Proceedings:

Conserving Montana's Rare Plants and Special Habitats

April 15 and 16, 1997
Missoula, Montana

Co-sponsored by: U. S. Bureau of Land Management - Montana Office
U. S. Forest Service - Region 1
Montana Native Plant Society
Montana Natural Areas Technical Committee
Montana Natural Heritage Program
Nature Conservancy

Montana Plant Conservation Conference

Tuesday, April 15 - Mount Sentinel Room

8:00 - 8:10 AM Welcome and Announcements

PLANT CONSERVATION - Moderator: Angela Evenden, U.S. Forest Service Intermountain Research Station

8:10 - 8:30 AM	A Message to Botanists - Jack Ward Thomas, University of Montana
8:30 - 8:50 AM	Working with Sensitive Species in Times of Change - Steve Shelly, U.S. Forest Service Region 1
8:50 - 9:10 AM	Fire and the Endangered Plant, *Silene spaldingii* - Peter Lesica, Nature Conservancy
9:10 - 9:20 AM	Wetland Habitat of the Threatened Plant, *Spiranthes diluvialis* - Bonnie Heidel, Montana Natural Heritage Program
9:30 - 9:50 AM	Not All Moonworts Are Created Equal - Jim Vanderhorst, Montana Natural Heritage Program
9:50 - 10:10 AM	BREAK

PLANT CONSERVATION - Moderator: Maria Mantas, Flathead National Forest

10:10 - 10:30 AM	Genetic Variation in *Arabis fecunda*: Management Implications - John Bishop, Donna Leeper, and Tom Mitchell-Olds, University of Montana
10:30 - 10:50 AM	The Importance of Genetic Variation in Survival of Populations - Dara Newman, University of Montana
10:50 - 11:10 AM	Tribal Plants of Special Concern - Joanne Bigcrane, Consolidated Salish and Kootenai Tribes
11:10 - 11:30 AM	Averting Rarity: Conserving Medicinal Plants - Robyn Klein, Sweetgrass School of Herbalism
11:30 - 11:50 AM	The State Flora, Brought to You by the Regional Office *et al*. - John Pierce, U.S. Forest Service
11:50 - 12: 10 AM	A Computerized Plant Key: a Tool for Rapid Identification and Inventories - Bruce Barnes, Flora ID Northwest

12:10 - 1:10 PM LUNCH

HABITAT CONSERVATION - Moderator: James Habeck, University of Montana

1:10 - 1:30 PM	Reserves in the Shortgrass Prairie - Theodore Weaver, Montana State University
1:30 - 1:50 PM	Now It's Designated; What Next…? - John Joy, Beaverhead-Deerlodge National Forest
1:50 - 2:10 PM	Positive and Negative Interactions Between Whitebark Pine and Subalpine Fir in the Northern Rockies - Ray Callaway, University of Montana
2:10 - 2:30 PM	The Rocky Mountain Front: A Landscape In Transition - Dayna Ayers Baumeister, University of Montana
2:30 - 2:50 PM	Classifying Existing Vegetation: A First Step in Understanding Rare Plant Communities - Toby Spribille, Kootenai National Forest
2:50 - 3:10 PM	BREAK

HABITAT CONSERVATION - Moderator: Bernhard Hall, The Nature Conservancy

3:10 - 3:30 PM	The Montana Distribution of Two Rare Fen Mosses, *Scorpidium scorpiodes* and *Meesia triquetra* - Joe Elliot, Conservation Biology Research
3:30 - 3:50 PM	High Temperature Mosses and Vascular Plants of Yellowstone's Thermal Features, Tulli Kerstetter, Montana State University
3:50 - 4:10 PM	Blackfoot Ecosystem Weed Management Project - George Hirschenberger, Bureau of Land Management
4:10 - 4:30 PM	Roadside Revegetation With Native Plants in Glacier National Park - Joyce Lapp and Jen Asebrook, Glacier National Park
4:30 - 4:50 PM	Native Plant Solutions for Conservation Problems - Susan Winslow, Bridger Plant Materials Center
4:50 - 5:10 PM	Mycorrhizae Mediate Spotted Knapweed Invasion in Palouse Prairie - Marilyn Marler, Cathy Zabinski, Ray Callaway, University of Montana
5:10 - 5:30 PM	Seasonal Changes in Seed Bank Composition of Native Palouse Prairie and Adjacent Knapweed Dominated Grassland Sites - Todd Wojtowicz and Cathy Zabinski, University of Montana
5:30 - 5:50 PM	Botany Discoveries Year-round in the Bitterroot Valley - Judy Hoy

DISPLAYS: A Comparison of Native and Invasive Plant Seedling Growth Rates - Laurie Ashley and Cathy Zabinski, University of Montana

Rare and Out-of-Print Natural History Books - Robert Scott, Discovery Books

Montana Native Plant Society Display

Wildcrafting - Robyn Klein, Sweetgrass School of Herbalism

Montana Plant Conservation Conference

Wednesday, April 16 - Montana Room

8:00 - 8:30 AM	Surfing Botany Sites on the Internet - Scott Lee-Chadde, Montana Natural Heritage Program
8:30 - 10:00 AM	Internet demonstration open-time
10:00 - 10:30	BREAK
10:30 - 11:00 AM	INVADERS Database Project: Exotic Plant Invasions of the Pacific Northwest - Peter Rice, Jun (George) Huang, and Matthew Harrington, University of Montana
11:00 - 12:00 AM	INVADERS demonstration open-time
9:00 - 12: 00 AM	Meeting: **Status Review of Montana Threatened, Endangered, and Sensitive Plant Species**
12:00-1:00 pm	LUNCH
1:00-2:00 pm	Herbarium Tour - Peter Lesica and David Dyer, University of Montana
2:00-4:00 pm	Meeting: **Montana Natural Areas Technical Committee**
2:00-4:00 pm	Internet and INVADERS demonstration open-time

A NOTE TO ALL CONFERENCE PARTICIPANTS

Comments are invited on the second Montana Plant Conservation Conference. It was organized by an ad hoc committee, and the comments solicited from participants at the first conference provided the basis for scheduling it in alternate years, and for holding it in Missoula.

What did you *like* or *dislike* about the program, the arrangements, and about the organization of it? What suggestions would you make for its improvement? Would you be interested in becoming involved in the development of the next conference? Please jot your comments and leave them at the registration table or mail them to:

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THANKS!!

Working with Sensitive Species in Times of Change

Recent changes in sensitive species programs, both nationally and regionally, are of interest to plant conservation efforts in Montana. They include changes when the U.S. Fish and Wildlife Service narrowed the circumscription of candidate species in 1996, the Montana State Office of the Bureau of Land Management issued a special status species policy in 1996, and current flux while changes in the U.S. Forest Service planning regulations at the national level are pending. This presentation will examine these "moving parts," and will also review pending changes, and developing approaches, to sensitive species conservation in the U.S. Forest Service.

The Forest Service program to conserve species diversity is guided, in part, by the requirements of the National Forest Management Act to maintain the diversity of communities and species on each National Forest. One of the main shifts will be the adoption of ecosystem management principles in planning. These changes should not result in a downplaying of the importance of "fine filter" (species) conservation because:

1) Standardized criteria for sensitive species designation are pending, which will focus on the conservation of species that are at risk at both rangewide and local scales, and 2) Contemporary definitions of ecosystem management include the maintenance of viable populations of species as a primary goal.

In Region 1 of the U.S. Forest Service, several approaches are in use for maintaining plant species diversity:

* Conservation strategies are excellent tools for the conservation of species, or "guilds" of species sharing habitats.

* Monitoring is a critical aspect in determining our success at conserving the species that make up ecosystems.

* Genetic analysis provides measures of genetic variation patterns and a new perspective on the phylogeny of both species and ecosystems.

* Habitat Management gives opportunities for "hands-on" management to enhance or restore sensitive plant habitat.

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Fire and the Endangered plant, *Silene spaldingii*

Fire is frequently used to manage natural areas grasslands; however, it is important to understand the effects of burning on rare species before implementing prescribed fire. I studied the effects of spring and fall fire on *Silene spaldingii*, an endangered perennial herb of grasslands in northwest Montana. Individual *S. spaldingii* plants were mapped, and size and flowering were recorded for one year prior and five years subsequent to the burn treatments. Enhanced recruitment and an increase in population size were the principal effects of fire on *S. spaldingii*, and fall burn plots had lower recruitment than spring burn plots. The number of flowers per reproductive plant was greater in burn plots, but the proportion of reproductive plants was greater in control plots than for the fall burn. These effects were apparent for 2-3 years following the treatments. Fire had no detectable effect on the survival of adults or recruits of *S.*

spaldingii. Results suggest that fire has a positive effect on the population dynamics of *S. spaldingii* by removing litter and creating safe sites for recruitment. Prescribed fire should be an important tool for managing populations of this rare plant.

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Wetland Habitat of the Threatened Plant, *Spiranthes diluvialis* in Montana

Spiranthes diluvialis Sheviak (Ute ladies'-tresses; Orchidaceae) was listed as Threatened (57 FR 2053) before it was discovered in Montana in 1994. It is also known from Colorado, Idaho, Nebraska, Nevada, Utah and Wyoming. Evaluation of its status in Montana was initiated in 1996 following unequivocal cytological verification. To survey for the species, preliminary habitat search images were developed based on the single known site and information from the rest of its range. Using aerial photographs, wetland settings were identified in over 80 sections, habitat hypotheses were evaluated through fieldwork in 28 sections, and four new sites were documented. *Spiranthes diluvialis* is an obligate wetland species now known from Jefferson and Madison counties at low elevation (below 5,000 ft). It occurs in arid intermontane valleys with saline soils also high in calcium carbonate. It is restricted to wetlands that are typically part of a meandered wetland complex, in segments and zones of the wetlands where there is stable non-saline subsurface groundwater in low competition settings. Recurrent patterns of associated vegetation and soils were identified. The resulting habitat search images are being refined and employed to complete the systematic survey and the Montana status assessment, toward the goal of statewide and rangewide conservation.

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Not All Moonworts are Created Equal

Habitat preferences and biogeography of moonworts (*Botrychium* subgenus *Botrychium*) provide additional evidence to support the controversial taxonomy of the subgenus developed over the last two decades by Warren (Herb) and Florence Wagner. Contrasting examples are given for the six sensitive moonwort species found on the Kootenai National Forest - *Botrychium ascendens, B. crenulatum, B. minganense, B. montanum, B. paradoxum,* and *B. pe dunculosum*. Although habitats and distribution of the six species overlap and they may grow together in genus communities, modal differences can be discerned from the microhabitat to the global scale.

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Genetic variation in *Arabis fecunda* and its management implications

Approximately 19 populations of *A. fecunda* exist in the wild, distributed across three mountain ranges: the Sapphires, Pioneers, and Highlands. We have quantified several types of genetic variation in a subset of populations representing each mountain range. We find: a) Low levels of genetic variation overall, with most polymorphism found in the Sapphire populations, and evidence of one recent inter-range migration; and b) Heritable variation among ranges in activities of 8 enzymes, indicating local differentiation in quantitative traits of possible ecological significance. Also, a phylogeny of alleles at the BC1 locus suggests that the Sapphire populations a) May predate those in other ranges and b) Have maintained a large population size over a long time period. If genetic variation and large population size are important for persistence, then the Sapphire populations should be awarded increased protection. However, finding that the Pioneer and Highland populations are evolutionarily independent lineages, have low variation, and yet have undergone local differentiation, warns against management decisions based solely on levels of genetic variation.

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Averting Rarity: Conserving Medicinal Plants

Montana plants have been collected for the commercial herb market throughout our state's history. The interest in wild plants which have medicinal uses has been steadily increasing over the past decade. In 1994, the estimated retail value of the United States medicinal herb industry was $1,602,790,726. However, data on the tonnage of medicinal herbs collected from the wild is almost non-existent. Conserving rare plants and special habitats is presently of great interest to herbalists. This is evidenced in particular by their concern over the harvesting of wild goldenseal (*Hydrastis canadensis*) and purple coneflower (*Echinacea* spp.). Several organizations started by herbalists now help educate the public about the shrinking stands of wild medicinal plants. An overview of specific medicinal plants will help illustrate the importance of taking into account the pressures from the commercial herb market.

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The State Flora, Brought to You by the Regional Office et al.

The U.S. Forest Service Region 1 Plant Species Data Base was built by me as a component of ECODATA, where it is a part of the analysis package. I will focus on the Region 1 Flora component. Other discrete parts of the package that can be linked address: Autecology, Establishment, and Synonmy. The Region 1 Flora covers from Canada to Wyoming and Utah, and Minnesota to the Cascade Crest. The Autecology component has ecological attributes for only the most common species. The Establishment component is designed to aid in planning community restoration; only a few species have been loaded. The Synonymy component is being developed to crosswalk the preferred name of all vascular plant species found in the Region 1

Flora with major floras, and it will contain a crosswalk with floristic databases being developed through Montana Natural Heritage Program to be made available on the Internet.

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A Computerized Plant Key: A Tool for Rapid Identification and Inventories

Computer plant keys are demonstrated for the vascular plants of the Pacific Northwest, including Southern British Columbia, Washington, Oregon, Idaho, Montana and Wyoming. The keys allow the user to identify easily any plant in a fraction of the time normally required. A person may select which characteristics of a plant to use in keying it out, instead of being limited to the forced choices of a dichotomous key. The user can also ask the system to access a set of choices that is dynamic, based on the current input and species remaining in the database. Identification is made by the plant's unique combination of characteristics, and with a little practice takes one to two minutes or less. The speed and ease of use allow plant enthusiasts and botanists to reduce the time required to inventory plants in the field, and reduce the training and experience needed.

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Reserves in the Shortgrass Prairie

Observations made on the reserve system of the shortgrass prairie may be useful both to shortgrass preservation and to preservation in other ecosystems. As a results, I offer four propositions for discussion. 1) All parts of the ecosystem should be represented. A reserve map for the shortgrass prairie shows the strengths and weaknesses of the shortgrass prairie reserve system. 2) If resources for preserves are limited, it is better to have numerous small reserves rather than few large reserves. Application of the principle requires identification of an "adequate minimum size." 3) Evaluation of a preserve system requires evaluation of all its units. 4) As the reserve system for an ecosystem approaches completion, attention should turn to management. Topics include cooperation, experimentation, transplantation, processes and costs.

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The Rocky Mountain Front: A Landscape in Transition

The landscape of the Rocky Mountain Front (Front) in northcentral Montana has changed dramatically over the last 150 years. Changes in fire frequency, occurrence of disease, climate, and human land use patterns have altered the composition and structure of both flora and fauna. Most noticeable is the invasion by the fire-intolerant limber pine (*Pinus flexilis*) into the fescue prairie, resulting in a diverse ecotone between Rocky Mountain forests and Great Plains grasslands. Currently, this pine species constitutes an integral component of the landscape,

moderating local abiotic conditions, facilitating understory plants and providing cover, shelter, and food for many wildlife species on the Front. Concurrently, limber pine along the Front is showing increased mortality related to physiological stress and an extensive infestation by pine blister rust. This decline may have dramatic impacts on the diversity of associated flora and fauna which have acclimated to the presence of limber pine in the grasslands.

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Classifying Existing Vegetation: A First Step in Understanding Rare Plant Commmunities

The conservation of diversity and rare biota is closely tied to our ability to recognize and understand their habitats. This requires a classification of ecosystems which closely reflects natural plant communities. Ecosystem classifications in Montana have for a number of years been based primarily on site characteristics expressed in the potential climax vegetation (habitat types), and the existing plant communities remain virtually undescribed. The management of rare plant communities requires that there be a consistent and scientifically tenable system for classifying all vegetation to provide baseline data on its diversity and composition. Description of existing vegetation involves organized sampling and analysis of vegetation samples. A focused approach is described which can accomplish this within the framework of landscape assessments by government and private natural resource managers.

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The Montana Distribution of Two Rare Fen Mosses, *Scorpidium scorpioides* and *Meesia triquetra*

Meesia triquetra and *Scorpidium scorpioides*, circumboreal species, usually have high fidelity to rich fens and their unique conditions (i.e., high concentrations of sodium bicarbonate, calcium, and magnesium; high electrical conductivities; and neutral or basic pH values). Prior to this report, there was one published location for *Meesia triquetra* in Montana, Pine Butte Swamp (a rich fen) in Teton County and two locations for *Scorpidium scorpioides*, Pine Butte Swamp and an 1898 collection of R. S. Williams near Columbia Falls. This report, with associated map, identifies 10 locations for *Scorpidium scorpioides* and 12 locations for *Meesia triquetra*. Associated mosses, some rare, are also addressed. The Montana Natural Heritage Program considers both of these mosses potentially imperiled in the state because of species and habitat rarity.

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High Temperature Mosses and Vascular Plants of Yellowstone's Thermal Features

Surrounding hot pools and their outflow channels, steam vents, and on barren hot ground in Yellowstone National Park are vascular plants and mosses able to tolerate high temperatures lethal to most species of the plant kingdom. Summer field studies over the past two years have identified ten species of vascular plants and ten species of mosses able to tolerate soil temperatures reaching 62° C and 71.7° C respectively. Although most of the 20 species identified to date are widespread colonizers, two grasses (*Dichanthelium lanuginosum, Agrostis rossiae*) and one moss (*Campylopus tallulensis*) are restricted to thermal features. The depauperate condition of most plants found at these high temperatures may be due in part to the relative infertility of the soil caused by low pH and poor water retention. Additionally, many flat to gradually sloped sites are seasonally disrupted by bison overwintering on the warm ground.

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Blackfoot Challenge Weed Management Project

The Blackfoot Challenge - a coordinating counsel of private landowners and county, state and federal land managers and officials - has undertaken a comprehensive weed management effort in the 1.4 million acre Blackfoot River watershed in west central Montana. Using seed money from the Bureau of Land Management, work began in 1996 to improve mapping and inventory systems, information and education efforts, technology transfer and overall strategies to deal with a dozen noxious weeds now established in the watershed.

The project is designed to better apply and integrate noxious weed management strategies including prevention, early detection, containment and eradication, judicious use of herbicides, expanded use of biological control agents, and grazing management strategies. The project will rely heavily on the formation and cooperative actions of local weed management areas to implement and perfect these strategies. The initial phase of the project will continue through 2002.

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Roadside Revegetation with Native Plants in Glacier National Park

The Federal Highway Administration has provided funding through the Federal Lands Highway Program to Glacier National Park since 1987 for planning and implementation of revegetation following reconstruction of the Going-to-the-Sun Road. To date there has been reconstruction of over 17 linear miles of road, and revegetation of 40.3 acres of disturbance related to this construction. Affected habitats range from fescue grasslands on the east side of the continental drive to cedar-hemlock forests on the west and subalpine meadows at the top. The goal of our native plant restoration program is to reestablish indigenous vegetation to disturbed areas while preserving the genetic integrity of our native floral populations and providing for optimum survival potential by using native plant materials collected at or near the

disturbed site. Our objectives include soil stabilization and erosion control, reduction of exotic plant populations and the reintroduction of native plant materials in such manner as to successfully blend into the surrounding undisturbed communities. Important elements of this program include comprehensive site analysis, species identification, soil and plant salvage, aggressive seed and plant collection, propagation and extensive post-construction monitoring.

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Native Plant Solutions for Conservation Problems

The Bridger Plant Materials Center (PMC) was established in 1959 by the USDA Soil Conservation Service to help solve conservation problems in Montana and Wyoming. Projects have focused on native species selection and establishment techniques for revegetation of rangeland and mineland, highly erodible or severely eroded areas, and saline-affected soils. Research on native trees and shrubs has focused on the identification and testing of superior ecotypes for windbreak and shelterbelt applications in the Great Plains. In 1986, a cooperative agreement with the National Park Service was initiated to assist with the identification, collection, propagation, and processing of indigenous species for revegetating roadsides. Assistance began in 1994 which emphasized the identification, propagation, and establishment of culturally significant plants. Future efforts will provide service in a collaborative interagency study for germination tests on *Penstemon lemhiensis* and to the US Fish and Wildlife Service for seed increase of *Gaura neomexicana ssp. coloradensis*.

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Seasonal Changes in Seed Bank Composition of Native Palouse Prairie and Adjacent Knapweed-Dominated Sites

To compare the seed bank in a relatively intact Palouse prairie site and an adjacent knapweed-dominated site, we extracted soil cores, randomly located in each of the two site types. Sampling occurred at ca. 30-day intervals, from May to September, 1996. The soil from each core was spread on top of potting soil in flats in the greenhouse, and the number of species and individuals that germinated were recorded. Sulfur cinquefoil (*Potentilla recta*) is a noxious weed present at both site types. Cinquefoil seedlings were common in both sites at all sampling dates, with a total of 900 seedlings. Spotted knapweed (*Centaurea maculosa*) seedlings were relatively rare, even in the heavily knapweed-invaded site. There were a total of 102 knapweeds that germinated in this study, with 36 percent of those occurring in the September core, right after seed drop.

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Mycorrhizae mediate spotted knapweed invasion in Palouse prairie

Mycorrhizal mutualisms mediate interactions among plants in natural communities; however little is known about the role of mycorrhizae in exotic invasions. We found that the exotic forb *Centaurea maculosa* (spotted knapweed) was heavily colonized by arbuscular mycorrhizal (AM) fungi. We tested the effects of mycorrhizae on interactions between *C. maculosa* and *F. idahoensis* in the greenhouse. In one experiment, *C. maculosa* and *F. idahoensis* were grown from seed in inter- and intraspecific combinations. Mycorrhizae greatly enhanced *C. maculosa*'s negative effect on *F. idahoensis*. Overall, the bunchgrass was 42% smaller when competing with *C. maculosa* than when competing with conspecifics, but those without AM fungi were 171% larger than the mycorrhizal treatment.

In a second experiment, *C. maculosa* was seeded into pots containing established, eight- week old *F. idahoensis* plants. *C. maculosa* biomass was 66% greater in the presence of AM fungi. Presence of AM fungi had no significant effect on biomass of *F. idahoensis* in this experiment. The presence of AM fungi always favored *C. maculosa* over *F. idahoensis* during competition, and thus mycorrhizal fungi may strongly enhance the ability of *C. maculosa* to invade intermountain grasslands.

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Botany Discoveries Year-Round in the Bitterroot Valley

Documenting plants at all seasons of the year is easily done if the plants are in your own backyard. It becomes very exciting if your backyard contains rare native plants or plants which are new records for Montana, but you will not discover them unless you look. Plant come in all sizes so if you think small and look at mosses and liverworts in your yard, you have an even better chance of finding new records. I will share the secrets of backyard botanizing in the Bitterroot Valley and how I found rare vascular and nonvascular plants in my backyard, including one new vascular species addition to the state flora and seven new moss additions for Montana.

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TECHNICAL DISPLAYS

A Comparison of Relative Growth Rate in Native Plant and Noxious Weed Seedlings

The relative growth rate of plants native to the Palouse prairie and related noxious weed seedlings were compared in a greenhouse experiment. The native yarrow (*Achillea millefolium*) and spotted knapweed (*Centaurea maculosa*), members of the Asteraceae family, were grown in potting soil in the greenhouse. Seedlings were harvested at 5 and 8 weeks after germination. The native soft cinquefoil (*Potentilla gracilis*) and noxious weed sulfur cinquefoil (*Potentilla recta*), of the Rosaceae family, were harvested after 8 weeks of growth. Seedlings were separated into root and shoot tissue, dried, and weighed. After five weeks of growth, yarrow had significantly less biomass than spotted knapweed ($n = 15$, $p < .001$). After eight weeks of growth, yarrow seedlings were still smaller than knapweed, but the difference was not significant ($n = 15$, $p < .12$). For the two *Potentilla* species, the native species was significantly smaller after 8 weeks of growth ($p < .001$).

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