as of a landscape unit such as a mountain side) (Forman & Godron 1986: 159, 162 – 166; Dramstad et al. 1996: 41 - 46).



This Garry oak leaf illustrates some of the typical adaptations for water conservations in long summer droughts: a relatively low edge to surface ratio and waxiness.

Central to the decision-making for the survival of these plant species (and the minimization of social conflicts around them and respective sites) will be to relate the determinations of minimum population size and ecological conditions to a dynamic understanding of critical habitat – rooted in an understanding of landscape ecology. Some plants species will have very specific requirements for habitat and locations within dynamic mosaics. Whereas some plant species have life histories and requirements are relatively predictable, the autecology of others are not so clear (and may well be less predictable). Some plant species almost seem to be literally castaways in northern GOEs. They just barely persist. And this is compounded by species where numbers and intra-specific diversity are in such steep decline making recent histories of occurrences, and identification of ecological requirements, difficult to reconstruct. More comprehensive ecogeographical surveys (Ingram 1990) are necessary that compile and map the data above in ways that systematically determine minimum population sizes and sites to maintain resilience, continuing adaptation to changing environments, and minimum levels of genotypic diversity in the case species deemed genetic resources.

This information, often more detailed than that which has been included in many of the recent status reports, will be key to finding a basis for spatial decision-making to find sites that support adequate population sizes into shifting mosaics of oak, fir

and grassland. Only the larger areas, pocket wilderness on remote mountain slopes hold much hope for maintaining the necessary conditions over the longer term**.** The smaller, more fragmented areas, and those that have been heavily degraded, may have other values that warrant protection, management and restoration – particularly, as in the case of a number of species in Saanich, where few other locations exist for this species in Canada.

Threats to the phytodiversity of northern Garry oak landscapes

What have been the forces that have destroyed so much, so quickly? The worst factors, that have degraded nearly all of the Garry oak ecosystems in BC and have converted over half of the area that existed in the mid-nineteenth century, are the following:

1. alienation of traditional land use practices;
2. agriculture;
3. introduction of invasive species;
4. tree cutting and removal of entire groves;
5. suppression of fire; and
6. urbanization and urban air and water pollution.

Aboriginal burning appears to have had a central impact on the vegetation on at least some of the islands as in the case of Whidbey Island (White 1999) whose inhabitants had strong links to areas in what is today BC. Interestingly, the few treaties that were negotiated (around Victoria) gave Salish landowners rights, outside of their reserves, to their 'fields' which extended to areas of management of traditional food plants.

Until the recent tree by-laws, oaks were regularly cut and their habitats bulldozed for housing and commercial developments. Much of the bases of oaks, under their canopies, continue to be damaged through asphalt and soil compaction

An older oak, perhaps several hundred years old, Mt Maxwell Ecological Reserve, Salt Spring Island, July 1993.

– often weakening larger individuals.

Over the last century, we may have lost a large portion, perhaps a quarter, of the total area of Garry oak landscapes in BC not by destructive activities but just by the suppression of fire (wild and aboriginal) (Agee 1993: 352 – 370). It takes only about 30 years of dense Douglas-fir encroachment, if that, to destroy populations of most species associated with Garry oak ecosystems.

Urbanization has been hard on the diversity of Garry oak ecosystems. Though the oak tree is hardy, it is vulnerable to root damage, soil compaction, and suffocation of roots from paving and asphalt. Watering is not particularly good for white oaks – rather the contrary. For many of the associated plants, insects and vertebrates, watering is lethal or destroys the viability of the habitat. Car exhaust is thought to destroy lichens on oaks pretty quickly. From a landscape ecology standpoint, all of the changes above have simplified and destabilized landscape processes with the net effect being less space and resources for these species. And the new urban edges have often tended to be hostile to these native species.

Some species at risk of extinction or extirpation from northern Garry oak ecosystems

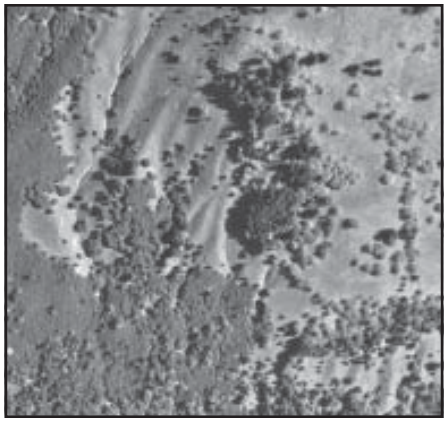
The full extent of threats to the plants in Canada that are largely confined to Garry oak ecosystems, and associated grasslands, woodlands, and edges of Douglas-fir forest, is unclear. The following species have already been listed as warranting concern – with many already on the Blue and Red Lists. But more systematic work is necessary.

Of the non-vascular plants, two species of mosses, apple moss, *Bartramia stricta,* and twisted moss, *Tortula laevipila* var. *meridionalis* are already listed. But the bryophytes associated with relatively large and intact Garry oak mosaics have just begun to be inventoried. There could well be a score or more of bryophyte species that are at risk. Of the vascular plants, the list is getting longer every year. The following species have been the subjects of discussions, proposals and lists. Some have been the subjects of reports but many are barely known and their conservation requirements will take years to assess:

Dune bentgrass, *Agrostis pallens*
Carolina meadow foxtail, *Alopecurus carolinianus*
Deltoid balsamroot, *Balsamorhiza deltoidea*
Winged water-starwort, *Callitriche marginata*
Greensheathed sedge, *Carex feta*
Foothill sedge, *Carex tumulicola*
Paintbrush owl-clover, *Castilleja ambigua*
Golden paintbrush, *Castilleja levisecta*
Muhlenberg's centaury, *Centaurium muehlenbergii*
Lace fern, *Cheilanthes gracillima*

Purple godetia, *Clarkia purpurea* ssp. *quadrivulnera*
Erect pigmyweed, *Crassula connata* var. *connata*
Coastal wood fern, *Dryopteris arguta*
Dense spike-primrose, *Epilobium densiflorum*
Brook spike-primrose, *Epilobium torreyi*
Globe gilia, *Gilia capitata* var. *capitata*
Mountain sneezeweed, *Helenium autumnale* var. *grandiflorum*
Scalepod, *Idahoa scapigera*
Kellogg's rush, *Juncus kelloggii*
Macoun's meadowfoam, *Limnanthes macounii*
Gray's desert-parsley, *Lomatium grayi*
Seaside birds-foot lotus, *Lotus formosissimus*
Bog bird's-foot trefoil, *Lotus pinnatus*
Spanish-clover, *Lotus unifoliolatus* var. *unifoliolatus*
Lindley's microseris, *Microseris lindleyi*
Dense-flowered lupine, *Lupinus densiflorus* var. *densiflorus*
Prairie lupine, *Lupinus lepidus*
Sulphur lupine, *Lupinus oreganus* var. *kincaidii*
Manroot, *Marah oreganos*
White meconella, *Meconella oregana*
Coast microseris, *Microseris bigelovii*
Dwarf sandwort, *Minuartia pusilla*
Mousetail, *Myosurus apetalus* var. *borealis*
Needle-leaved navarretia, *Navarretia intertexta*
Rosy owl-clover, *Orthocarpus bracteosus*
Pine broomrape, *Orobanche pinorum*
White lip rein orchid, *Piperia candida*
Fragrant popcorn-flower, *Plagiobothrys figuratus*
Slender popcorn-flower, *Plagiobothrys tenellus*
Tall woolly-heads, *Psilocarphus elatior*
Slender woolly-heads, *Psilocarphus tenellus* var. *tenellus*
Water-plantain buttercup, *Ranunculus alismifolius* var. *alismifolius*
California buttercup, *Ranunculus californicus*
Lobb's water-buttercup, *Ranunculus lobbii*
California-tea, *Rupertia physodes*
Bear's foot sanicle, *Sanicula arctopoides*
Purple sanicle, Sanicula bipinnatifida
Scouler's campion, *Silene scouleri* ssp. *grandis*
Small-flowered tonella, Tonella tenella
Poison oak, *Toxicodendron diversilobum*
Cup clover, *Trifolium cyathiferum*
Macrae's clover, *Trifolium dichotomum*
Bearded owl-clover, *Triphysaria versicolor* ssp. *versicolor*
Howell's triteleia, *Triteleia howellii*
Howell's violet, *Viola howellii*
Yellow montane violet, *Viola praemorsa* spp. *praemorsa*
California hedge-parsley, *Yabea microcarpa*
White-top aster, *Seriocarpus rigidus* = *Aster curtus*

Then there are a host of species that occur nearby GOEs and with so few occurrences in Canada, it is difficult to know much about their ecology (or whether there are any genotypes more associated with GOEs). The links to GOEs of the following species warrant further exploration: Geyer's onion, *Allium geyeri* var. *tenerum*; twisted-pod evening-primrose, *Camissonia contorta*; Lemmon's willow, *Salix lemmonii*; and cup clover, *Trifolium cyathiferum*.



This Garry oak mosaic is dominated by grassland with sparse Garry oak and large areas of young conifers (Mt. Tuam Ecological Reserve 21 May 2001). This area formerly had more Garry oak savannah but there was a hot fire in the early 1960s after which there was considerable loss of soil, particularly the organic layer, leading to establishment of conifers and invasive exotics.

Another of group of species can also be considered at risk. Occurrences of Salish food species are declining and landraces (highly diverse locally adapted populations) and early cultivars are disappearing. Canada is a signatory of the *Convention on Biological Diversity* which definitely extends to the genetic resources important to indigenous people. If these agricultural genetic resources (that are increasingly being cultivated) important to the Salish (Turner 1975) were seriously assessed, another twenty or more species would be considered at risk.

Thinking like a dynamic mosaic

In the coming years, the more vulnerable plants of GOEs may well become the biggest stars and the worst headaches for plant conservationists in BC. The following are some of the most compelling realizations that have come to me.

1. Larger protected areas can hold a greater diversity of species and are not so prone to species loss. Today, most of the larger, remaining dynamic mosaics with Garry oak ecosystems are under threat and remain unprotected. Some of the richer Garry oak areas with rare plants, that will warrant field work and conservation interventions in the coming years include Nanoose Hill directly above the torpedo testing, the Thetis-Francis Connector north of Victoria, Downes Point on Hornby Island, Oak Bluffs on North Pender Island, Sutil Mountain on Galiano Island, the unprotected part of Mount Finlayson near Victoria, some remaining unprotected areas of the Saturna Island Bluffs, Mary Hill, Reginald Hill on Salt Spring Island, Sumas Mountain, Skirt Mountain near Victoria, Walker Hook on Salt Spring and Whaling Station Bay on Hornby.
2. More comprehensive ecogeo-

graphical surveys and status reports are necessary along with more sophisticated discussions of critical habitat & recognition of landscape ecology processes. When it comes to having to make difficult decisions about distribution funds for habitat conservation, in the shorter-term, various forms of rapid biodiversity appraisal (RBA) is prudent.

3. Especially in the current climate of provincial funding cuts and uncertainty about federal species at risk legislation, adoptions of a plant species or two at risk, by a range of organizations and communities in 2002 and 2003, is a good idea. While there is promising work going on in compiling ecological and life history knowledge of these species, there are so many species that are so poorly understood that the involvement of more researchers, land managers and owners, activists is quickly needed. To get to know the appearance of these species, the recent illustrated compendium on rare native species is a good beginning (Douglas et al. 1998).

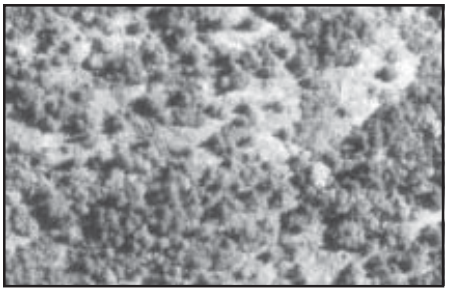
4. To adequately protect these plant species on an ongoing basis, the design criteria of networks of protected habitat cores, buffers, landscape linkages and restoration areas must support dynamic plant communities and a range of disturbance and successional conditions.

5. Designing nature reserves for specific communities and populations is like designing and building human dwellings. With care, we can create solid homes – or end up in leaky condos.

6. Many of these species have so few occurrences that *ex situ* conservation, in botanical gardens, field gene banks, and in restoration sites is prudent.

7. Most northern GOEs are cultural landscapes and aboriginal people are going to be increasingly asserting their continued presence on the land – extending to concerns for traditional food plants. Conservation initiatives that constrained aboriginal involvement and impact on decision-making (and virtually all have so far), and that have insufficient flexibility to be transformed by such perspectives, will fail.

8. Effective plant conservation is driven by linkages between knowledge, stakeholders (social groups who assert interests) and decision-makers around specific places. The 'currency' is exchange and respect between a number of very different perspectives around ecosystems, plants, and decision-making about the land. When conservation isn't happening, it's because some of the key links are not there yet or are weak. ❀



An example of the high levels of environmental heterogeneity in many Garry oak landscapes. In this case, the matrix is grassland with Garry oak surrounding small clumps of old-growth Douglas-fir (Mt. Maxwell, Salt Spring Island - a currently unprotected area north of the 2001 acquisitions).

Brent Ingram has over 20 years of experience in surveying and designing protected areas for plants at risk, conducted part of his M.Sc. and Ph.D. research on GOEs, and was a co-founder of the Garry Oak Ecosystems Recovery Team and its Conservation Planning and Site Planning Recovery Action Group. As well as recently teaching in the University Of Victoria Restoration Of Natural Systems Program, he is developing a forest biodiversity conservation curriculum, including for the rapidly declining oak woodlands in the Himalayan foothills, for the Pakistan Forest Institute. Email: side_stream_environmental_design@telus.net

References

Agee, James K. 1993. *Fire Ecology of Pacific Northwest Forests*. Washington, DC: Island Press.

George W. Douglas, Gerald B. Straley and Del V. Meidinger. 1998. *Rare Native Vascular Plants of British Columbia*. Victoria: BC Ministry of Environment.

Forman, Richard T. T. and Michel Godron. 1986. *Landscape Ecology*. Toronto: John Wiley.

Ingram, G. B. 1990. Multi-gene pool surveys in areas with rapid genetic erosion: An example from the Aïr Mountains, northern Niger. *Conservation Biology* 4(1): 78 - 90.

Ingram, G. B. 1996. Design for plant conservation: Techniques for setting boundaries of nature reserves. *Plant Talk* (London) 7: 26 - 29.

Ingram, G. B. 2000. The implications of landscape ecology for conserving the biological diversity of northern Garry oak, *Quercus garryana*, ecosystems. in *Workingpaper Landskabsøkologiske Skrifter. The Management of Biodiversity from a Landscape Ecological Perspective*. Roskilde, Denmark: Roskilde University. 135 - 176.

Turner, Nancy J. 1975. Food *Plants of British Columbia Indians Part 1 / Coastal Peoples*. Victoria: BC Provincial Museum.

White, Richard. 1999. Indian land use and environmental change Island County, Washington: A case study. In *Indians, Fire, and the Land in the Pacific Northwest*. Robert Boyd (ed.). Corvallis, Oregon: Oregon State University Press. 34 – 49.

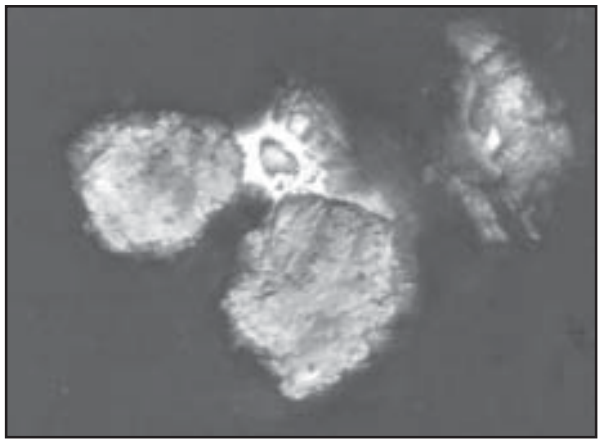
Garry Oak Ecosystems Recovery Team preparing Plants at Risk fact sheets

By Brenda Costanzo and Marilyn A. Fuchs

The Garry Oak Ecosystems Recovery Team (GOERT), formed in June 1999, has been involved in various projects this past year including the production of a series of fact sheets about plants at risk in Garry oak and associated ecosystems. The first of these fact sheets are to be released in 2002 or 2003. They will be arranged in a field manual about plants and other species at risk. They will be distributed to public and private land managers, land stewards and field personnel who are involved in the management and restoration of Garry oak and associated ecosystems. The field manual is intended to increase field recognition of plants at risk in Garry oak and associated ecosystems, to encourage awareness of their critical habitats and distribution, and to provide guidance regarding management and protection of these species at risk.

Garry oak (*Quercus garryana*) ecosystems, and the complex of closely related coastal bluff, maritime meadow, vernal pool, grassland, rock outcrop, and transitional forest ecosystems of southwest British Columbia, are important for their great beauty and their biological diversity. Over recent decades, habitat conversion of the oak and associated ecosystems to agricultural and urban uses has occurred at an alarming and accelerating rate. Habitat loss, fragmentation, and invasion by exotic species, altered fire regimes, and other factors pose serious and ongoing threats to Garry oak and associated ecosystems throughout their range in Canada.

Garry oak and associated ecosystems are home to 91 species, including 60 plants, that have been designated as "at risk" in British Columbia. Twenty-one of the species have also been listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but many more are likely candidates for national listing upon assessment by COSEWIC. Very small population sizes, limited numbers of occurrences, rapid or pronounced population declines, and other indicators associated with these species suggest that extinction or extirpation (local extinction) is possible or likely unless recovery actions are taken. Although some of these species, particularly those that reach the northern limits of their distribution in Canada, have always been rare, evidence indicates that general declines are widespread and in urgent need of attention. Garry oak plant communities, recognized as conservation targets by the British Columbia government, have been ranked as imperilled and critically imperilled within the province and are thus in need of conservation attention.



Aerial view of Isabella Islets south of Salt Spring 2001. Some of the more secure refuges for the plants at risk, associated with Garry oak ecosystems, are small islands - especially where there are few infestations of invasive plants.

Photo: Gordon Brent Ingram

The field manual is designed for use in the field, and will include additional fact sheets about invertebrates and vertebrates at risk in Garry oak and associated ecosystems. There will also be a companion field manual of *Invasive Species of Garry Oak and Associated Ecosystems in British Columbia*. Completion of all the insert sheets for both manuals will take a number of years, and of course is dependent upon funding. The field manuals will be sent to a selected list of user groups, free of charge.

The Plants at Risk fact sheets will include the following information: English and scientific species name including family name and other scientific names; risk status; range/known distribution; field description; life history information; habitat and ecological characteristics; why the species is at risk; what you can do for the species and references. There will be an accompanying distribution map of the species in British Columbia, a photograph of the plant (where available) and a line drawing.

The fact sheets were compiled by Brenda Costanzo, on behalf of the Plants at Risk Recovery Action Group under GOERT. Funding to date has been provided by the Government of Canada Habitat Stewardship Program for Species at Risk. Partners include the British Columbia Conservation Data Centre of the BC Ministry of Sustainable Resource Management and the Nature Conservancy of Canada.

For more information, see the Garry Oak Ecosystems Recovery Team web site at: www.goert.ca

The NPSBC Flora of British Columbia

The NPSBC is encouraging members to adopt a plant and share knowledge about our provincial flora. Choose a plant in your neighbourhood; find out its distribution by checking your references and by asking other members of the society if they have seen it where they live (use the society's listserve!); take photographs and/or make drawings, and do some background research (What is its habitat? Is it rare or common? Is it used in native plant gardening?). Tell the rest of us about your discoveries by submitting an article to *Menziesia*. We can even post the information on our web pages. Here's an example:

Botrychium montanum W.H. Wagner
Western goblin fern

By Patrick Williston

Botrychium montanum is a fern in the Botrychiaceae, a family recognized by some as being distinct from the related Ophioglossaceae. Species within the genus *Botrychium* are known as the moonworts, and many are considered to be rare. Several new moonworts have been described in the past 25 years including *B. montanum*, first published in 1981 (Wagner and Wagner 1981). *B. montanum* is small, usually less than 8 cm tall, and is distinguished by bearing reduced, rhombic pinnae with irregular or minutely toothed margins on a thick succulent rachis. Plants are a dull grey-green and in BC they tend to appear in mid-August. Spores do not mature until the late fall.

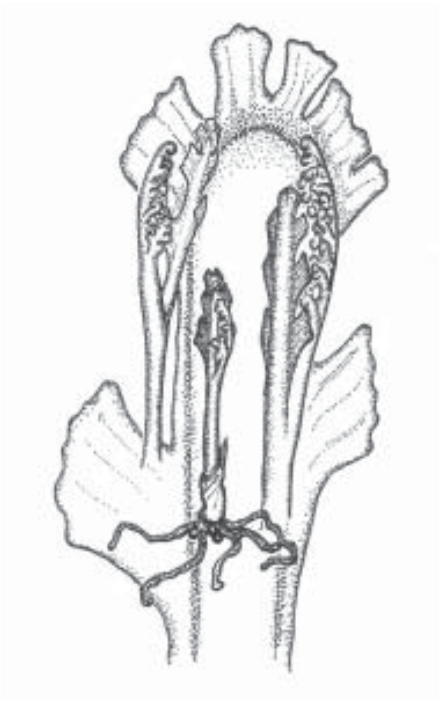
Habitat

Throughout most of its range, *B. montanum* grows in dark cedar forests near seepage where *Mnium* mosses are common (Wagner and Wagner 1993). In BC, *B. montanum* has only been found in very old, oldgrowth stands, also known as antique forests. Such forests have supported the same, stable ecological conditions for hundreds of years, often outdating the oldest trees in the stand, which may be 800 years old or older. In the southern end of its range, this fern appears to have greater ecological amplitude; for instance, in Montana there are a small number of collections from a high mountain passes (Wagner and Wagner 1981).

Biology

Moonwort spores germinate underground to produce subterranean gametophytes that are small (2-5 mm) and achlorophyllous (they do not photosynthesize). They rely upon an association with endophytic fungi to provide nutrients for their survival. The gametophytes produce eggs and sperm on the same plant and often in close proximity to one another. These ferns are selfers, which means they most frequently fertilize themselves to produce a sporophyte, the life history stage that we commonly recognize as a mature fern. Because they are self-fertilized, all of the spores produced by the mature fern are clones of the parent (Farrar 2001). This means that a single spore can initiate an entire population but that they will all be genetically identical. Of course, most spores are unsuccessful, perhaps because they do not land close to their required fungal partners.

A small number of moonworts, including *B. montanum,* also reproduce asexually. By mechanisms not yet fully understood, individual plants appear to be able to produce multiple gametophytes underground (Johnson-Groh pers. comm.). Whether from locally dispersed spores or from asexually derived



Photos and illustration by Patrick Williston

gametophytes, it is not uncommon to see *B. montanum* stems arising together in tight clusters. Moonworts gametophytes may take up to three years to produce an aboveground sporophyte. Individual sporophytes live for approximately five years aboveground, but do not always appear every summer and can remain dormant for one to three years before re-emerging (Johnson-Groh pers. comm.).

Use in the garden

In general, moonworts do not transplant well; reports suggest that they die after about one year. Furthermore, their scarcity is such that they are best admired in nature. In fact, several moonworts are so rare that they are illegal to collect in the United States. Regrettably, Canada does not yet have equivalent legislation. The germination of spores on artificial media requires the patience of an alchemist (Whittier 1981).

Range

Western goblin has been collected from only three localities within Canada, all of which are in BC. All three localities are within the Interior Cedar-Hemlock zone (Meidinger and Pojar 1991): one north of Hazelton, one north of Clearwater, and one near Salmon Arm. This fern is also suspected to occur in the antique forests of coastal BC; however, specimens from this region are lacking. *B. montanum* is known from Washington, Oregon, California, Idaho, and Montana. Populations in Idaho and Montana are all within close proximity of the BC border adjacent to the East Kootenays where they have yet to be discovered.

Status

With 3 localities, *B. montanum* is ranked S2S3 in BC and N2N3 in Canada. It is globally ranked G3 and

The distribution of *Botrychium montanum* in British Columbia

in the U.S. is N3. It is known from 6 localities in California (S2), 13 from Idaho (S2), 54 from Montana (S3), and 121 from Washington (S3). In Oregon it is ranked S2 (the number of localities in Oregon was not available). Rankings follow the system developed by Nature Conservancy where 1 is endangered and 5 is secured. This system is described in numerous online and printed publications (see srmwww.gov.bc.ca/cdc/).

Threats

The principal threat to this fern is loss of habitat. Antique cedar stands in inland British Columbia are rare and few are protected within parks. Because cedar is among the most valuable of BC's wood products, these stands have been preferentially selected for harvesting. These stands also tend to occur close to valley bottoms where access roads are built and stands are most accessible to harvesting. To date, *B. montanum* has not been found in second growth stands within BC. While undiscovered populations certainly exist, such as in the East Kootenays, the destruction of suitable habitat is rapid, at least throughout its range within Canada. The threat of extirpation for this fern is considerable.

Notes

The name 'western goblin' refers to its somewhat 'Tolkien-esque' appearance. This plant often barely emerges from the litter of the forest floor and prefers the cool, dark, and damp seclusion of its seepy habitat, just like most other goblins.

This species is closely related to *Botrychium mormo* (little goblin fern), another rare moonwort with a distribution centred in the Great Lakes region. The two are very similar in appearance and are distinguished by their colour which is dull grey-green (glaucous) for *B. montaum* and shiny yellow-green for *B. mormo* (Wagner and Wagner 1993). All other features appear to more or less intergrade between the two species and isozyme analysis has failed to detect differences in alleles (Farrar 2001). This supports the notion that these plants are in fact varieties of the same species.

In 2001 I encountered this plant a number of times in the antique forests of the Kispiox Valley, north of Hazelton, BC. These populations represented a northern range extension of nearly 400 km, and with up to 100 individuals, they are the largest populations known within the province (large populations are also known from Montana; Wagner and Wagner 1981).

B. montanum is one of a small number of moonworts that grow in antique forests. Most other moonworts occur in meadows, willow thickets, alpine gravels, sandy areas, or in disturbed sites like eroded slopes and old roadsides.

References

Farrar, D. 2001. Isozyme Characterization of Moonwort Ferns (*Botrychium* subgenus *Botrychium*) and their Interspecific Relationships in Northwestern North America. Final Report Submitted to the Colville National Forest, Washington. 24p. plus appendices.

Johnson-Groh, C. 2002. Personal communications.

See 'Botrychium' on page 7

NPSBC South Coast Native Plant Study Group

By Frank Skelton

At the second SCNPSG meeting on February 7, 2002 Paulus Vrijmoed gave a very informative talk on seed propagation of native plants including details on seed collection, storage and germination. The third meeting was held at the Vancouver Museum In the Ray Whittick Lounge on Thursday, March 7. Terry Taylor gave a fascinating talk and slide show titled "The Ecology of Native Plants and Native Plant Communities of the Lower Mainland Area: Sea to Summit".

SCNPSG Meetings are planned for the first Thursday of April, May and June at 7:15 pm at the Vancouver Museum. Details will be posted on the NPSBC list serve and email notifications will be sent to South Coast members of NPSBC.

Telephone or email me for more information on meetings and activities. Phone: 604-228-8879. Email: feskelton@telus.net

NPSBC e-mail discussion list

Founding NPSBC board member Adolf Ceska has set up an e-mail discussion list as a convenient forum for members of the Society to discuss topics related to the native plants and botany of British Columbia. The list is unmoderated, but the hope is that discussion topics will be limited to botanical research, plant ecology, ethnobotany, native plant propagation, gardening with native plants, and events sponsored by the Native Plant Society of BC or similar organizations.

TO SUBSCRIBE to the list: Send a mail message containing 'subscribe NPSBC-L' (no apostrophes) to:
Majordomo@victoria.tc.ca

TO SEND MAIL to the list, address your message to:
NPSBC-L@victoria.tc.ca

If you have any questions regarding the discussion list, please send them to the list administrator at NPSBC-L-owner@victoria.tc.ca

NPSBC new members

Since December 15, 2001

George Douglas, Duncan
Laura Duncan, Kimberly
Karen Gray, Moscow, Idaho, USA
Randal Mindell, Vancouver
Kathy Nomme, Vancouver
Sylvia Pincott, Abbotsford
Mike Sainsbury, Vancouver
Santino Santoro, Vancouver
Cheryl Smyth, North Vancouver
Nicole Stewart, West Vancouver
Laura Super, Vancouver

Members renewing after one or more years away:
Paul de Greef, Vancouver
Tom Duralia, Vancouver
Eric Kaipainen, Surrey
William Merilees, Nanaimo
Elizabeth Whitelaw, Vancouver

Mission Statement

The purpose of the NPSBC Native Plant Society of British Columbia is to encourage knowledge, appreciation, responsible use and conservation of British Columbia's native plants and habitats.

Menziesia is published 4 times a year by the NPSBC. Upcoming submission deadline: June 15 (Summer). Subscription is included in membership to the NPSBC. Annual membership fees are: $20 - Individual; $30 - Household; and $75 - Sustaining member.

Please note that advertising space is available in *Menziesia*. A 3.5" x 2" space costs $20 for one insertion. Send a cheque or money order (made out to NPSBC), plus ad text or business card to editor Harry Hill (see below) by publishing deadline.

Newsletter submissions should be sent to:
Menziesia
Attn: Harry Hill, Editor
RR22, 1533 Park Ave., Roberts Creek, BC, V0N 2W2
Tel: 604-885-9769
E-mail: menziesia@dccnet.com

NPSBC memberships should be sent to:
Regan Hunt, Membership Coordinator
11021 Bond Boulevard
North Delta, BC, V4E 1M8
Tel. 604-591-3025
FAX: 604-591-1776
E-mail: rhunt@huntechconsulting.com

NPSBC correspondence should be sent to:
NPSBC
Attn: Ross Waddell
2012 William Street, Vancouver, BC, V5L 2X6
Tel: 604-255-5719
E-mail: npsbc@hotmail.com