Oxytropis nana Nutt., a Wyoming endemic collected by Thomas Nuttall on his journey across Wyoming in 1834

WYOMING NATIVE PLANT SOCIETY
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Treasurer's Report - Balance as of October 25, 1991: $489.60; deposits: dues $108.00, scholarship fund $8.00; disbursements: newsletter printing $30.50, stamps $29.00; new balance as of February 12, 1992: $546.10. RD

Nominees for Offices - Nominations are needed for the offices of President, Vice-President, Secretary-Treasurer, and Board Member by May. You can nominate yourself. Send nominations to the Secretary-Treasurer. RD

Annual Meeting - The annual meeting is scheduled for the Beaver Rim-South Pass area on June 27 and 28, 1992. Further details will appear in the next newsletter. RD

Symposium on Idaho Botany - A symposium on Idaho botany will be held in conjunction with the Idaho Academy of Sciences meeting at Albertson College in Caldwell, Idaho, on March 27, 1992. This special session will be from 1:30 to 4:30. Speakers include Ron Hartman, Pat Packard, Barbara Ertter, Doug Henderson, Bob Mosley, and Karl Holte. The keynote address at the annual banquet will be by Arthur Cronquist of the New York Botanical Garden. Further information can be obtained from Don Mansfield, Biology, Albertson College, Caldwell, ID 83605, (208)459-5287.

New State Records - Natives: Salix irrorata (Converse, Albany, & Platte cos.), Pediomelum digitatum (Goshen Co.); Introductions: Astragalus tibetanus (Fremont Co.), Cosmos bipinnatus, Tagetes patula, Lavatera thuringiaca, Nepeta grandiflora, and Eschscholtzia californica (all Laramie Co.). RD

Wyoming Plant Families

Family 9: Apiaceae (alternate name: Umbelliferae), Carrot Family

This is the ninth largest family of flowering plants in Wyoming with 60 species. Common representatives include caraway, poison hemlock, wild carrot, cow parsnip, biscuitroot, sweet cicely, parsnip, and yampah. Unifying characteristics include an umbellate inflorescence, 5 separate petals, 5 stamens, inferior ovary, 2 styles, and a fruit called a schizocarp. None of our other families have this combination of characteristics. The leaves are mostly compound and often lace-like or fern-like. Many species are pleasantly odiferous. Refer to the figure for a representative umbellate inflorescence, flower, and fruits. Two of our species are deadly poisonous, water hemlock (Cicuta) and poison hemlock (Conium). Poison hemlock was used to put Socrates to death. Within the last 10 years, a person died in Yellowstone Park after consuming roots of water hemlock. It is not uncommon for some members of a family to be common food items and others to be poisonous, e. g., carrots and poison hemlock, tomatoes and black nightshade, peas and locoweed. Find representatives of the family and study their inflorescence, flowers, and fruits. The tiny flowers are surprisingly similar throughout the family. Yellow and white are the usual colors.

Family 10: Boraginaceae, Borage Family

This is the tenth largest family of flowering plants in Wyoming with 58 species. Common representatives include miner's candle, hound's tongue, forget-me-not, stickseed, heliotrope, stoneseed, and bluebell. Unifying characteristics are a superior and 4-lobed ovary, 5 united petals, simple usually alternate and entire leaves, mostly regular flowers, 5 stamens attached to corolla tube and alternate with corolla lobes, and 1 style. The 4-lobed ovary develops into 4 nutlets (or fewer by abortion) for the fruit. Our only other families with a 4-lobed ovary are the Lamiaceae which has opposite or whorled leaves and usually irregular flowers with 2 or 4 stamens, and the Verbenaceae which has usually 4 stamens and mostly opposite leaves. Refer to the figure for the bluebell (Mertensia) and forget-me-not or stickseed (Hackelia) flower types. Look for representatives of the family and study the distinctive ovary and note the leaf arrangement. Look for nutlets in the old withered flowers at the base of the inflorescence, if the plants have developed that far. RD

Figure. Apiaceae. A. Inflorescence of **Conium** (x 1.3): inv = involucre, invl = involucel, ray = ray, fru = fruit. B. Flower of **Conium** (x 8). C-R. Outlines of cross sections and either lateral or dorsal views of fruits: C. **Ligusticum filicinum**, lateral (x 7); D. **Angelica pinnata**, dorsal (x 5); E. **Berula erecta**, lateral (x 5); F. **Carum carvi**, lateral (x 5); G. **Sium suave**, lateral (x 5); H. **Cicuta maculata**, lateral (x 5); J. **Conium maculatum**, lateral (x 5); K. **Harbouria trachypleura**, lateral (x 5); L. **Cymopterus acaulis**, dorsal (x 3.5); M. **Lomatium foeniculaceum**, dorsal (x 3.5); N. **Musineon divaricatum**, lateral (x 5); O. **Oxypolis fendleri**, dorsal (x 5); P. **Pastinaca sativa**, dorsal (x 2.5); Q. **Perideridia gairdneri**, lateral (x 5); R. **Osmorhiza occidentalis**, lateral (x 2.5).

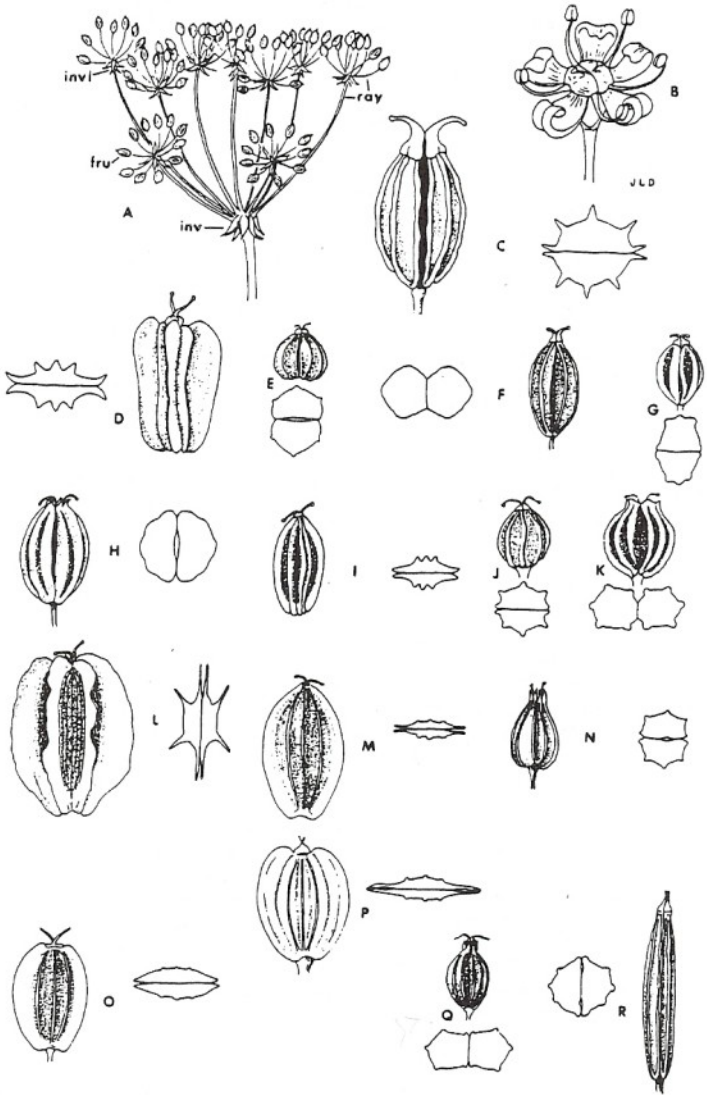
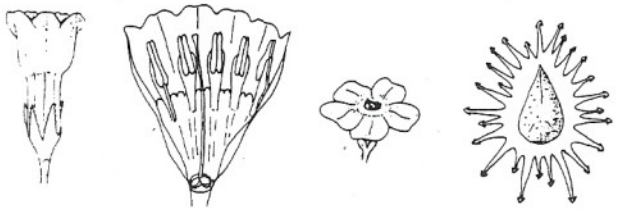


Figure. Left: flower of **Martensia** (x 1.4). Left center: same flower opened along one side (note 4 lobed ovary and fornices between stamens). Right center: flower of **Hackelia** (x 2.5). Right: outlet of **Hackelia** (x 2.5).



Chloroplast DNA Variation in Haplopappus section Oonopsis (Asteraceae) -

Chloroplast DNA (cpDNA) studies have proven to be helpful in determining phylogenetic relationships in plants. In these studies, cpDNA is extracted from leaves and digested with restriction enzymes. The DNA fragments are separated through gel electrophoresis, and the fragment patterns produced provide information into the evolutionary relationships within the group of plants being studied (i. e., similar patterns between species suggest a close relationship between them).

A study was conducted to determine the amount of cpDNA variation both within and between the taxa of Haplopappus section Oonopsis. Section Oonopsis consists of six taxa (H. fremontii ssp. fremontii and ssp. monocephalus, H. engelmannii, H. multicaulis, H. wardii, and one undescribed species) nearly endemic to the eastern plains of Wyoming and Colorado. Fourteen different restriction enzymes were used on a minimum of five populations from each taxon. Five individuals from one population of each taxon were sampled to assess intrapopulational variation.

Small amounts of interspecific and interpopulational cpDNA variation were detected. The limited amount of cpDNA variation suggests a relatively recent origin for Haplopappus section Oonopsis. If it were an older group, more divergence, due to random mutations in the chloroplast genome, would be expected.

Although the chloroplast genome shows little divergence, the species within Haplopappus section Oonopsis are highly variable morphologically. While the small amount of cpDNA variation is indicative of a recent origin for the section, the high amount of morphological variation suggests that rapid morphological differentiation occurred.

The cpDNA data set has aided in our understanding of Haplopappus section Oonopsis. A comparison of both molecular and morphological data sets has provided insight into the evolutionary history of the group. TE

(Tim received one of our scholarships)

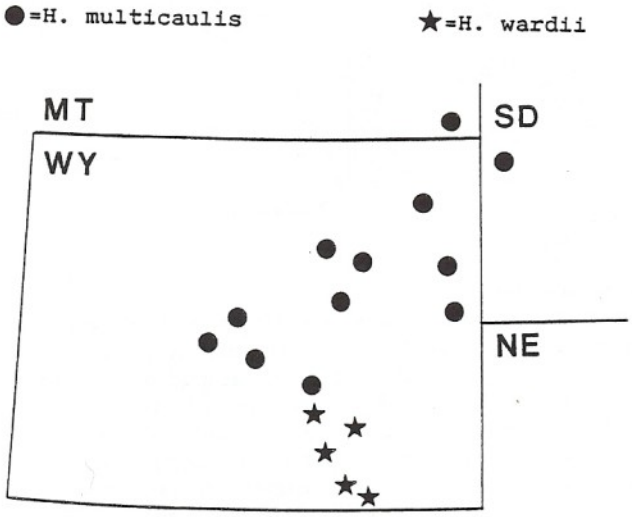


Fig. 1--Wyoming Haplopappus taxa.

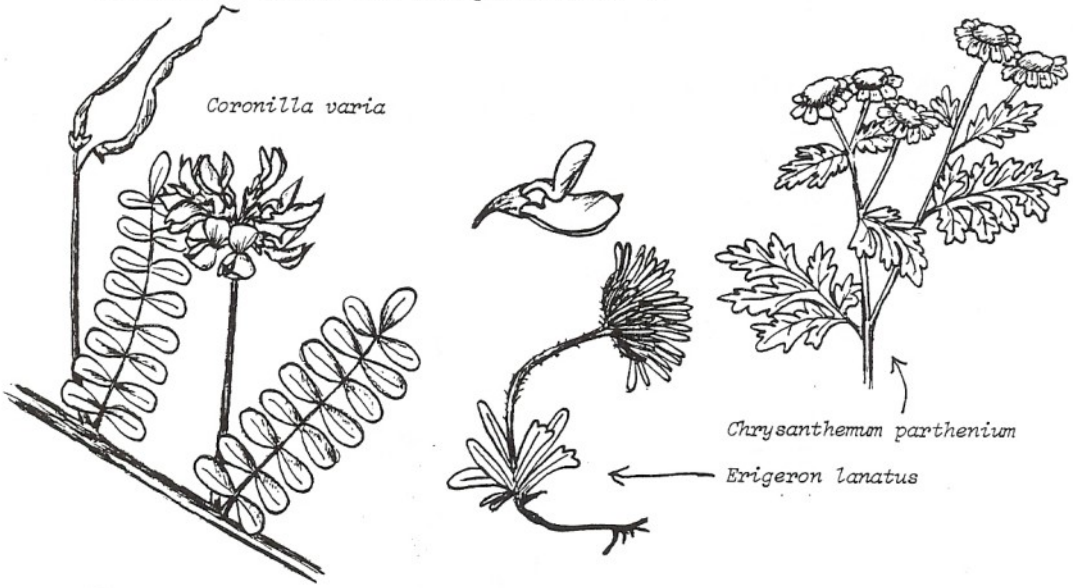
New Additions to the Flora of Wyoming -

Despite more than a century of botanical exploration, new additions to the flora of Wyoming are continually being made. In 1990, three plant species, previously unknown from the state, were found for the first time in the Wind River Range.

Coronilla varia, commonly known as crown-vetch, is a member of the pea family native to the Mediterranean. The flowers are bicolored (pink and white) and the petals are distinctive in being long-clawed at the base. Flower heads, made up of 10-20 flowers, loosely resemble a clover, but the plant differs in having long, pinnately compound leaves with 11-25 leaflets. Crown-vetch is planted along highways in many states. In Wyoming, it is known to occur only along the open, grassy banks of Kendall Warm Springs near the dirt road leading to the Green River Lakes.

Another weedy species to become established in the Winds is feverfew (**Chrysanthemum parthenium**). This member of the composite family resembles the common ox-eye daisy (**C. leucanthemum**), but has many flower heads instead of a single one, shorter rays and broader, more dissected fern-like leaves. Feverfew occurs in rocky-sandy soil of the North shore of the New Fork Lakes.

Another new composite from Wyoming is **Erigeron lanatus**, or woolly daisy. This species is characterized by having a single, large head with bluish or pinkish ray flowers and woolly, somewhat glandular phyllaries. The leaves are entire or sometimes three-lobed at the tip. **E. lanatus** was previously known from Western Canada, Montana and Colorado. In Wyoming, it occurs only on high elevation limestone talus. The first population of this species was discovered on Gypsum Mountain in 1990. Ron Hartman and Jonathan Hughes found a second population in 1991 on nearby Big Sheep Mountain. WF



Plants and Landscape Ecology

Plants, plants, plants, the reason we belong to this organization. We express a love for the plant kingdom and I guess rejoice that nature has evolved the way we believe it has. Showy flowers of the warm season grab our attention. Everyone likes the pretty face of monkeyflower, iris, trillium, orchid, and numerous other flowers.

You may have attended an institute of 'higher thinking' at some time in your past and may have taken a course in botany, ecology, or plant ecology. You may have learned about plant succession and climatic climax; about the complex web of interactions between plants and their environment; or the trophic pyramid, with plants on the bottom of the pile.

Another topic of interest may have been endangered species and biodiversity. Within this topic one might look at individuals, populations, communities, or ecosystems, a hierarchy of complexity, size, and time. You may have learned to examine a homogeneous plant community, a place where one or two plant species grow, to reduce apparent complexity. However, this did not explain how plant communities interacted or changed along an environmental gradient, such as an elevation change. Also, how plants and plant communities react to catastrophic change, such as fire, floods, or insect infestations, over the long term (greater than 250-500 years) and not the short term, has provided intriguing study.

During the 1970s and 80s, the study of populations and communities progressed from a local, stand scale of investigation, to the landscape scale. The plant ecologist started to examine heterogeneous vegetation, not just the homogeneous plant community. Complexity secrets of large areas with multiple communities varying over a long time period, began to be revealed during the 1980s with the use of computer models. The study of landscape ecology blossomed.

A basic tenet of landscape ecology is a hierarchy of spatial and temporal processes: space/size and time considerations affect the natural processes *we perceive* are active. How we believe a local plant population or community functions, may not be applicable over a larger area or longer time period. A case study is forest fire, which has been considered detrimental to forest development. Forest fire suppression was an acceptable management practice for many years in all wildlands. During the late 50s and early 60s, studies indicated that fire suppression created fuel accumulations that could lead to catastrophic wildfire. Fire suppression policies were altered and prescribed natural fires became the new norm. One problem with the 'let it burn' concept is the extrapolation of data concerning a species or a community across large areas: fire return intervals may differ considerably for the same species in different locations.

A basic tenet of Geography is that every location is unique and a basic concept of science is the generalization of phenomena to facilitate comprehension of complexity. However, once phenomena has been simplified past some point, an amorphous environment will not reveal the diversity that we consider an integral aspect of the natural world. Extrapolation of data across a large area represents generalization; uniqueness and diversity are lost. Historical events and biophysical site characteristics that contribute to forest development are lost. A time and space hierarchy should be utilized to examine plant communities over a large, heterogeneous area, and a the long time period.

Well, that seems nice, how about uncommon and rare plants? You might view all plants and plant communities as unique or the same. A similar concept relates to classification: are you a splitter or a lumper? Thus, if you are interested in protection of the unique, don't forget that some 'camps' might not feel that something is unique. Any population of a plant species might suffice for the protection of the species and not the protection of a representative population of each subspecies.

If you view biodiversity protection from the landscape ecology perspective, you will need to consider a hierarchy of scale, the spatial and temporal dimensions. If you do, diversity may be examined at many scales, with the retention of a multitude of plant species within a space and time framework that incorporates all ecosystem components and is self-replenishing for many centuries. Enjoy your next hike off the beaten path, searching for that specific plant, and remember that biodiversity relates to space and time dimensions, to a landscape ecology. PA

WHAT IS RARE? Part II In the last issue of the WY Native Plant Society newsletter, I addressed the murkiness of the concept of plant rarity. With rare plants sometimes common and common plants sometimes rare, a conservation-minded botanist can have a tough time explaining to the uninitiated why a particular species needs protection. As part of a continuing series, this article covers the subject of "legal rarity," and attempts to reduce the unending confusion over the terms threatened, endangered and rare.

"Threatened" and "Endangered" are legal designations bestowed upon plant species whose demise appears imminent, by the US Fish and Wildlife Service under the authority of the Endangered Species Act (ESA). Such designations result in severe management restrictions for Federal agencies, as well as reams of paperwork. Although Threatened and Endangered (T/E) plants strike fear in the hearts of many landowners in WY, those fears are unfounded; under the ESA, Federally-listed plants (in contrast with animals) receive **NO** protection on private land. Some states have their own endangered species acts, and so in California, for example, one encounters "State-Endangered" species. WY has no such law.

"Candidate" species are those being considered for listing as T/E, but for which there is insufficient information available at this time to make a decision. There are roughly 30 candidate plants in WY. Federal agencies are obligated to manage for protection of these candidates.

"Sensitive" designations are applied to species of concern by the US Forest Service and Bureau of Land Management. By listing a plant as Sensitive, the agency makes a commitment to manage for its protection, but restrictions are not as severe as for a T/E species. Sensitive designations are valuable for protecting rare plants that, although not (yet) threatened, are extremely vulnerable due to their rarity, and such designations can prevent the need for listing under the ESA.

Sensitive designations are also useful in protecting species that are regionally rare. Under the ESA, disjunct (widely-separated) populations of animals (such as the grizzly in WY) receive protection, but plants do not. And so the arctic bearberry, a Canadian species known from only one location in the lower 48 states (Swamp Lake in northwest WY), is not covered by the ESA, in spite of its obviously high botanical importance. By designating such regionally-rare species as Sensitive, protective management is required.

"Rare" is NOT a legal term in the world of plant conservation. In the absence of a legal definition, we must look elsewhere...perhaps even to the scientific literature. Stay tuned for Part III in the next issue for a scientific explanation of "WHAT IS RARE?"--**HJM**

Contributors This Issue - PA = Peter Anderson, RD = Robert Dorn, TE = Tim Evans, WF = Walter Fertig, HJM = Hollis J. Marriott.

Rare Plant Consortium - An organization called the Rare Plant Consortium has been established with the primary purpose to establish an open network among researchers and land managers, to facilitate communication and collaboration among scientists and students interested in all aspects of the biology of endemic plants, and to assist in the acquisition of funding for research and conservations efforts. There are no dues and no direct financial obligations connected to Consortium membership. Organizations or individuals may be members. For more information contact: Rare Plant Consortium, 1133 N. Western, Wenatchee, Washington 98801, (509)662-4315.

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