



**Garry Oak
Ecosystems
Recovery Team**

Stewardship Account for *Lomatium grayi*

Prepared by
Claudia Schaefer for
the BC Conservation Data Centre and
the Garry Oak Ecosystems Recovery Team
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**NATURE
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C A N A D A

STEWARDSHIP ACCOUNT FOR *LOMATIUM GRAYI*

1. Species information

Lomatium grayi (Coult. & Rose) Coult. & Rose has no recognized subspecies or varieties in Canada. In some of the states in the U.S., the variety *depauperatum* is recognized, and in this context our plants would be considered *Lomatium grayi* var. *grayi* (Coult. & Rose) Coult. & Rose (Douglas, pers. com., 2001). Earlier synonyms for the species include *Peucedanum millefolium* Wats. (1881), *Peucedanum grayi* Coult. & Rose (1888), *Cogswellia millefolia* M.E. Jones (1908), *Cogswellia grayi* Coult & Rose (1909), *Lomatium millefolium* Macbr. (1918) and *Peucedanum grayi* var. *aberrans* M.E. Jones (1902). The English names for *Lomatium grayi* are Gray's desert-parsley, Mountain desert-parsley, Gray's lomatium, Narrow-leaf lomatium, and Gray's biscuit-root. The family name is Apiaceae (synonym Umbelliferae), sometimes referred to as the parsley family, carrot family or umbel family.

Work on the classification of this species occurred mainly around the turn of the century, and the previous names for the taxon are listed above. There have been no recent taxonomic changes or problems.

Lomatium grayi is relative distinctive in the field, although it could be confused with *L. dissectum* or Fern-leaved desert-parsley, which occupies the same habitat in British Columbia (Janszen, pers. com., 2001). Mathias (1942) states that *Leptotaenia salmoniflora* (now *Lomatium salmoniflora*) is scarcely separable from *L. grayi* unless either fresh flowers or ripe fruit are available. As with most *Lomatium*, it is difficult to make a firm identification if the specimen is immature and dried.

2. Range and Known Distribution

a) Global range

The global range of *Lomatium grayi* is limited to the western portion of North America. It occurs in British Columbia, Canada, south to California and east to Wyoming, Colorado and New Mexico, including the states Idaho, Nevada, Oregon, Washington and Utah. It has not been recorded in Arizona. Although it was only recently added to the Jepson Manual for California due to collections in 1993, it had been known from the state from a collection in 1899 (Constance and Ertter 1996). *L. grayi* is not currently being tracked by any of the Natural Diversity (Heritage) Programs in the United States.

There is no evidence in the literature that the historic range is different from the current range. The populations in B.C. represent the northernmost extent of the species' North American and global range. There appears to be a gap in the range of the species between the Canadian populations and those further south, as it's closest U.S. occurrence is in north central Washington. This could mean that the B.C. plants are genetically different from those in the rest of *L. grayi*'s range.

b) Canadian range

The range of the species in Canada is very restricted, as it only occurs in the extreme southwest of the nation, and likewise of the province of British Columbia, on two of the southern Gulf Islands. There is no known difference in the historic and current distribution of *Lomatium grayi* within Canada.

c) British Columbia range

Lomatium grayi is extremely restricted in its range within British Columbia, confirmed from only two of the Gulf Islands in the southwest corner of the province, Saltspring Island and Galiano Island. There are four occurrences of the species on Saltspring Island, and one occurrence on Galiano Island. The Galiano Island and some Saltspring Island occurrences were visited and confirmed in 1996 by B.C. Conservation Data Centre staff. It is assumed that there has been no change in the distribution of the species within Canada or within B.C., however it is not known when, prior to the first recording, these populations became established. It is therefore possible that the species expanded its northern range into the province several decades ago.

There is a third general location for *Lomatium grayi* that needs to be confirmed. Seeds of *Lomatium* plants, at the time identified as *L. utriculatum*, were collected a number of years ago from Halliwell Park on Hornby Island by Bernie Guyader, and planted in his garden (Ceska, pers. com., 2001). The plants successfully germinated and were identified as *L. grayi* by Adolf Ceska of the B.C. Conservation Data Centre. Halliwell Park and possibly other parts of Hornby Island therefore need to be surveyed.

The populations are generally in inaccessible locations such as cliff faces and ledges, so further searches for this species in likely habitat may increase the known range within B.C. and Canada.

While efforts were made to search herbaria for collections of *Lomatium grayi*, it is possible that specimens from Canada occur in other herbaria, for instance those in the States, which may represent B.C. populations currently unknown to us.

3. Habitat Description

a) General habitat requirements of the species

In British Columbia, *Lomatium grayi* occurs on dry sites in the lowland zone (classified as the Coastal Douglas Fir Zone). These sites are usually relatively open, with a woodland structure or lacking a canopy completely. The structure may be described as 'mature or old shrub stage' if trees are less than 10m tall (tree growth is usually very slow in these habitats) and cover more than 10% of the habitat, 'mature or old woodland', or 'sparsely vegetated' if tree cover is less than 10%. *L. grayi* occurs at lower elevations in Canada than it does in most of its North American range; it is generally found within a few hundred metres of sea level in B.C.

The specific micro-habitat types in which *Lomatium grayi* has been found in B.C. include southern aspect conglomerate cliffs or rocky bluffs and ledges along the ocean, under the overhang of a rock protrusion in a Douglas-fir – Arbutus slope, and on a small, northern exposure rock cliff within a grassy Douglas-fir – Garry Oak slope. These micro-habitats are often part of, or associated with, Garry Oak Meadow Ecosystems. *Lomatium grayi* is considered a species associated with these ecosystems, which occur in areas of southern, coastal B.C. where the underlying bedrock is at or near the surface. Trees are scattered and are dominated by *Quercus garryana*, with the occasional tree of *Pseudotsuga menziesii* and *Arbutus menziesii*. The shallow soils often support a great diversity of grasses, wildflower species and cryptogams.

There are no known studies that have characterized the abiotic requirements of *Lomatium grayi*. One can deduce from the locations where this species is found that it is relatively drought tolerant, allowing it to survive in the dry, sun- and wind-beaten habitats that it does. *L. grayi* is often associated with lithosolic soils over parts of its range in the United States, but restricted to basaltic outcrops in others (Thompson 1984, Thompson and Moody 1985). There is no evidence to suggest that *Lomatium grayi* is dependent upon any dynamic abiotic or biotic factors, however this has not been studied.

Growth is generally restricted to early spring when sufficient moisture is available, and above-ground parts senesce by early summer (Thompson 1984). It is possible that early spring moisture availability and a critical minimum temperature for growth dictate the northern limit of the species, since similar habitat further north is not colonized.

While the composition of flora at each occurrence in B.C. is different, the most likely native species that are associated with *Lomatium grayi* in the field are: *Selaginella wallacei*, *Bromus sitchensis*, *Montia perfoliata* (syn. *Claytonia perfoliata*), *Sedum spathulifolium*, *Lathyrus nevadensis*, *Cerastium arvense*, *Galium aparine*, *Rosa* sp., *Lonicera ciliosa*, *Achillea millefolium*, *Vicia americana*, *Grindelia integrifolia*, *Sedum spathulifolium* and *Bromus sitchensis*. The following non-native species, predominantly grasses, can also be found: *Bromus tectorum*, *Bromus sterilis*, *Poa secunda*, *Dactylis glomerata*, *Cynosurus echinatus*, *Aira caryophyllea*, *Cytisus scoparius*, *Erodium cicutarium* and *Plantago lanceolata*. No other species at risk are known to be associated with *Lomatium grayi* in its micro-habitat.

b) Habitat availability and net trends in habitat change:

The long-term survival of the species in a global framework is not at any foreseeable risk, since it is a relatively common plant in many states south of the border. Within B.C. and Canada, the species is likely dependent upon the continued availability of its preferred habitat, and it being relatively free of mechanical disturbance such as human trampling.

Likely more significant than the outright loss of *Lomatium grayi* habitat within B.C., is the degradation of the habitat. While the effects of the increase of non-native species in *L. grayi* habitat over the previous decades are not known, it is possible that this factor represents the greatest threat to the subject species, in the form of competition for space and resources. Other threats are housing development on rock outcrops and in meadow areas; these areas have shallow

soils that are highly susceptible to compaction from foot traffic, which can change rooting ability for plants, water and nutrient availability, etc.

The habitat of *Lomatium grayi* differs across its North American range. In many states, it is a species of the steppe and intermontane region (Thompson and Moody 1985), so the habitat trends and threats are different from B.C. It is possible that grazing by domestic animals is a significant threat to U.S. *Lomatium grayi* habitat, but specific threats to the species have not been studied.

There is still potential habitat within southwestern B.C. that can be surveyed. Coastal bluffs and Garry Oak Meadows should be searched. Boat access may be necessary to survey ocean cliff faces.

Habitat ownership/protection:

The two known populations of *Lomatium grayi* occur on Saltspring and Galiano Islands. The occurrences on Saltspring Island predominantly occur in Mount Maxwell Provincial Park and Ecological Reserve (#37), and are therefore protected. There is one patch of plants that currently occurs just outside the border of the reserve. The Galiano Island occurrence is on private land; Conservation Data Centre staff received permission in 1996 to survey this population (Penny, pers. com. 2001). The likely population on Hornby Island is located in a provincial park, and is therefore protected.

4. Status of Species

Lomatium grayi is not an endemic or relict species, nor is it known to be an indicator or keystone species. The species is not at risk globally. The global rank is G5T5? (10 Mar 2000); the North American rank is N? and the provincial rank for B.C. is S1. No related forms of the species are threatened. *L. grayi* could possibly be confused with *L. dissectum*.

With regards to scientific interest in the species, while no studies were found that specifically tested the pharmacological uses of *Lomatium grayi*, several studies have been done on the closely related *L. dissectum*. The latter has been found to completely inhibit the cytopathic effects of bovine rotavirus (McCutcheon *et al.* 1995), completely inhibit the growth of *Mycobacterium tuberculosis* and *M. avium* (McCutcheon *et al.* 1997), and inhibit other bacterial and fungal growth (VanWagenen & Cardellina 1986; VanWagenen *et al.* 1988). *L. grayi* is also of interest as a larval host plant for the rare Indra Swallowtail Butterfly (Whaley, pers. com. 2001) and *Depressaria multifida* (Thompson 1983). There is also potential for studying the effects of climate change on the distribution of a plant species, since the B.C. populations of *Lomatium grayi* represent the northern range limit of the species.

Lomatium grayi is reported as having been used as a starvation food by the Paiute (Compton, pers. com., 2001). Many *Lomatium* species have sizeable tubers and provided a food source for numerous North American indigenous groups (Norton *et al.* 1984). Several species were and

continue to be used by British Columbian groups, although no further uses of *L. grayi* are currently known (Compton, pers. com., 2001).

There are no known interactions of *L. grayi* with other plant species. In Utah, *L. grayi* is one of the most common species visited by the bee, *Halictus farinosus* (Nye 1980). This is the only pollinator mentioned in the literature. Other studies have been done on the interaction of other species with *L. grayi*, such as the nymphalids *Papilio zelicaon*, which oviposits on *L. grayi* and only one other plant species (Thompson 1989).

The amount of the species range that occurs in protected areas is unknown, as there are numerous states where the species is relatively common. It is likely that some populations within each state fall in protected areas. The majority of the Salt Spring Island plants in B.C. occur in a protected area.

5. Life History

Lomatium grayi is a malodorous perennial herb, similar in smell to celery (Whaley, pers. com. 2001). Growth is generally restricted to early spring when sufficient moisture is available, and aboveground parts senesce by early summer (Thompson 1984); this necessitates that surveys to confirm known locations or find new sites occur very early in the season. Seeds usually germinate very early in the spring, and seedlings seldom produce more than two or three leaves during the first year of growth (Thompson and Moody 1985). Flowering generally occurs in April or May (Hitchcock *et al.* 1955-1969).

A plant usually remains vegetative for one to several years, increasing each year the size and number of leaves produced, as well as the size of the taproot (Thompson and Moody 1985). When the plant reaches a size sufficient enough to allow flowering, it produces 1-20 umbels, which have either male flowers or a combination of male and hermaphroditic flowers, making this species andromonoecious. One umbel can contain several hundred flowers (Thompson 1984). Only some of the hermaphroditic flowers develop into mature schizocarps, which then separate into two winged mericarps; one study found 35 to 70% of the schizocarps matured (Thompson 1987). Thompson (1984) found that small plants produce mostly male flowers, while larger plants produce a higher proportion of hermaphroditic flowers, likely because male flowers are less costly to produce. The sex ratio varies among umbels within the same plant, among years, and among plants of the same age (Thompson 1984). Individuals often do not flower in consecutive years, and the frequency of flowering varies among populations (Thompson and Moody 1985).

Thompson (1984) studied the variation in seed mass between *Lomatium grayi* plants, and found great differences (almost 16 fold) among 2-yr-old plants that were grown from seedlings under similar conditions. Variance was greatest among seeds within an individual umbel, and between plants. Plants growing in rock crevices and very shallow soils tend to be smaller yet longer living than plants in deeper soils (Thompson 1987). Plants usually live five to seven years. It has been shown that the ontogeny of flowering and sex expression likely differs genetically between populations (Thompson 1987). Soltis *et al.* (1997) also found significant intrapopulation genetic

diversity in *Lomatium grayi*, although Novak and Soltis (1991) found no phylogeographical pattern to the genetic variation they studied, unlike other species of *Lomatium*.

In Utah, *Lomatium grayi* is one of the most common species visited by the bee, *Halictus farinosus* (Nye 1980). This is the only pollinator mentioned in the literature.

Lomatium grayi seeds in southeastern Washington are attacked by larvae of two species of weevil and one species of moth, all of which feed parasitically within developing seeds (Ellison and Thompson 1987). For example, adult weevils of *Smicronyx* genus emerge from the soil in spring, feed and mate on *L. grayi* stems and floral tissues, and oviposit in developing schizocarps. The overall effect of this parasitism and predation by *Smicronyx* sp. larvae and adults included both the direct killing of seeds by larvae and a reduction in the mass and the germinability of seeds that escaped larval attack (Ellison and Thompson 1987).

The mechanisms and distance of dispersal of pollen and mericarps has not been studied. Nor have the nutritional requirements of the species. There is little scientific research on the life history of this plant in general.

6. How the species is at risk

Degradation and fragmentation of *Lomatium grayi* habitat is a concern, however there are no indications that past degradation or fragmentation has altered the number of plants in the province or in the United States. In fact, more populations are being found, likely due to increased botanical exploration rather than range expansion or population increase, although the latter possibilities cannot be ruled out. The species is known in California from only four recent records, where they have classified it as S1. The species was ranked S2 in Wyoming due to there being less than 20 records for the state, however due to inquiries during the completion of this Stewardship Account, the Natural Diversity Database in Wyoming has down-listed the species to S3, since more than 40 records now exist (Heidel, pers. com., 2001).

Specific studies on the susceptibility of *L. grayi* to a range of disturbance factors are not known, however shallow soils that occur in the species' habitat are known to compact relatively easily under mechanical or foot traffic. Compaction can cause root damage, rooting difficulty, seedling establishment difficulty, decreased moisture availability, decreased nutrient availability, etc.

Succession is not considered a significant factor in the micro-habitat of *L. grayi*. The open nature of these habitats appears to be predominantly self-perpetuating.

The habitat of the species in B.C. is available on numerous other Gulf Island, Vancouver Island and on the Sunshine Coast, so habitat availability does not appear to be the restricting or limiting factor for this species. Since the Canadian populations of this species represent its northernmost range, climatic conditions are the likely limiting factor. It is possible that some aspect of temperature (complexed with moisture availability) is the most important abiotic factor dictating the northern extent of the species, since most occurrences are located on slopes or cliff faces and ledges with southern exposures.

There are no known dispersal or pollination restrictions, but this aspect of the species' life history has not been studied. The effects of competition and disease are also not known. There are many non-native species that grow alongside the species, including *Bromus tectorum*, *Bromus sterilis*, *Poa secunda*, *Cynosurus echinatus*, *Aira caryophyllea*, *Erodium cicutarium* and *Plantago lanceolata*. It is not known if these species are a direct competitive threat to *L. grayi*, however the abundance of non-native species in the micro-habitats of this species at risk may be restricting its expansion and possibly affecting the stability of its numbers.

7. Management Recommendations

There are no current management policies or actions in B.C. or in any of the states south of the border for this species. Many of the locations of the species are in inaccessible sites, which is helpful in ensuring that these populations are safe from human disturbance. The Saltspring Island occurrences are predominantly within the Mount Maxwell Provincial Park and Ecological Reserve. There is one patch, part of the specimen record from UTM Grid 10, UTM 461104 5406099, that falls just outside of the reserve border. The border should be adjusted to include this patch if at all possible.

There are no known studies that have examined management prescriptions for *L. grayi*. There is currently not enough information to address this issue. Studies of coastal grasslands of Oregon that contain communities characterized by *Lomatium martindalei* found that grazing generally decreased shrub cover and increased annual species, but it was the exclusion of fire that was causing succession to shrub and tree dominated communities (Ripley 1984). Studies such as this can be referred to it is felt that certain locations are succeeding to a forested state.

Currently there is no known decline in the population of *Lomatium grayi* in B.C. and Canada, but a census of the populations should be conducted regularly. Additionally, new sites should be sought, including the possible population on Hornby Island.

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Rob Alvo. November 2001. Conservation Biologist, Ecological Integrity Branch, Parks Canada, Room 375, 4th Floor, 25, rue Eddy, Hull (Québec) K1A 0M5, Tel.: (819) 994-5533, Fax: (819) 997-3380, E-mail: Robert_Alvo@pch.gc.ca

Dr. Karen Antell (nee Simmons). November 2001. Associate Professor Biology, Eastern Oregon University, Science Office, Eastern Oregon University, One University Blvd., La Grande, OR 97850, Phone 541-962-3610, Fax 541-962-3873, E-mail: kantell@eou.edu.

Adolf Ceska. December 2001. Assistant Botanist, B.C. Conservation Data Centre, Conservation Biology Section, Environment Inventory Branch, Ministry of Sustainable Resource Management, P.O. Box 9344 Station Provincial Government, Victoria, BC V8W 9M1, Phone: (250) 356-7855, Fax: (250) 387-2733, E-mail: aceska@victoria.tc.ca.

Dr. Brian D. Compton, Ph.D. November 2001. Professional Consultant, #201-1885 W. 16th Ave., Vancouver, BC, V6J 2M3, Phone: 604-731-2647, Fax: 604-731-2659, E-mail: bcompton@interchange.ubc.ca.

Brenda Costanzo. November, December 2001. Garry Oak Botanist, Conservation Data Centre, Conservation Biology Section, Environment Inventory Branch, Ministry of Sustainable Resource Management, P.O. Box 9344 Station Provincial Government, Victoria, BC V8W 9M1, Phone: (250) 387-9523, Fax: (250) 387-2733, E-mail: Brenda.Costanzo@gems7.gov.bc.ca.

Marta Donovan. November, December 2001. Biological Information Coordinator, B.C. Conservation Data Centre, Conservation Biology Section, Environment Inventory Branch, Ministry of Sustainable Resource Management, P.O. Box 9344 Station Provincial Government, Victoria, BC V8W 9M1, Phone: (250) 356-0928, Fax: (250) 387-2733, Marta.Donovan@gems4.gov.bc.ca

George Douglas. November 2001. Program Botanist, B.C. Conservation Data Centre, Conservation Biology Section, Environment Inventory Branch, Ministry of Sustainable Resource Management, P.O. Box 9344 Station Provincial Government, Victoria, BC V8W 9M1, Phone: (250) 356-5019, Fax: (250) 387-2733, E-mail: George.Douglas@gems7.gov.bc.ca

Dr. Ronald L. Hartman. November 2001, Professor of Botany, Curator of Rocky Mountain Herbarium, Department of Botany, University of Wyoming, Laramie 82071-3165, Phone number: 307-766-2236
Fax number: 307-766-2851, E-mail: RHartman@uwyo.edu

Dr. Pam Kranitz. December 2001. Research Scientist, Pacific Wildlife Research Centre, Canadian Wildlife Service, Environment Canada, R.R. # 1, 5421 Robertson Road, DELTA BC V4K 3N2, Phone: (604) 940-4676, Fax: (604) 946-7022, E-mail: pamk@interchange.UBC.ca

Jenifer Penny. December 2001. Assistant Botanist, B.C. Conservation Data Centre, Conservation Biology Section, Environment Inventory Branch, Ministry of Sustainable Resource Management, P.O. Box 9344 Station Provincial Government, Victoria, BC V8W 9M1, Phone: (250) 356-5244, Fax: (250) 387-2733, E-mail: Jenifer.Penny@gems3.gov.bc.ca

Harvey Janszen. November, December 2001. Botanist, Ophioglossum Consulting, Box 34, Saturna Island, BC V0N 2Y0, Phone: (250) 539-5150, Fax: (250) 539-3267, E-mail: hjanszen@gulfislands.com.

10. Personal communications

George Argus. November, 2001. Curator Emeritus, Canadian Museum of Nature, Box 3443, Sta. D, Ottawa, Ontario K1P 6P4, Phone: (613) 269-4605, E-mail: argus@sympatico.ca

Anne Bradley. November, 2001. Regional Botanist, USDA Forest Service, Pacific Southwest Region, 1323 Club Dr., Vallejo, CA 94592, Phone: 707-562-8938, Fax: 707-562-9050, E-mail: abradley@fs.fed.us

Jacques Cayouette. December, 2001. Curator, DAO Herbarium & National Vascular Plant Identification Service, Agriculture & Agri-Food Canada, William Saunders Bldg., C.E.F., Ottawa, Ontario, Canada, K1A 0C6, Phone: (613) 759-1363, Fax: (613) 759-1599, E-mail: cayouettej@EM.AGR.CA.

Beth Corbin. November, 2001 Botanist, Bureau of Land Management, Eagle Lake Field Office, 2950 Riverside Dr., Susanville, CA 96130, Phone: 530-252-5305, Fax: 530-257-4831, E-mail: bcorbin@ca.blm.gov

Ellen Dean. November and December, 2001. Director/Curator, UC Davis Herbarium, Section of Plant Biology, University of California at Davis, One Shields Avenue, Davis, California 95616, Phone: (530) 752-1091, E-mail: eadean@ucdavis.edu.

Michael P. Dolan. November, 2001. Rangeland Management Specialist/Botanist, Bureau of Land Management, Alturas Field Office, 708 W.12 th St., Alturas, CA 96101; Phone: 530-233-4666, Fax: 530-233-5696, E-mail: mdolan@ca.blm.gov

Kim Earll. November, 2001. Botanist, Lassen National Forest, 2550 Riverside Dr., Susanville, CA 96130, Phone: 530-252-6664, Fax: 530-252-6428, E-mail: kearll@fs.fed.us

Bill Gentle. November, 2001. Director, Wyoming State Parks and Historic Sites, 122 West 25th Street, Herschler Building, Cheyenne, Wyoming 82002, Phone: 307-777-6324, Fax: 307-777-6472, E-mail: BGENTL@state.wy.us

Linnea Hanson. November, 2001. Forest Botanist, Feather River Ranger District, Plumas National Forest, 875 Mitchell Ave, Oroville, CA 95973, Phone: (530) 534-6500, Fax: (530) 532-7425, E-mail: lhanson@fs.fed.us

Bonnie Heidel. December, 2001. Botanist, Wyoming Natural Diversity Database, University of Wyoming
Box 3381, Laramie, Wyoming, 82071, Phone: 307-766-3020, Fax: 307-766-3026, E-mail: bheidel@uwyo.edu

C. Lynn Kinter. December, 2001. Curatorial Assistant, Marion Ownbey Herbarium, School of Biological Sciences, Washington State University, Pullman WA 99164-4236, Phone: 509-335-3250, Fax: 509-335-3184, E-mail: wsherb@mail.wsu.edu

Andy Kratz. November, 2001. Botanist, USDA Forest Service, Rocky Mountain Region, 740 Simms Street, Golden, CO 80401, Phone: 303-275-5009, Fax: 303-275-5367, E-mail: akratz@fs.fed.us

Charlie McDonald. November/December, 2001. Regional Botanist, U.S.D.A. Forest Service, Southwestern Region, 333 Broadway Blvd SE, Albuquerque, New Mexico, 87102, Phone: (505) 842-3228, Fax: (505) 842-3152, E-mail: cbmcdonald@fs.fed.us.

Gisèle Mitrow. December, 2001. Manager, DAO Herbarium & National Vascular Plant Identification Service, Agriculture & Agri-Food Canada, William Saunders Bldg., C.E.F., Ottawa, Ontario, Canada, K1A 0C6, Phone: (613) 759-1363, Fax: (613) 759-1599, E-mail: mitrowg@EM.AGR.CA.

Teresa Prendusi. November, 2001. Regional Botanist and Rare Plant Specialist, Intermountain Region
USDA Forest Service, Federal Building 324, 25th Street, Ogden, UT 84401, Phone: 801-625-5522, Fax: 801-625-5127, E-mail: tprendusi@fs.fed.us

Don Rivard. November, 2001. Ecosystem Management Specialist, Parks Canada, Canadian Heritage, Jules Leger Bldg., 4th Floor, 25 Eddy Street, HULL QC K1A 0M5, Telephone: (819) 953-4444, Fax: (819) 997-3380, E-mail: don_rivard@pch.gc.ca

Sharon Rodman. November, 2001. Interim Collections Manager, University of Washington Herbarium (WTU), Department of Botany, Campus Box 355325, Seattle, WA 98195-5325, Phone: (206) 543-1682, Fax: (206) 685-1728

Ann Rose. November and December, 2001. Landscape Architect, State of Wyoming Department of State Parks & Cultural Resources, Division of State Parks & Historic Sites, 122 w. 25th Street, Herschler Bldg., 1-E, Cheyenne, WY 82002, Phone: (307) 777-7029, Fax: (307) 777-6472, E-mail: arose@actcom.net.

Allison Sanger. November, 2001. Botanist, Bureau of Land Management, California State Office, 2800 Cottage Way, Sacramento, CA 95825, Phone: (910) 978-4642, Fax: (916) 978-4657, Allison_Sanger@ca.blm.gov

Steve Shelly. December 2001. Regional Botanist/Research Natural Areas Coordinator, U.S. Forest Service, Region 1, P.O. Box 7669, Missoula, Montana, 59807, Phone: (406) 329-3041, E-mail: sshelly@fs.fed.us.

Kristina A. Schierenbeck. November, 2001. Associate Professor, Herbarium Director, Editor, *Madroño*, Dept. of Biological Sciences, California State University, Chico, Chico, CA 95929-0515, Phone: 530-898-6410, Fax: 530-898-4363, kschierenbeck@csuchico.edu

Mark R. Stromberg, Ph.D. November, 2001. Resident Director, Hastings Natural History Reservation, University of California-Berkeley, 38601 E. Carmel Valley Road, Carmel Valley, CA 93924, Phone: 831 659-2664, stromber@socrates.Berkeley.EDU

Fengjie Sun. November, 2001. Graduate Student, Department of Plant Biology, 239 Morrill Hall, 505 South Goodwin Avenue, Urbana, IL 61801-3707, Phone: 217-244-5928, Fax: 217-244-7246, Email: fsun@uiuc.edu

Phil Tonne. December 2001. Botany Coordinator, New Mexico Natural Heritage Program, University of New Mexico, Department of Biology, 167 Castetter Hall, Albuquerque, NM 87131, Phone: 505-277-3822, Fax: 505-277-3844, E-mail: ptonne@unm.edu

Dr. W. Whaley. December 2001. Associate Professor, Science Building, Room 217, Utah Valley State College, Orem, Utah, Phone: (801) 222-8607, E-mail: whaleywa@uvsc.edu

John Willoughby. November, 2001. State Botanist, Bureau of Land Management, 2800 Cottage Way, Sacramento, CA 95825, Ph: 916.978.4638, Fax: 916.978.4657, Email: john_willoughby@ca.blm.gov

Alma Winward. November, 2001. Regional Ecologist, Intermountain Region, USDA Forest Service, Federal Building 324, 25th Street, Ogden, UT 84401, Phone: 801-625-5596, Fax: 801-625-5127, E-mail: awinward@fs.fed.us