Castilleja

The Newsletter of the Wyoming Native Plant Society

December 1997
Volume 16, No. 4

In this issue:

Seneca Snakeroot (*Polygala senega)* is one of three Wyoming species in the milkwort family (Polygalaceae). Although quite reduced in size, the flowers of milkworts (inset) are notable for their superficial resemblance to the papilionaceous flowers of the pea family. The petals of the milkwort flower have been modified into a keel-like structure and 2 small wings enclosed within 2 large, hood-like sepals (3 other small sepals are also present). Seneca snakeroot is a perennial herb with hairy stems up to 15 inches tall, a terminal spike of white flowers, and narrow, alternate leaves. It is widespread in the forests of eastern North America, but only occurs in the Black Hills in Wyoming. Seneca snakeroot contains the glucoside seregin which was used by Indians of eastern North America to cure snakebites. Illustration by Ilgvar Steins from "The Milkworts of Canada".

WNPS NEWS

1998 Student Scholarships Available: The annual WNPS student scholarship is available to any junior college, undergraduate, or graduate student studying the native flora and fungi of Wyoming. Applicants are now being sought for the 1998 award. One to three scholarships will be awarded in the amounts of 200-300 dollars. Projects may deal with any aspect of botany, but research must be conducted in Wyoming. Applicants are asked to submit a 2-3 page summary of their proposed research project, including information on methods, goals, and a budget. Applications need to be submitted to the Secretary of the Society before 21 February 1998. Winners will be chosen by the Society's board in March 1998. WF

Sweetwater County Chapter: Charmaine Refsdal Delmatier is organizing a new chapter of WNPS for the southwestern part of the state. To help kick off the chapter, a field trip will be held this coming June to get members acquainted with each other and the colorful desert. Look for more information on the trip in *Castilleja* later this spring. For more information on the chapter, please contact Char at (307) 875-6437. WF

New Members: Please welcome the following new members of WNPS: Sue Ann Kamal (Greeley CO), Rich Lindsey (Laramie), Mark Lyford (Laramie), Mark Shirley (Encampment), S. Ray Smith (Winnipeg, MAN), Katherine Stoops (What Cheer, IA), and Kevin Taylor (Laramie).

We're looking for new members: Do you know someone who would be interested in joining WNPS? Send their name or encourage them to contact the Society for a complimentary newsletter.

Attention Readers: We are always looking for articles and illustrations for the newsletter. Items for the March issue are needed by 15 March 1998.

Treasurer's Report: Balance as of 24 December 1997: General Fund $572.65; 1997-98 Student Scholarship Fund $575.00; Total funds: $1147.65 WF

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Contributors to this issue: John Baxter, Robin Corcoran, Charmaine Refsdal Delmatier (CRD), Walter Fertig (WF), Lynn Kinter, Isobel Nichols, and Ilgvar Steins.

Strange Scientific Names

By John Baxter

The next time you're at a party and the conversation begins to lag, try casually dropping a couple of long scientific names like *Cheiranthodendron polydactylon* or *Anodopetalum biglandulosum*. Your listeners will be (choose one): A. impressed, B. infuriated, C. terrified. If they haven't been exposed to biology, the correct answer would probably be "C". For some reason, your average run-of-the-mill, man-in-the-street finds scientific names rather scary, even though people have been saying *Cosmos* and *Delphinium* for years, without a tremor.

Of course, rhyming names like *Cressa depressa* and *Sarcobatus vermiculatus* are more user-friendly and easier to remember. And the most unforgettable botanical scientific names is *Veronica beccabunga*. You probably won't believe this, but I once found a Veronica Beccabunga in the Milwaukee phone book.

There are quite a few strange scientific names floating around in the literature. For example, the plant genera *Boopis, Bubbia,* and *Grubbia*. Some (obscure?) ichthyologist named a fish genus *Abudefduf*. Mycologists have a tendency to come up with weird names, especially when honoring their former major professors. A mycologist in India, whose Ph.D. research was with Dr. James Dickson, Univ. of Wisconsin, named a new species *Jamesdicksonia obesa*. Why *obesa*? Maybe it has fat spores. Anyway, *obesa* isn't too appropriate. Dickson was as skinny as a rail.

A few years ago a couple of mycologists described a new fungus that has a large, spherical black spore that looks like a cannonball. The specific epithet they chose was *cannonballus*. Is this kosher?

Field Trip Reports

Paintbrush Canyon Trip (September 13, 1997: It was fair, with hardly any wind, on a mid-September day when the Teton Chapter sponsored a nature walk with Stuart Markow up the steep but breathtaking Paintbrush Canyon, just west of Jenny Lake. The group wound their way up from the parking lot, over the open midslopes, through a long stretch of mixed conifer forest, and then up to an expansive view of the Teton Range.

As we ascended from the parking lot, the hillside was full of blue, yellow, and white from various asters, buckwheat, penstemons, and yarrow. The species of aster changed along an elevational gradient as we hiked from the parking lot to the subalpine. First we encountered thickstem aster (*Aster integrifolius*) at the parking lot, then Pacific aster (*A. ascendens*) at midslope, and Engelmann aster (*A. engelmannii*) at higher elevations in wooded areas. Engelmann aster is a special treat to look at with its purple-tinged involucral bracts.

As we entered a mixed conifer forest of Douglas-fir (*Pseudotsuga menziesii*), Engelmann spruce (*Picea engelmannii*), and subalpine fir (*Abies lasiocarpa*), the group encountered three similar members of the lily family: fairy bells (*Disporum trachycarpum*), false Solomon's seal (*Disporum trachycarpum*), and twisted-stalk (*Streptopus amplexifolius*). Several heaths were also discovered, including the mycotrophic pinedrops (*Pterospora andromedea*) and pinesap (*Hypopitys monotropa*). These leafless plants derive their nutrition by parasitizing the mycorrhizal connections of other forest plants. Other heaths included pipsissewa (*Chimaphila umbellata*) and woodnymph (*Moneses uniflora*). Now things were getting too interesting to stop, so we headed up the trail for some more fun.

Our attention turned to nongreen things - in particular, mushrooms. A large reddish bolete (a mushroom with pores instead of gills) caught our eyes immediately. It was woolly cap (*Suillus tomentosus*), a bolete with a diameter of 4-6 inches across the cap. Various chantrelles and morels were also scattered across the landscape.

Next our attention turned to green things, graminoids and ferns. We spotted two members of the rush family growing in shaded portions of the forest (*Luzula glabrata* var. *hitchcockii* and *L. parviflora*). Where there was plenty of moisture, we encountered woodreed (*Cinna latifolia*), a robust member of the grass family. Hot on the trail for more green things, we found two pteridophytes, rock brake (*Cryptogramma acrostichoides*) and bladder fern (*Cystopteris fragilis*) growing in the crevices of rocky outcrops.

Underneath some of the rocky outcrops were wet seeps. To our delight, we discovered one of the twayblades (*Listera* sp.), an orchid with a basal rosette of kidney-shaped leaves and small delicate greenish-white flowers. Growing with it were fivestar mitrewort (*Mitella pentandra*), brook saxifrage (*Saxifraga odontoloma*), and Eastwood willow (*Salix eastwoodiae*).

Something kept driving us, whether it was a refusal to accept that summer would soon be over, or whether it was the excitement of discovering the diversity of the plant kingdom, or a combination of both, but something kept us going. The vista that opened up before us was worth the effort; we had reached the alpine. A cirque of granite and limestone pillars surrounded the head of the valley we had just climbed. The plants immediately became smaller in stature. Such a small size may protect alpine plants from harsh winds but these precautions hardly seemed necessary on this particular sunny and balmy day.

Of all the showy flowers encountered, one that caught our eyes was explorer gentian (*Gentiana calycosa*) with its solitary bright blue flowers. If one looks closely, the florescent green dots that line the corolla throat are visible. When the sun shines through the corolla, the brilliance of both green and blue can be seen from a distance.

Even though we wanted to go further and encounter more alpine flora, darkness would soon be upon us. Then, dinner was mentioned, and that's all it took; we were off the mountain in record time. On the way down, one couldn't help but admire the fall colors of mountain-ash (*Sorbus scopulina*). We returned to our vehicles just before dark, conquering a good 10 miles! CRD

Below: Eastwood willow (*Salix eastwoodiae*). Illustration by W. Fertig.

Botany Briefs

Rare Plant Habitat Protected by the BLM in Southwest Wyoming: The Bureau of Land Management's Green River Resource Area in southwestern Wyoming manages lands containing some of the state's rarest native plant species. In October 1997, a new resource management plan for the Green River Resource Area was approved by the BLM that will provide new protection for the habitat of many of these plants. Nine hundred acres of BLM-administered surface lands have been designated as an Area of Critical Environmental Concern (ACEC) for four "special status" plant species that have been candidates for listing under the Endangered Species Act.

The new ACEC protects populations of the small rock cress (*Arabis pusilla*) near South Pass, Wyoming tansymustard (*Descurainia torulosa*) south of Rock Springs, precocious milkvetch (*Astragalus proimanthus*) near Mckinnon, and Uinta greenthread (*Thelesperma pubescens*) at Cedar, Hickey, and Sage Creek mountains (see March 1996 issue of *Castilleja* for more on this area). Due to their ACEC status, these areas are now closed to surface disturbing activities (including new mining claims and off-road vehicles) that would negatively impact the specific locations of these rare plants. Existing mining leases are still allowed, but with no-surface occupancy requirements. Current grazing activities may be changed if they prove to be detrimental to the rare plants.

New acreage may be added to the ACEC if additional plant species should warrant special management attention. Likewise, if one of the candidate species in the ACEC proves to be more common, the ACEC boundaries may be amended to exclude these habitats.

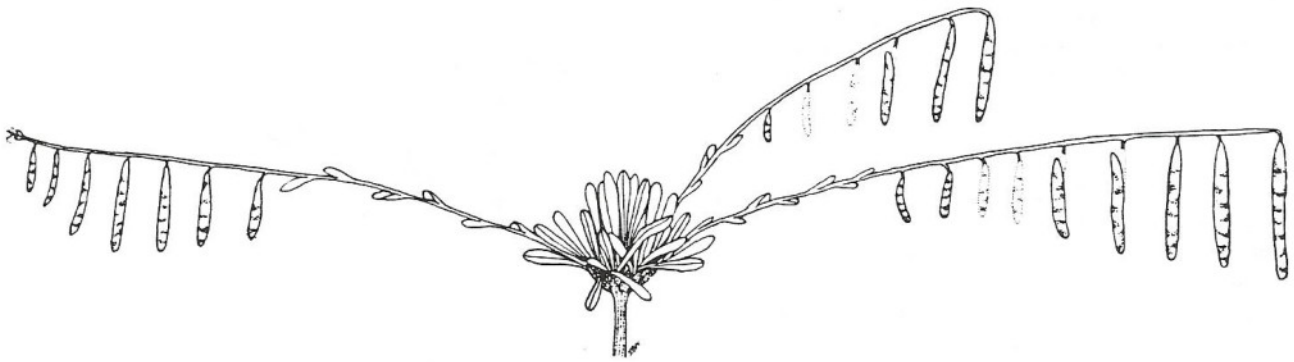
Protection of these species (all of which are restricted to Wyoming) serves to fulfill the BLM's internal policy of proactive management to prevent candidate species from becoming even more rare and being listed under the Endangered Species Act. With this new management plan the Green River Resource Area is at the forefront of plant conservation efforts in Wyoming. WF

More Additions to the Flora of Wyoming: Two new species have been reported for the state since the last installment of this feature in the October 1997 issue.

Sesuvium verrucosum Seapurslane: Jim Orpet, an environmental consultant, discovered this species while surveying the banks of a playa lake east of Reno Junction in Campbell County in 1995. Seapurslane is the only member of its family (the Aizoaceae, or ice-plant family) known to occur in Wyoming. It can be recognized by its freely-branched, matted growth form, opposite succulent leaves, and inconspicuous, petal-less flowers. The population in Campbell County is disjunct from the nearest populations in Colorado, central Kansas, and northern Utah.

Euphorbia chamaesyce (syn. = *E. prostrata, Chamaesyce prostrata*) Prostrate spurge: This species was discovered on a sand bar along the North Platte River in Goshen County by Robert Dorn this past summer. Prostrate spurge is a hairy, annual forb with asymmetrical, opposite leaves, and short, axillary inflorescences. It most closely resembles *Euphorbia maculata* and *E. stictospora*, but can be distinguished by its deeply divided styles and cross-rugulose seeds. Although native to the southeastern United States, this species is probably introduced in Wyoming. WF

Below: Small rock cress (*Arabis pusilla*) is one of Wyoming's rarest plant species. It is known from a single, small population on BLM lands near South Pass in Fremont County. *Arabis pusilla* is one of only three Wyoming plants that is currently a candidate for listing under the Endangered Species Act. Its habitat will now be better protected as a result of ACEC designation by the BLM. Illustration by Isobel Nichols from the "Wyoming Rare Plant Field Guide".



The Big Fall Creek Thermal Area

By Walter Fertig

Outside of Yellowstone National Park, thermal features are quite uncommon in Wyoming. Unfortunately, many of the state's thermal areas have been destroyed by human development, flooding, and general mismanagement. Very few of these sites have been formally protected.

The Big Fall Creek thermal area in the southern Wyoming Range is one of the lesser-known thermal areas in the state, but it may soon be protected if a proposal to designate the site as a Special Management Area (SMA) is adopted by the Bridger-Teton National Forest. In addition to its thermal springs, the Big Fall Creek SMA would provide protection for a rich mosaic of upland forest, sagebrush grassland, tall forb, and riparian vegetation types, which in turn provide habitat for several rare plant and animal species.

Special Management Areas (also called Special Interest Areas) are sites designated by individual forests or acts of Congress that protect areas with unusual geological, botanical, zoological, or historical features. These areas are usually, but not always, in near-pristine condition. Management emphasis in SMAs is on protecting the natural or cultural features of the area while still allowing compatible recreational uses.

The Big Fall Creek SMA derives its name from a two mile stretch of waterfalls found along the mid to lower reaches of Big Fall Creek. These falls drop over a series of travertine terraces and low cliffs formed from calcium-rich thermal waters. Some geologists fear that the existing terraces and cliffs are not being replaced by fresh travertine deposits and may eventually deteriorate.

The ultimate source of the warm waters is a series of at least eight thermal springs at the head of Big Fall Creek. Water issuing from these springs is about 61° F (16° C) and smells strongly of sulfur. Dense stands of speedwell (*Veronica anagallis-aquatica* and *V. americana*) and yellow monkeyflower (*Mimulus guttatus*) are found along the thermal pools associated with these springs. Additional springs on forested tributary branches of Big Fall Creek discharge cooler waters (in the 46-48° F range).

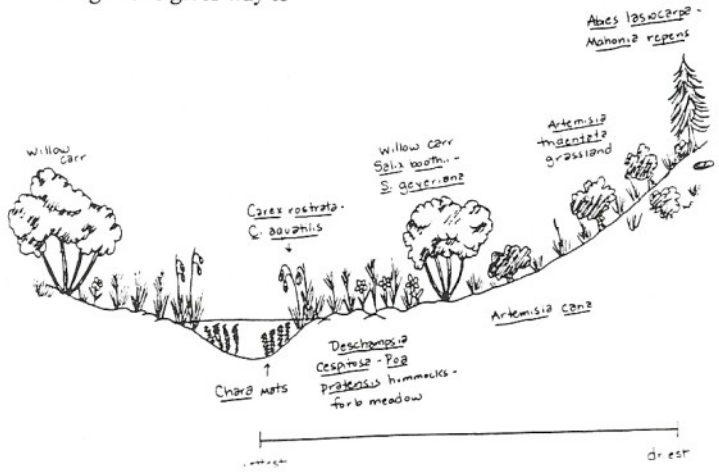
Downstream of the thermal springs, Big Fall Creek becomes a braided stream that meanders across a broad, wet valley. The stream channel is bordered by a narrow band of sedges (*Carex rostrata, C. aquatilis,* and *C. vesicaria*) on seasonally flooded sandy mud. The sedge zone gives way to extensive areas of wet, hummocky meadows dominated by tufted hairgrass (*Deschampsia cespitosa*), mannagrass (*Glyceria striata*), Kentucky bluegrass (*Poa pratensis*), and a rich assortment of wetland forbs. Farther from the watertable, this community is replaced by Booth and Geyer willow thickets and stands of silver sagebrush (*Artemisia cana*).

The steep slopes that surround the Big Fall Creek drainage illustrate the contrasts between north and south-facing vegetation types. Dry, south-facing slopes of calcareous parent material are dominated by mountain big sagebrush (*Artemisia tridentata var. vaseyana*)/Idaho fescue (*Festuca idahoensis*) grasslands intermixed with mountain snowberry (*Symphoricarpos oreophilus*), bitterbrush (*Purshia tridentata*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Tall forb communities of balsamroot and little sunflower (*Balsamorhiza sagittata/Helianthella uniflora*) replace sagebrush on semi-disturbed toe slope areas.

In contrast, north-facing slopes support dense forests of subalpine fir, Engelmann spruce and lodgepole pine. Understory shrubs are often abundant, especially mountain-lover (*Paxistima myrsinites*), Oregon-grape (*Mahonia repens*), and Canada buffaloberry (*Shepherdia canadensis*). Douglas-fir is surprisingly uncommon, although it may be found along the edge of an old logging road that passes through the SMA.

Nearly 300 species of trees, shrubs, forbs, grasses, and ferns have been recorded from the Big Fall Creek SMA. One of the most interesting is Payson's milkvetch (*Astragalus paysonii*), a tall, white-flowered member of the pea family that produces numerous banana-shaped yellow-green fruit pods in late summer. This species is found only in the mountains of western Wyoming and north-central Idaho and is listed as Sensitive by the US Forest Service. Payson's milkvetch was probably originally adapted to recovering burned areas, but in the absence of widespread fire, it now grows primarily on semi-disturbed roadcuts that do not have dense grass growth. It is somewhat ironic that this species has become established along the banks of the old logging access road in the SMA.

The vegetation of Big Fall Creek suffered for many years from overgrazing, siltation problems, and the effects of heavy recreational use. Hopefully, with time and protection as an SMA, this interesting area will continue to recover and provide quality habitat for plants and animals for years to come.



The Role of Genetics in the Conservation of Rare Plant Species

By Lynn Kinter

While habitat preservation has long been a mainstay of many conservation programs, preservation of genetic variation has only recently been recognized as an important concern for plant species that are rare or threatened. Maintenance of genetic variation is thought to enhance the ability of populations to adapt to changing environments and decrease their susceptibility to pests and disease. Additionally, management of rare native plants, both in the wild and in cultivation, can be greatly facilitated by knowledge of individual and population genetics.

In contrast to works on animal conservation, the literature concerning native plants has largely neglected genetic considerations in devising strategies for rare species conservation, focusing instead on ecological and demographic issues. While theory and empirical examples suggest that demography and ecology are usually of more immediate importance than population genetics in determining viability of wild populations, genetics is increasingly recognized as crucial to success in long-term management of species. Models which combine plant genetics and population biology are now being developed which will provide a basis for managing populations of endangered species efficiently and sustainably. This increased scientific understanding is particularly important in the development of integrated conservation strategies, combining population and species management using on-site and off-site conservation techniques.

Biologists working with threatened species have some unique concerns related to the fitness of their populations. Small, isolated populations may show declines in genetic fitness and adaptability, or lose genetic fidelity when crossed with closely related species.

Because rare plants generally occur in small populations, it is important to assess whether significant genetic deterioration can arise through sudden or gradual decreases in numbers. Small populations may experience harmful genetic effects such as bottlenecks—sharp reductions in the number of individuals of a species in a particular place or time, accompanied by a significant loss of genetic diversity. Genetic drift—random changes in gene frequencies due to reproduction of a small number of gametes—may lead to loss of alleles. Founder effect may occur when only a few individuals carrying a small fraction of the total genetic variation of the parental population establish a new population.

For plants, an added concern is that the breeding population is frequently smaller than the actual number of individuals in a population. This may be due to numerous factors including nonrandom mating, differential fertility, unequal sex ratios, age and size structure, and gene flow among populations. Alone or in combination, these factors may lead to loss of heterozygosity or loss of alleles, and decreased vigor of individuals and inability to adapt to changing environmental conditions.

The distribution and amounts of genetic diversity within and among populations of rare plants are likely to depend on whether a species has always been rare or whether it has recently become so as a result of human influences. Species that occur naturally in sparsely distributed, small populations may possess genetic systems adjusted to close inbreeding, as well as adaptations that offset the disadvantage of rarity. In contrast, species that have experienced severe reductions in population numbers due to habitat destruction or grazing may be more susceptible to genetic stresses imposed by small population size. These differences have important implications for population genetic structure, sampling of genetic material, and breeding methods that may be used.

Some biologists question the effects of inbreeding and loss of genetic diversity on the survival of populations. Caro and Laurenson (1994) cite several mammalian species, including cheetahs, that are commonly believed to be declining due to low genetic diversity but that may be in decline due to other factors, such as predation or habitat destruction. However, many other biologists recognize the critical role played by genetic diversity in conservation of species. Some plant populations, such as the Lakeside daisy of Illinois, or species, such as the American chestnut of the eastern U.S. have been essentially lost because they lack genetic diversity to reproduce or to survive environmental challenges.

The frequency and intensity of inbreeding are often higher in plants than in animals due to small population sizes, the sessile nature of plants, restricted dispersal through pollen and seeds, self-fertilization, and sibling mating. The major effect of self-fertilization on fitness in plants is inbreeding depression—a reduction in fitness when compared with outcrossed offspring. While the extent of inbreeding depression may be determined with hand pollinating in cultivated species, it can also be assessed using electrophoretic data in natural populations that may not be suitable for experimentation.

Outbreeding depression may occur with intraspecific hybridization between individuals from spatially separated genetic sources. When two populations are adapted to local environmental conditions, their hybrids may be less fit in either location.

Hybridization between rare plants and nearby related common species can result in the loss of genetic uniqueness. One example is the extremely rare Catalina mahogany (*Cercocarpus traskiae*) of the Channel Islands off the California coast, which is now hybridizing with the widespread mountain mahogany (*C. betuloides*). Isozyme and random amplified polymorphic DNA (RAPD) analyses show that five of the remaining eleven adult trees are first or later generation hybrids.

Genetic considerations may have long and short-term importance for the management of rare species. The long-term objective of conservation management is to maintain the evolutionary viability of taxa, optimizing their chances of surviving environmental changes. In the short-term, when taxa are critically endangered, direct management of natural

populations or the establishment of off-site populations may be required, and several genetic factors must be considered.

Taxonomic treatments based on morphology are sometimes unclear. When identity is based only on morphology and geographic range, populations thought to belong to a rare taxon may actually be from a more common species. Conversely, taxonomists may identify individuals from two populations as the same taxon, when in fact they are different. Such was the case for the rare Santa Cruz Island bush mallow (*Malacothamnus fasciculatus* var. *nesioticus*), which was once treated as one of several common mainland varieties of bushmallow. A recent genetic analysis revealed several allozymes, RAPD fragments, and internal transcribed spacer sequences unique to the island variety, and thus resulted in its classification as a separate variety and "endangered" listing by the state of California. For prudent management, taxa generally should be considered genetically distinct unless proven otherwise.

A species' or populations' geographic range and associated genetic variability is of particular importance to plant conservation biologists. Endemic species of restricted range tend to have fewer polymorphic loci and less genetic diversity than widespread species. Genetic differentiation among populations of endemic species is similar to genetic differentiation among more widespread species. Additionally, gene flow among populations of many endangered species has undoubtedly decreased in recent decades, due to habitat fragmentation and resultant geographic isolation (Hamrick and Godt 1996).

Breeding systems are correlated with level of genetic variation, with predominantly self-pollinating species typically having less genetic diversity and much greater differentiation among populations. Outcrossing taxa, especially those pollinated by wind, have more genetic diversity within species and much lower heterogeneity among populations. However, Schoen and Brown found that genetic diversity within populations varies more among selfing species than among predominantly outcrossing species, and emphasized the need for specific empirical data in conservation decisions when differentiation among populations increases.

The short-term preservation of plant species can be accomplished by on-site conservation of populations, (such as protection from grazing or removal of potential hybridizing congeners) or off-site by maintaining representatives in gardens and storage of seeds or propagules. In each strategy, empirical genetic information is required for decisions concerning which populations to preserve or sample. This information can also serve as a baseline to determine whether genetic diversity is lost over time.

Hamrick and Godt (1996) cite three case studies from the southeastern U.S. in which the distribution of genetic diversity did not follow generalities based on literature. In their examples, the endangered populations were prioritized for conservation efforts based on qualitative data of alleles of polymorphic loci and allozyme diversity. In each case, the populations having highest diversity, and therefore highest priority, were exceptions to what managers would have expected based on literature.

Preventing the extinction of rare plant species requires a complex set of ecological and evolutionary information. Population dynamics are affected by social structure, life history, environmental fluctuations, and many other factors. In small populations, inbreeding can greatly reduce individual fitness, and loss of genetic variability due to random drift can diminish adaptability. While demography is usually of more immediate importance than population genetics in determining viability of wild populations, long-term, and in some cases short-term, viability can also depend on the genetic fitness and variability of plant populations. Knowledge of individual and population genetics can aid in identifying and prioritizing populations for conservation, and heighten the effectiveness of transplant or reintroduction efforts. Increased understanding of the interactions of demographic and genetic factors holds promise for enhanced preservation of rare native species.

Ed. Note: Lynn received one of the Society's student scholarships in 1997.

References:

Caro, T.M. & M.K. Laurenson. 1994. Ecological and genetic factors in conservation: a cautionary tale. Science 263:485-486.

Hamrick, J.L. & M.J.W. Godt. 1996. Conservation genetics of endemic plant species. *In* Conservation Genetics: Case Studies from Nature. Ed. J.C. Avise & J.L. Hamrick, pp 281-304. Chapman and Hall, New York

Below: Middle Park beardtongue (*Penstemon cyathophorus*), an endemic of north-central Colorado and adjacent Wyoming (Sierra Madre of Carbon County). This species can be recognized by its long stamens that project beyond the corolla. Illustration by Robin Corcoran from the "Colorado Rare Plant Field Guide".

Ill. by Robin Corcoran

Two varieties of *Senecio dimorphophyllus* occur in Wyoming. Variety *paysonii* can be recognized by its clasping stem leaves and truncate bases of the lower leaves. It occurs sporadically in the mountains of northwestern Wyoming. Variety *dimorphophyllus* has gradually tapering leaf bases and is locally abundant in wet meadows in the Medicine Bow Range. Illustration by W. Fertig from "The Alpine Flora of the Rocky Mountains".

The Wyoming Native Plant Society, established in 1981, is a non-profit organization dedicated to encouraging the appreciation and conservation of the native flora and plant communities of Wyoming. The Society promotes education and research on native plants of the state through its newsletter, field trips, and annual student scholarship award. Membership is open to individuals, families, or organizations with an interest in Wyoming's flora. Members receive *Castilleja*, the Society's quarterly newsletter, and may take part in all of the Society's programs and projects, including the annual meeting/field trip held each summer. Dues are $5 annually.

To join the Wyoming Native Plant Society, return the membership form below to:

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