Proceedings

Ninth Montana Plant Conservation Conference

February 9 and 10, 2016

University of Montana, Missoula

How Can Genetics Contribute to Plant Conservation?

MNPS

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The Ninth Montana Plant Conservation Conference will be devoted to learning about recent advances in genetics and how genetics data can aid in understanding plant taxonomy, conserving rare plants, setting conservation priorities and managing weeds. We will start with an introduction to population genetics and modern molecular methods. This will be followed by overviews of how population genetics is used in plant conservation and plant taxonomy. After lunch we will hear of specific case studies on pines, spring beauty, moonworts, Spalding's catchfly, larch and Eurasian water-milfoil. The second day of the conference will consist of two workshops. In the morning the Important Plant Areas (IPA) Committee and others who wish to attend will review and vote on nominations for two new IPA's. Later in the morning and continuing after lunch, botanists and resource managers will review the Montana Natural Heritage Program Species of Concern (SOC) list and the Status Under Review list, providing new information on distribution and threats and suggestions for rank changes.

Montana Native Plant Society
The mission of the Montana Native Plant Society is to preserve, conserve, and study the native plants and plant communities of Montana, and to educate the public about the value of our native flora.

U.S. Forest Service
The Mission of the U.S. Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

Montana Natural Heritage Program
The Mission of the Montana Natural Heritage Program is to be Montana's source for reliable, objective information and expertise to support stewardship of our native species and habitats, emphasizing those of conservation concern.

Natural Resources Conservation Service
Helping People Help the Land. The United States Department of Agriculture, Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

The University of Montana Division of Biological Sciences
The University of Montana Division of Biological Sciences is comitted to fundamental research excellence, to training the next generation of scientists and leaders through innovative graduate and undergraduate programs, and to fostering biological literacy in our communities.

Cover Illustration of *Claytonia lanceolata* by Debbie McNeil

How Can Genetics Contribute to Plant Conservation?

Schedule

Tuesday, February 9

	Moderator: **Chantelle DeLay**, Flathead National Forest
9:00-10:20	Genetics in Conservation: A Primer and Beyond. **Fred Allendorf,** University of Montana
10:20-10:40	Break
10:40-11:20	The History and Future of Population Genetic Research in the Conservation of Plant Species. **Loreen Allphin**, Brigham Young University
11:20-11:50	Why All the Name Changes? The Role of Genetics in Plant Taxonomy? **Matt Lavin**, Montana State University
11:50-1:00	Lunch (on your own)
1:00-1:50	Facilitating Whitebark Pine Restoration with Genetics. **Mary Frances Mahalovich**, U.S. Forest Service
1:50-2:20	Choosing Molecular Markers for *Botrychium* Taxonomy? **Valerie Hipkins**, U.S. Forest Service
2:20-2:50	Does *Claytonia Flava* Deserve Conservation Status? **Steve Shelly**, U. S. Forest Service, with P. Lesica, P G. Wolf, P.S. Soltis & D.E. Soltis
2:50-3:10	Break
3:10-3:40	Evolutionary Significant Units for Spalding's Catchfly. **Peter Lesica**, Conservation Biology Research with B. Adams & C.T. Smith
3:40-4:10	Using Environmental DNA and Genetics to Detect Aquatic Invasive Plants. **Gordon Luikart**, University of Montana with S. Amish & J. Shabacker
4:10-4:40	Using Molecular Tools to Understand Larch Hybrids. **Lila Fishman**, University of Montana

Wednesday, February 10

8:00-10:00	Workshop: Important Plant Area Nominations Peter Lesica, (MNPS Conservation Chair) will lead discussion of new IPA nominations.
10:00-10:20	Break
10:20-12:00	Workshop: Montana's Plant Species of Concern. Andrea Pipp (Montana Natural Heritage Program Botanist) will lead a review of vascular plant, moss, and lichen Species of Concern (SOC) and vascular species listed as Status Under Review to get updated information on observations, threats, threat category, and state Heritage ranks. Botanists and managers accomplish this task by contributing new information for the species they manage. Please review the SOC lists before you come at http://mtnhp.org/SpeciesOfConcern/?AorP=p. This is important work because the lists direct conservation actions by both agencies and NGOs.
12:00-1:00	Lunch (on your own)
1:00-3:00	Workshop: Montana's Plant Species of Concern (continued)

Abstracts

Genetics in Conservation: A Primer, and Beyond

Fred W. Allendorf, University of Montana

I have been tasked with the impossible: provide an overview of the application of genetics to plant conservation in 60 minutes. My request by email to members of the MNPS for issues they would like me to address today returned the following question: *Why are people on edge when we talk about genetics?* My objective today is to make conservation practitioners in the room more comfortable with using genetic techniques to address questions of concern. The need for applying genetics to problems in conservation continues to increase. In addition, many important technological and conceptual developments have changed the field of conservation genetics over the last five years. Today, it is fairly easy to collect massive amounts of genetic (or genomic, whatever that means) data on any species. Nevertheless, the analysis and interpretation of the data are problematic. In addition, the conservation practitioner is faced with a bewildering array of possible genetic techniques to choose from to address questions of interest. I will provide a brief overview of these techniques and provide examples of how they can be applied to conservation. I will also address some of the primary conceptual issues associated with applying genetics to conservation (i.e., should we be using selectively neutral or adaptive markers, or both?). Finally, I will consider the primary issues that differ in the application of genetics to plants in comparison to animals.

The History and Future of Population Genetic Research in the Conservation of Plant Species

Dr. Loreen Allphin, Department of Plant and Wildlife Sciences, Brigham Young University

Over 20 years ago, genetic factors were thought to play a minor role in the fate of endangered species' populations. Now there is a compelling body of theoretical and empirical evidence supporting the contention that genetic changes in small populations are intimately involved with their fate. Thus, understanding genetic and evolutionary processes in natural populations is becoming increasingly important for conservation of rare species. Most rare, endemic taxa occur in small, isolated populations with low levels of genetic variation within and among populations. In contrast, widespread congeners often exhibit higher levels of genetic diversity. Populations of rare plant species with low genetic variation may also exhibit reduced fitness. Low genetic diversity in populations often results from anthropogenic habitat fragmentation and/or bottlenecks. However, in rapidly radiating groups, low diversity might also be a consequence of recent evolutionary origin. Most conservation genetic studies assume a well-supported classification for the taxon or group studied. However, there are still new discoveries to be made and complex taxonomic issues to resolve in many plant taxonomic groups. Historically, population genetic studies were limited to allozyme analyses. Recent genetic advances have provided numerous genetic markers for assessing genetic diversity in natural populations, potentially resolving greater genetic variability and allowing for more thorough population genetic studies. Additionally, numerous genetic software packages have been developed for more complete analysis of population genetic data. With the wide array of molecular tools available, a new era of conservation genetics has begun with an important role to play in the preservation of rare plant species. Conservation of rare plant populations can be enlightened by the evolutionary significance of genetic findings.

Why All the Name Changes? The Role of Genetics in Plant Taxonomy

Matt Lavin, Montana State University

Many scientific name changes at the species, genus and family levels have occurred because of new insights gained from genetic data and the application of the concept of monophyly. A monophyletic group is one where all members (or samples) trace back to a unique common ancestor. Monophyly, however, is useful but not necessary at the species level. A convergence of geographical, ecological, morphological, and genetic data is sufficient for recognizing species. At higher taxonomic levels, however, a rigorous application of the concept of monophyly offers the best hope for the stability of scientific names. Examples of where monophyly has a high likelihood of achieving nomenclatural stability include segregating the various genera of fescue grasses and the modifications made to the families Scrophulariaceae and Amaranthaceae. When the concept of monophyly has not been applied rigorously at the genus level, name changes are questionable and are likely to change again as more genetic evidence accumulates. Examples include the sunflower genera related to the common aster and the grass genera related to the needlegrasses. Ecologists and others dealing with taxonomic

names should not be in the business of arbitrating correct scientific nomenclature. Rather, they should simply adopt a standard nomenclatural reference (e.g., Manual of Montana Vascular Plants, USDA Plants Database) as the source of their preferred scientific names.

Facilitating Whitebark Pine Restoration with Genetics

Mary Frances Mahalovich, USDA Forest Service

Whitebark pine is a candidate for listing under the Endangered Species Act due to blister rust, mountain pine beetle, altered fire regimes and climate change. In response to its decline, genetic testing began in 1999. Highlights of these studies indicate rust resistance varies spatially and temporally, increasing from the southeast to the northwest. Over 20 wildlife species utilize whitebark pine seeds as part of their diet; fortunately, selection for rust resistance is favorably correlated with higher levels of protein and fat content. Whitebark pine also exhibits late winter cold hardiness and drought avoidance, increasing from the northwest to the southeast. Molecular markers indicate surprisingly high levels of genetic diversity with relativity little inbreeding, leading to the establishment of several genetically unique areas (higher numbers of polymorphic loci or the presence of unique alleles). Where genetic variation is largely assumed to be clinal in nature, stable isotope analysis revealed ecotypic or edaphic variation. Management implications of these studies include guidance for cone collections, gene conservation and seedling deployment strategies, identification of refugia, determination of realized gains, and implications for seed orchard design, where unfavorable correlations can be managed through zoning, restricted selection indices, or the identification of correlation breakers (individuals that stack several adaptive traits into one genotype). While these studies indicate a positive outlook, continued pressure from blister rust and mountain pine beetle erodes species persistence. A better understanding of the spatial and temporal variation in both demographics and genetics will facilitate project planning and effects analysis. How whitebark pine responds to climate change can be enhanced by including measures of adaptive capacity in bioclimatic envelope models. Thus, promising genetics are only effective in the presence of favorable demographics to ensure whitebark pine functions as both a foundation and keystone species. Additional information is available at the following link: http://www.fs.usda.gov/detail/r1/plants-animals/?cid=stelprdb5341541.

Choosing Molecular Markers for *Botrychium* Taxonomy

Valerie Hipkins, US Forest Service, National Forest Genetics Lab

Ferns in the genus *Botrychium* are frequently of local conservation concern or of federally protected status, making accurate classification critical to forest planning. Several species of *Botrychium* are difficult to distinguish morphologically in the field, especially when specimens are small or immature, and other taxa may naturally hybridize in sympatric locations. The inability to positively identify species from morphological observations complicates conservation efforts and warrants the use of molecular genetic analyses. In the past, Forest Service Botanists across the continental US and Alaska have contracted with Donald Farrar (Prof. Emeritus, Iowa State University) to positively identify samples of *Botrychium* using allozyme markers. Although NFGEL uses a variety of laboratory genetic markers to address the conservation and management of any plant species, due to Dr. Farrar's retirement, NFGEL had agreed to continue his work to identify *Botrychium* specimens to species based on allozyme banding patterns for our Agency managers and partners. Our ability to use allozyme markers to identify species of *Botrychium* will be discussed.

Does *Claytonia flava* Deserve Conservation Status?

Steve Shelly, U.S. Forest Service, Region 1, Missoula, Montana; Peter Lesica, Paul G. Wolf, Pamela. S. Soltis & Douglas E. Soltis

A biosystematic study of *Claytonia lanceolata* and related taxa in the Rocky Mountains was undertaken to evaluate the taxonomic status of *C. lanceolata* var. *flava*. This study was part of a broader assessment to determine the need for protection of the latter taxon under the federal Endangered Species Act. Electrophoretic and morphological studies revealed that *C. lanceoleta* var. *flava* in southwestern Montana and northwestern Wyoming represents a distinct diploid species (n=8) whose populations consist of yellow and/or white-flowered plants. Morphological, allozyme, and cytological data all indicate that this taxon does not belong in the *C. lanceolata* complex, but is best placed in the group of narrow-leaved species that includes *C. rosea, C. tuberosa*, and *C. virginica*. The allozyme data also showed that yellow and white-flowered plants that are biotically sympatric (occurring together in the same population) are nearly or completely identical genetically, and are less closely related to plants of the same flower color in other geographic areas.

Numerous populations of *C. lanceolata* var. *flava*, most often consisting of the white-flowered phenotype, were found in Montana and Wyoming, and legal protection is not warranted at this time. In some cases, actions to conserve endangered plant taxa must be preceded by an evaluation of their taxonomic status; this study illustrates the utility of biosystematics techniques in conducting such evaluations.

Evolutionary Significant Units for Spalding's Catchfly

Peter Lesica, Conservation Biology Research; Brice Adams & Christian Smith

Protecting genetic diversity throughout the range of a species provides for long-term evolutionary potential and persistence under a changing environment and requires identification of all genetically distinct population segments (conservation units, CUs) within species. Spalding's catchfly (*Silene spaldingii*) is listed as threatened under the Federal Endangered Species Act, and the recovery plan identified five physiographic regions across the range of the species to use as surrogates for genetic CU's. We collected leaf samples from 19 of the largest populations across all five physiographic regions and used variable microsatellite and chloroplast DNA markers to determine how well physiographic regions reflect genetic population structure within this species. Genetic variation clustered into four groups which did not correspond well with the physiographic regions. We observed little genetic differentiation among populations in the main range of the species which encompasses nearly all of four continuous physiographic regions. However, three other distinct genetic groups were identified: two in Montana and one in the Salmon River drainage of Idaho. These genetic groups rather than physiographic regions should be used to plan recovery and inform genetic rescue efforts because they better reflect historical patterns of population structure. Our results suggest that physiographic regions may not always be an accurate reflection of population structure for threatened or endangered species.

Sampling Using Environmental DNA and Genetics to Detect Aquatic Invasive Plants

Gordon Luikart, Steve Amish & Jenna Shabacker. Montana Conservation Genomics Laboratory (MGCL), Flathead Lake Biological Station, Division of Biological Sciences, University of Montana.

Environmental DNA (eDNA) is DNA in environmental samples, such as soil, water, and snow. The uses of eDNA include the detection and surveillance of rare or cryptic species that are difficult to study with traditional methods such as observations or raking/dredging lake bottoms. I provide examples of eDNA studies conducted in our laboratory for detection of aquatic invasive species such as Eurasian water milfoil, which has recently invaded Montana waterbodies. Early detection of an invasion is crucial to increase the feasibility of rapid responses to eradicate the species or contain its spread. I also discuss examples from the literature, including detection of endangered species.

Using Molecular Tools to Understand Larch Hybrids

Lila Fishman, University of Montana

Hybridization between closely-related species can be a serious conservation concern, but can also create novel genetic combinations that may respond adaptively to changing environments. Hybrids between the high-elevation conifer species *Larix lyallii* (subalpine larch) and its montane congener *Larix occidentalis* (western larch) have been reported in the Bitterroot Mtns., including at a site protected by the Carlton Ridge Research Natural Area. However, previous hybrid indices were entirely phenotypic, and thus may reflect phenotypic plasticity rather than genetic mixing. As part of a UM class project, we used population genetic approaches to assess the incidence of hybrids in a putative hybrid zone in a rockfall area on the north face of Carlton Ridge. We genotyped individuals from pure stands (n = 30-40), as well as adults and young trees (N = 112) from the putative hybrid zone, at six microsatellite markers. Using the program STRUCTURE, we cleanly assigned pure *L. lyallii* and *L. occidentalis* individuals to distinct populations. From the putative hybrid zone, we identified four likely F1 hybrids with 50:50 genetic assignment, but all other individuals were assigned entirely (>95%) to one or the other species. Our results genetically confirm the existence of natural larch hybrids and spatial co-occurrence of these normally disjunct species at Carlton Ridge, but show no evidence of an extensive hybrid swarm or inter-specific introgression. Higher-resolution genomic studies would be necessary to reveal subtle introgression, but this marker-based approach may be useful for the identification of early-generation larch hybrids throughout their shared range.

Abbreviated Important Plant Area Nominations

IPA Nominated Site Name: Italian Peaks Important Plant Area

General Location: The Italian Peaks area occurs at the southern end of the Bitterroot (or Beaverhead) Range at the very extreme southwest corner of Beaverhead-Deerlodge National Forest (Fig. 1). The main divide ridge forms the Montana-Idaho border

Counties: Beaverhead County

Elevation: above treeline (9,400 ft)

Size of Area: approximately 2,000 acres

Property Ownership: U. S. Forest Service

Table 1. Vascular plant species of concern in the Italian Peaks IPA

Species	MNHP global rank	MNHP state rank
Agastache cusickii	G3G4	S2S3
Anelsonia eurycarpa	None	None
Caltha leptosepala sulfurea	None	None
Erigeron asperugineus	G4	S2
Erigeron leiomerus	G4	S2
Pedicularis contorta ctenophora	G5T3	S2S3
Physaria carinata	G3G4	S1S2
Potentilla jepsonii	G5T4	S3
Townsendia condensata	G4	S1S3

Threats: The only significant threat to the rare plants in the Italian Peaks is from motorized and perhaps non-motorized vehicle use. There is a trail that goes above treeline over Deadman Pass at ca. 9,750 ft in elevation. The trail goes through or near populations of *Erigeron asperugineus, E. leiomerus* and *Townsendia condensata*. Although the trail is closed to motor vehicles, trespass is common. There is currently little evidence of vehicle use off of the trail, but the country is very open and off-trail damage to all of the rare species is a very real possibility. Little enforcement of the roadless area is done due to the remote location.

Justification: The proposed Italian Peaks IPA area has an amazing assemblage of rare plants within a very small geographic area. Seven species of concern are present within the nominated area, as well as one species (*Anelsonia eurycarpa)* which has not been reported in the state before. The boundary of the proposed Italian Peaks IPA is the Montana-Idaho border on the south side. On the north-west side it is the small peak that is the last sizeable area of calcareous parent material above treeline. The east boundary is the 9,400 ft contour (approximate treeline) in the Deadman drainage. The northern boundary is the 9,400 ft contour (or above the level of dense forest cover) and the northern-most extent of apparent calcareous habitat on the Nicholia-Deadman Ridge. The boundary was drawn to include all of the known rare plant occurrences in the headwaters of the main stem of Nicholia Creek and adjacent Deadman Creek. It is believed that most or all of the rare species occur on soils derived from calcareous parent material; the proposed boundaries include most of the high-elevation calcareous parent material in the area.

Form Submitted by: Jessie Salix (Beaverhead-Deerlodge National Forest), Peter Lesica, Dave Hanna and Andrea Pipp (Montana Natural Heritage Program).

Nominated Site Name: Dutchman Wetlands Important Plant Area

General Location: The Dutchman Wetlands encompass the lower reaches of Dutchman and Lost creeks north and west of the town of Warm Springs.

Counties: Deer Lodge

Elevation: 4760-4960 ft

Size of Area: ca. 4,500 acres

Property Ownership: ARCO Environmental Remediation LLC and other individual private land owners (see Map 1)

Table 1. Plant species of concern at proposed Dutchman Wetlands IPA

Species	MNHP G-rank	MNHP S-rank
Atriplex truncata	G5	S3
Castilleja exilis	G5	S2
Primula incana	G4/G5	S3
Trichophorum cespitosum	G5	S2
Thalictrum alpinum	G5	S2
Utricularia ochroleuca	G4?	S1

Threats: Changes in upstream diversion of Dutchman or Lost creeks could adversely affect plant communities or rare plant populations. Trampling by livestock may threaten some plant communities and some rare plants; however, disturbance from grazing may be advantageous to some species. Exotic species, including *Agrostis stolonifera*, *Cardaria draba*, *Cirsium arvense* and *Sonchus arvensis*, are present in significant amounts and pose potential threats. Long-term changes in climate could result in hydrologic changes that adversely affect some species while being beneficial to others.

Justification: The proposed Dutchman Wetlands IPA provides habitat for six species listed as species of concern by the Montana Natural Heritage Program which are considered rare in Montana although more common elsewhere. It is one of only two known sites for *Utricularia ochroleuca* in Montana and is probably one of the largest populations of *Castilleja exilis* in the state.

Submitted by: Susan Wall, Peter Lesica

MTNHP Status Under Review List

Family	Scientific Name	State Rank	Observations
Nyctaginaceae	Abronia fragrans	SU	2
Lamiaceae	Agastache foeniculum	SU	0
Asteraceae	Agoseris grandiflora	SU	1
Asteraceae	Agoseris heterophylla	SU	5
Rosaceae	Agrimonia gryposepala	SU	0
Rosaceae	Agrimonia striata	SU	2
Poaceae	Agrostis mertensii	S3?	1
Poaceae	Agrostis oregonensis	SU	0
Poaceae	Agrostis pallens	SU	0
Poaceae	Agrostis thurberiana	SU	4
Poaceae	Agrostis variabilis	SU	0
Liliaceae	Allium brandegeei	SU	0
Liliaceae	Allium canadense	SU	0
Liliaceae	* Allium geyeri var. geyeri	SU	13
Asteraceae	Almutaster pauciflorus	SU	3
Amaranthaceae	Amaranthus californicus	SU	1
Asteraceae	Ambrosia tomentosa	SU	0
Rosaceae	Amelanchier humilis	SU	0
Rosaceae	Amelanchier pumila	SU	0
Rosaceae	Amelanchier utahensis	SU	0
Lythraceae	Ammannia coccinea	SU	0
Cyperaceae	Amphiscirpus nevadensis	S3S4	0
Boraginaceae	Amsinckia lycopsoides	SU	0
Poaceae	Andropogon hallii	SU	11
Ranunculaceae	Anemone canadensis	SU	4
Apiaceae	Angelica pinnata	SU	0
Asteraceae	Antennaria howellii ssp. neodioica	SU	0
Asteraceae	Antennaria howellii ssp. petaloidea	SU	0
Asteraceae	Antennaria monocephala	S3?	0
Ranunculaceae	Aquilegia coerulea	SU	1
Caryophyllaceae	Arenaria aculeata	SU	15
Caryophyllaceae	Arenaria kingii	S3S4	17
Asteraceae	Artemisia arbuscula ssp. longiloba	SU	0
Asteraceae	Artemisia lindleyana	SU	0
Asteraceae	Artemisia norvegica	SU	0
Asteraceae	Artemisia rigida	SU	0
Asteraceae	Artemisia scopulorum	SU	2
Asteraceae	Artemisia tilesii	SU	0
Asteraceae	Artemisia tilesii ssp. elatior	SU	0
Asteraceae	Artemisia tripartita ssp. rupicola	SNR	0
Asclepiadaceae	* Asclepias pumila	S3?	22
Asclepiadaceae	* Asclepias verticillata	SU	18
Pteridaceae	Aspidotis densa	SNR	1
Aspleniaceae	* Asplenium trichomanes-ramosum	S2S3	1
Fabaceae	Astragalus argophyllus	S3?	1
Fabaceae	Astragalus canadensis var. canadensis	SNR	0
Fabaceae	Astragalus ceramicus var. filifolius	S3S4	0
Fabaceae	Astragalus chamaeleuce	S3?	32
Fabaceae	Astragalus crassicarpus var. crassicarpus	S3S4	0
Fabaceae	* Astragalus hyalinus	S3?	63
Fabaceae	Astragalus kentrophyta var. kentrophyta	S3?	0
Fabaceae	Astragalus lentiginosus var. salinus	S3?	0
Fabaceae	Astragalus leptaleus	S3?	4
Fabaceae	Astragalus miser var. crispatus	SNR	0
Fabaceae	Astragalus miser var. decumbens	SNR	0
Fabaceae	Astragalus miser var. serotinus	SNR	0
Fabaceae	Astragalus purshii var. concinnus	SNR	0
Fabaceae	Astragalus shortianus	SNR	0
Amaranthaceae	Atriplex gardneri var. falcata	SU	0
Brassicaceae	* Barbarea orthoceras	SU	0
Berberidaceae	Berberis nervosa	SU	0
Asteraceae	Bidens comosa	SU	0
Brassicaceae	Boechera lemmonii	SU	3
Brassicaceae	Boechera lyallii	SU	1
Brassicaceae	* Boechera microphylla var. microphylla	SU	0
Brassicaceae	Boechera pauciflora	SU	0
Brassicaceae	Boechera saximontana	SU	0
Brassicaceae	Boechera sparsiflora	SU	0
Cyperaceae	* Bolboschoenus fluviatilis	SNR	4
Poaceae	Bouteloua hirsuta	SU	0
Poaceae	Bromus latiglumis	SU	0
Poaceae	Bromus polyanthus	SU	0
Cyperaceae	Bulbostylis capillaris	SU	0
Poaceae	Calamagrostis koelerioides	SU	0
Poaceae	Calamagrostis scopulorum	SU	0
Liliaceae	Calochortus macrocarpus	SU	1
Onagraceae	* Camissonia breviflora	S3?	0
Onagraceae	* Camissonia subacaulis	S2S3	0
Onagraceae	Camissonia tanacetifolia	SU	0
Campanulaceae	Campanula uniflora	S2S3	1
Brassicaceae	Cardamine oligosperma var. oligosperma	S1S2	0
Cyperaceae	Carex backii	S1S3	0
Cyperaceae	Carex bolanderi	SNR	0
Cyperaceae	Carex capitata	S3?	2
Cyperaceae	Carex chalciolepis	S1?	0
Cyperaceae	Carex cordillerana	SNR	0
Cyperaceae	Carex eburnea	S3?	0
Cyperaceae	Carex echinata	S3?	4
Cyperaceae	Carex foenea	SU	0
Cyperaceae	Carex fuliginosa	S3S4	2
Cyperaceae	Carex glacialis	SNR	0
Cyperaceae	Carex jonesii	SU	0
Cyperaceae	Carex laeviconica	SNR	0
Cyperaceae	Carex leptopoda	SU	0
Cyperaceae	Carex norvegica	S3?	3
Cyperaceae	Carex saximontana	S3?	1
Cyperaceae	Carex siccata	SNR	0
Cyperaceae	Carex straminiformis	SU	0
Cyperaceae	Carex tahoensis	S3S4	0
Cyperaceae	Carex tenera	S3S4	1
Cyperaceae	Carex torreyi	S3?	4
Cyperaceae	Carex vulpinoidea	S3S4	0
Cyperaceae	Carex xerantica	SU	0
Orobanchaceae	Castilleja kerryana	SNR	0
Orobanchaceae	Castilleja linariifolia	SNR	1
Orobanchaceae	Castilleja occidentalis	S3S4	0
Orobanchaceae	Castilleja pilosa var. longispica	S3S4	0
Pteridaceae	Cheilanthes gracillima	S3S4	3
Poaceae	* Cinna arundinacea	SU	0
Asteraceae	Cirsium brevistylum	S2S4	43
Asteraceae	Cirsium canovirens	SNR	0
Asteraceae	Cirsium foliosum	SU	0
Ranunculaceae	* Clematis columbiana var. columbiana	S2S3	0
Ranunculaceae	* Clematis columbiana var. tenuiloba	S3?	18
Orobanchaceae	Cordylanthus capitatus	SU	0
Orobanchaceae	Cordylanthus ramosus	S3S4	1

MTNHP Status Under Review List (continued)

Family	Scientific Name	State Rank	Observations
Rosaceae	Crataegus castlegarensis	SNR	0
Rosaceae	Crataegus okanaganensis	SNR	0
Rosaceae	Crataegus okennonii	SNR	0
Rosaceae	Crataegus phippsii	SNR	0
Rosaceae	Crataegus suksdorfii	SNR	0
Rosaceae	Crataegus williamsii	SNR	0
Pteridaceae	Cryptogramma cascadensis	S1S2	0
Pteridaceae	Cryptogramma stelleri	S2S3	0
Apiaceae	Cymopterus hendersonii	S2?	5
Apiaceae	Cymopterus longilobus	S3	0
Apiaceae	Cymopterus terebinthinus var. foeniculaceus	SNR	0
Poaceae	Danthonia parryi	SU	0
Poaceae	Danthonia spicata	SU	7
Ranunculaceae	Delphinium andersonii	SNA	0
Ranunculaceae	* Delphinium depauperatum	S2?	20
Ranunculaceae	Delphinium geyeri	SNA	0
Ranunculaceae	* Delphinium glaucum	S1?	0
Brassicaceae	* Descurainia torulosa	S1?	0
Poaceae	Dichanthelium acuminatum	SU	0
Poaceae	Dichanthelium wilcoxianum	S3?	2
Brassicaceae	Draba calcifuga	S3	0
Brassicaceae	Draba paysonii var. paysonii	S3	0
Rosaceae	Drymocallis fissa	SNR	0
Dryopteridaceae	Dryopteris carthusiana	S3?	27
Dryopteridaceae	Dryopteris expansa	S3?	8
Cucurbitaceae	Echinocystis lobata	SU	0
Elatinaceae	Elatine brachysperma	SU	2
Elatinaceae	Elatine californica	SU	4
Cyperaceae	Eleocharis bella	SU	0
Cyperaceae	Eleocharis flavescens	SU	0
Hydrocharitaceae	Elodea nuttallii	S2	0
Poaceae	Elymus submuticus	SU	0
Poaceae	* Elymus triticoides	SU	2
Poaceae	Elymus virginicus	SU	0
Onagraceae	Epilobium foliosum	SU	0
Equisetaceae	* Equisetum palustre	S3?	21
Equisetaceae	* Equisetum pratense	S2S3	25
Asteraceae	Erigeron flagellaris	SU	4
Polygonaceae	Eriogonum androsaceum	S3S4	4
Polygonaceae	* Eriogonum annuum	S3?	56
Polygonaceae	Eriogonum cernuum	SNR	1
Polygonaceae	Eriogonum effusum	SU	0
Polygonaceae	Eriogonum microthecum	S3?	6
Polygonaceae	Eriogonum ovalifolium var. pansum	SNR	0
Polygonaceae	Eriogonum pauciflorum	SNR	21
Polygonaceae	Eriogonum strictum	SNR	2
Polygonaceae	Eriogonum umbellatum var. aureum	SU	0
Polygonaceae	Eriogonum umbellatum var. ellipticum	S3?	0
Liliaceae	Erythronium grandiflorum var. candidum	S3?	0
Euphorbiaceae	Euphorbia hexagona	SU	0
Gentianaceae	Eustoma grandiflorum	SU	0
Asteraceae	Euthamia graminifolia	SU	0
Asteraceae	Evax prolifera	SU	0
Convolvulaceae	Evolvulus nuttallianus	SU	0
Poaceae	Festuca baffinensis	SU	0
Poaceae	Festuca brachyphylla	SU	6
Poaceae	Festuca hallii	SNR	0
Poaceae	Festuca minutiflora	SNR	0
Poaceae	Festuca saximontana	SU	0
Limnanthaceae	Floerkea proserpinacoides	SU	0

Family	Scientific Name	State Rank	Observations
Gentianaceae	Gentiana fremontii	S3?	4
Gentianaceae	Gentiana prostrata	SU	0
Gentianaceae	Gentianella tenella	SU	0
Rosaceae	Geum canadense	SU	0
Rosaceae	Geum rossii var. rossii	S1?	0
Asteraceae	Gnaphalium purpureum	SU	0
Asteraceae	Gnaphalium stramineum	SNR	0
Plantaginaceae	Gratiola neglecta	S3S4	4
Asteraceae	Helenium hoopesii	SU	0
Asteraceae	Helianthella quinquenervis	SNR	4
Asteraceae	Helianthus pumilus	SNR	0
Hydrophyllaceae	Hesperochiron californicus	SU	0
Asteraceae	Heterotheca villosa var. depressa	SU	0
Asteraceae	Hieracium scouleri var. scouleri	SNR	0
Rosaceae	Horkelia fusca	SU	0
Lycopodiaceae	Huperzia haleakalae	S2S3	1
Lycopodiaceae	Huperzia miyoshiana	S2S3	0
Lycopodiaceae	Huperzia occidentalis	S2S3	6
Asteraceae	Hymenopappus filifolius var. luteus	SU	0
Balsaminaceae	Impatiens aurella	SU	2
Polemoniaceae	Ipomopsis congesta ssp. pseudotypica	S2?	6
Isoetaceae	Isoetes echinospora	S2?	0
Isoetaceae	Isoetes howellii	S2?	0
Isoetaceae	Isoetes occidentalis	S1?	0
Rosaceae	Ivesia tweedyi	SNR	0
Juncaceae	Juncus effusus	SU	2
Juncaceae	Juncus orthophyllus	SU	0
Juncaceae	Juncus triglumis var. triglumis	SU	5
Juncaceae	Juncus vaseyi	SU	0
Boraginaceae	Lappula cenchrusoides	SU	0
Poaceae	Leersia oryzoides	S2?	0
Lemnaceae	Lemna valdiviana	SU	0
Brassicaceae	Lepidium montanum	SU	0
Poaceae	Leptochloa fusca	SNA	1
Apiaceae	Ligusticum verticillatum	SNR	4
Liliaceae	Lilium columbianum	S2S3	0
Liliaceae	Lilium philadelphicum	S3?	6
Linaceae	* Linum rigidum var. compactum	SU	38
Saxifragaceae	Lithophragma tenellum	SU	0
Campanulaceae	Lobelia kalmii	S2?	13
Caprifoliaceae	Lonicera caerulea	SU	1
Fabaceae	Lupinus caudatus	SNA	0
Lycopodiaceae	Lycopodium alpinum	S3S4	2
Lycopodiaceae	Lycopodium clavatum	S2S3	2
Lycopodiaceae	Lycopodium sitchense	S3?	12
Liliaceae	Maianthemum trifolium	SU	0
Malvaceae	Malva nicaeensis	SNA	0
Malvaceae	Malva sylvestris	SNA	0
Marsileaceae	Marsilea oligospora	S1?	0
Poaceae	* Melica bulbosa	S3S4	46
Poaceae	Melica smithii	S1?	0
Poaceae	Melica subulata	SU	0
Loasaceae	* Mentzelia albicaulis	S3?	43
Saxifragaceae	Micranthes nivalis	SU	0
Phrymaceae	Mimulus breweri	SNR	1
Phrymaceae	Mimulus glabratus	SU	0
Nyctaginaceae	Mirabilis albida	SU	0
Nyctaginaceae	Mirabilis nyctaginea	SU	0
Saxifragaceae	Mitella caulescens	S3S4	0
Ericaceae	Monotropa hypopithys	S3?	21
Poaceae	Muhlenbergia andina	S3?	4

MTNHP Status Under Review List (continued)

Family	Scientific Name	State Rank	Observations
Poaceae	Muhlenbergia mexicana	SU	0
Poaceae	Muhlenbergia minutissima	SU	1
Poaceae	Munroa squarrosa	SU	0
Boraginaceae	Myosotis verna	SU	0
Haloragaceae	Myriophyllum quitense	SNR	2
Haloragaceae	Myriophyllum verticillatum	SU	0
Polemoniaceae	Navarretia divaricata	SNA	0
Polemoniaceae	Navarretia leucocephala	SNA	0
Polemoniaceae	Navarretia saximontana	S2?	0
Onagraceae	Oenothera elata	SU	0
Orobanchaceae	Orthocarpus tolmiei	SNR	0
Poaceae	Oryzopsis contracta	S3?	2
Poaceae	Oryzopsis micrantha	SU	1
Oxalidaceae	Oxalis stricta	SU	0
Fabaceae	Oxytropis besseyi var. argophylla	SU	0
Fabaceae	Oxytropis besseyi var. fallax	SU	0
Fabaceae	Oxytropis besseyi var. ventosa	SU	0
Fabaceae	Oxytropis lagopus var. atropurpurea	SU	0
Fabaceae	Oxytropis lagopus var. lagopus	S3	0
Poaceae	Panicum virgatum	S3S4	4
Saxifragaceae	Parnassia palustris var. montanensis	SNR	0
Saxifragaceae	Parnassia palustris var. parviflora	SNR	14
Vitaceae	Parthenocissus vitacea	SU	0
Fabaceae	Pediomelum cuspidatum	SNA	0
Pteridaceae	Pellaea breweri	S2S3	0
Pteridaceae	Pellaea glabella	S2S3	0
Plantaginaceae	Penstemon arenicola	SU	0
Plantaginaceae	Penstemon cyaneus	SNR	0
Plantaginaceae	Penstemon deustus	SNR	0
Plantaginaceae	Penstemon eriantherus var. cleburnei	SU	0
Plantaginaceae	Penstemon glaber	SNR	2
Plantaginaceae	Penstemon gracilis	SNR	2
Plantaginaceae	Penstemon radicosus	SNR	12
Plantaginaceae	Penstemon rydbergii	SNR	4
Hydrophyllaceae	Phacelia bakeri	SU	0
Hydrophyllaceae	Phacelia glandulosa	S3?	0
Hydrophyllaceae	Phacelia ivesiana	S3?	53
Hydrangeaceae	Philadelphus trichothecus	SU	0
Polemoniaceae	Phlox austromontana	SU	0
Polemoniaceae	Phlox caespitosa	SU	12
Polemoniaceae	Phlox speciosa	SU	0
Solanaceae	Physalis hederifolia	SU	0
Solanaceae	Physalis hederifolia var. comata	SU	0
Solanaceae	Physalis heterophylla	SU	0
Solanaceae	Physalis longifolia	SU	0
Solanaceae	Physalis pumila ssp. hispida	SNR	0
Brassicaceae	Physaria curvipes	S3?	15
Brassicaceae	Physaria eriocarpa	SNR	4
Brassicaceae	Physaria pycnantha	SNR	0
Brassicaceae	Physaria spatulata	SNR	0
Lamiaceae	Physostegia virginiana	SNA	0
Lentibulariaceae	Pinguicula macroceras	S3	12
Pinaceae	* Pinus monticola	S3?	61
Orchidaceae	* Piperia elegans	S3?	16
Orchidaceae	* Piperia elongata	SNR	1
Plantaginaceae	Plantago canescens	S3S4	0
Orchidaceae	* Platanthera dilatata var. leucostachys	SU	32
Orchidaceae	* Platanthera huronensis	SU	18
Poaceae	Poa arnowiae	SU	1
Poaceae	Poa lettermanii	S3S4	1
Poaceae	Poa stenantha	SU	0
Polygalaceae	Polygala alba	S3S4	2
Polygalaceae	Polygala verticillata	SU	0
Polygonaceae	Polygonum engelmannii	SNR	0
Polygonaceae	Polygonum erectum	SNR	4
Polygonaceae	Polygonum majus	SNR	1
Polygonaceae	* Polygonum pensylvanicum	SU	0
Polygonaceae	Polygonum polygaloides ssp. confertiflorum	S2S3	2
Polygonaceae	* Polygonum punctatum	SNR	0
Polygonaceae	Polygonum sawatchense	SNR	0
Polygonaceae	Polygonum spergulariiforme	SU	0
Polypodiaceae	Polypodium hesperium	S3?	31
Dryopteridaceae	Polystichum andersonii	S2S3	1
Dryopteridaceae	* Polystichum munitum	S3?	1
Potamogetonaceae	Potamogeton strictifolius	SU	4
Rosaceae	Potentilla drummondii	SNR	0
Rosaceae	Potentilla hookeriana	SU	0
Rosaceae	Potentilla macounii	S3S4	0
Rosaceae	Potentilla multisecta	S2?	0
Asteraceae	Prenanthes racemosa	SU	0
Asteraceae	Pyrrocoma integrifolia	S3S4	4
Asteraceae	Pyrrocoma lanceolata	SNR	0
Ranunculaceae	Ranunculus adoneus	SU	0
Ranunculaceae	Ranunculus alismifolius	S3?	3
Ranunculaceae	Ranunculus populago	S3	5
Ranunculaceae	Ranunculus pygmaeus	S2S3	1
Ranunculaceae	Ranunculus rhomboideus	SU	0
Ranunculaceae	Ranunculus sulphureus	SNR	0
Anacardiaceae	Rhus glabra	SU	0
Rosaceae	Rosa blanda	SU	0
Rosaceae	* Rubus arcticus	SU	12
Rosaceae	* Rubus ursinus	S3S4	16
Salicaceae	Salix discolor	S2S3	0
Salicaceae	Salix petiolaris	SU	0
Saxifragaceae	Saxifraga chrysantha	SU	0
Saxifragaceae	Saxifraga flagellaris	SNR	0
Saxifragaceae	Saxifraga hyperborea	SNR	0
Saxifragaceae	Saxifraga rivularis	SNR	3
Saxifragaceae	Saxifraga tolmiei	S3S4	0
Poaceae	Schedonnardus paniculatus	SU	1
Poaceae	Schizachne purpurascens	SU	23
Cyperaceae	Scirpus atrocinctus	SNR	0
Cyperaceae	Scirpus atrovirens	SU	0
Cyperaceae	Scirpus pallidus	S3?	0
Cyperaceae	Scirpus pendulus	SU	0
Poaceae	Scolochloa festucacea	S1?	0
Selaginellaceae	Selaginella densa var. standleyi	SU	0
Selaginellaceae	Selaginella watsonii	S3?	0
Asteraceae	Senecio congestus	SU	0
Asteraceae	* Senecio debilis	S3?	17
Asteraceae	Senecio dimorphophyllus	SNR	1
Asteraceae	Senecio dimorphophyllus var. dimorphophyllus	SNR	0
Asteraceae	Senecio dimorphophyllus var. paysonii	SNR	0
Asteraceae	* Senecio fuscatus	S3?	2
Asteraceae	* Senecio hydrophilus	S3?	0
Asteraceae	Senecio integerrimus var. ochroleucus	SU	0
Asteraceae	Senecio pauciflorus	SU	1
Asteraceae	Senecio plattensis	S3S4	0
Caryophyllaceae	Silene hitchguirei	SU	5
Caryophyllaceae	Silene uralensis	SU	3
Iridaceae	* Sisyrinchium idahoense	SNR	3
Smilacaceae	Smilax lasioneura	SNR	0

MTNHP Status Under Review List (continued)

Family	Scientific Name	State Rank	Observations
Asteraceae	Solidago canadensis var. gilvocanescens	SU	0
Asteraceae	* Solidago mollis	S3?	13
Asteraceae	Solidago nana	S3S4	0
Asteraceae	Solidago nemoralis	SU	1
Asteraceae	Solidago simplex	SU	4
Rosaceae	Spiraea douglasii	S3?	1
Rosaceae	Spiraea x pyramidata	SNA	4
Poaceae	Sporobolus heterolepis	SU	0
Poaceae	Sporobolus vaginiflorus	SU	0
Caryophyllaceae	Stellaria crassifolia	S2S4	4
Caryophyllaceae	Stellaria jamesiana	S2S3	4
Poaceae	Stipa curtiseta	SU	1
Poaceae	Stipa pinetorum	SU	0
Poaceae	Stipa spartea	SU	1
Poaceae	Stipa thurberiana	SU	0
Liliaceae	Streptopus lanceolatus	SNR	0
Amaranthaceae	Suckleya suckleyana	SU	4
Asteraceae	Symphyotrichum ciliolatum	SNR	5
Asteraceae	Symphyotrichum cusickii	S1S3	1
Asteraceae	Symphyotrichum hendersonii	SNR	0
Asteraceae	* Symphyotrichum lanceolatum var. lanceolatum	SU	12
Asteraceae	* Symphyotrichum subspicatum	SNR	0
Saxifragaceae	Tellima grandiflora	S3?	0
Asteraceae	Tetradymia spinosa	SU	0
Lamiaceae	Teucrium canadense	SU	2
Ranunculaceae	Thalictrum fendleri	SU	0
Asteraceae	Thelesperma megapotamicum	SNA	0
Crassulaceae	Tillaea aquatica	SU	0
Asteraceae	Townsendia exscapa	SNR	0
Asteraceae	Townsendia incana	S3?	38
Asteraceae	Townsendia leptotes	SU	0
Brassicaceae	Transberingia bursifolia ssp. virgata	S3?	0
Ranunculaceae	Trautvetteria caroliniensis	S3?	10
Fabaceae	* Trifolium cyathiferum	S1?	8
Fabaceae	* Trifolium microcephalum	S3?	9
Campanulaceae	Triodanis leptocarpa	S1S2	0
Campanulaceae	Triodanis perfoliata	SU	0
Nyctaginaceae	Tripterocalyx micranthus	SU	0
Poaceae	Trisetum orthochaetum	SNA	0
Ulmaceae	Ulmus americana	SU	0
Ericaceae	Vaccinium ovalifolium	SU	0
Valerianaceae	Valeriana acutiloba	SNR	0
Verbenaceae	* Verbena hastata	SU	25
Verbenaceae	Verbena stricta	SU	0
Asteraceae	Verbesina encelioides	SU	0
Asteraceae	* Vernonia fasciculata	SNA	0
Asteraceae	* Vernonia fasciculata ssp. corymbosa	SNA	0
Caprifoliaceae	Viburnum edule	SU	0
Caprifoliaceae	Viburnum opulus	SU	0
Violaceae	Viola pedatifida	SNA	0
Violaceae	Viola purpurea	SU	0
Violaceae	Viola renifolia	S3?	30
Violaceae	Viola septentrionalis	S1?	0
Vitaceae	* Vitis riparia	SU	12
Lemnaceae	Wolffia borealis	SU	0
Lemnaceae	Wolffia brasiliensis	S3	3
Dryopteridaceae	Woodsia oregana	S3?	4
Asteraceae	Wyethia scabra	S2S3	47
Liliaceae	Zigadenus paniculatus	SU	0

REGISTRATION FORM

2016 Montana Plant Conservation Conference

University Center, third floor, University of Montana, Missoula

Please return your registration form and check by February 2, register on-line, or you can register at the door.

Registration Fee:

$30 per person; $25 MNPS member; $5 student

_____people @ above rates = $_____

_____parking permits @ $5 each = $_____

Total $_____

Name(s):_____
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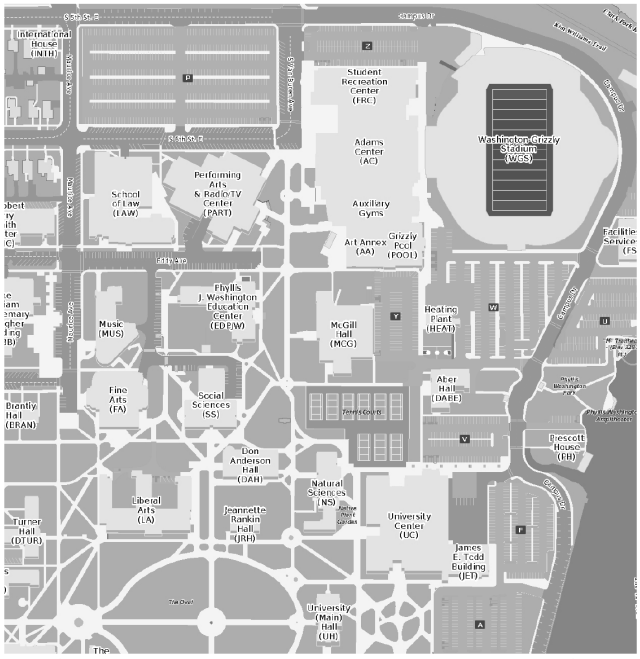

Send completed form and check made out to Montana Native Plant Society to:

MNPS Conference c/o Marirose Kuhlman
P.O. Box 692
Florence, MT 59833

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You may also register on-line by visiting the Montana Native Plant Society website at: **www.mtnativeplants.org**
You can use our secure PayPal feature to register and pay on-line. You can also download extra copies of the registration form for friends and colleagues that can be mailed to Marirose (address above) with a check.

Accommodations

Goldsmith's Bed and Breakfast
809 E. Front St., Missoula 59802
866-666-9945
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Single-Double, $89-$129
Right across river from campus

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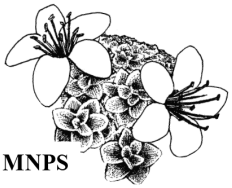
1 or 2 beds, $109
www.missoulaedgewater.doubletree.com
3 blocks to campus

On-Your-Own Lunch Options

There are three or four different places to eat in the UM University Center on levels below the conference venue. The Buttercup Market just west of the University offers lunches as do Q'doba, the Press Box, and Pizza Hut just north of campus across the university foot bridge.

Parking

Out of town attendees staying at a nearby motel should walk to campus from there. Parking permits for the lots on the north and east sides of the University Center will be available at the registration table on the third floor of the University Center. These permits cost $5 and can be purchased on the morning of the meeting or with your mail-in or on-line registration. You will have to pick up the permit and take it out to the lot and place it on the car dashboard. A map of the University can be found at http://map.umt.edu/.



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