



# Rocky Mountain Herbarium (RM)

Herbaria are libraries, and like libraries of books, each specimen in a herbarium tells a story. The story includes characters, a place and a time. The plot line revolves around change—in land use, in climate, in human ingenuity, from the time of collection until now. Herbarium specimens document these changes, through the data contained on each label, and the DNA contained within their cells. Herbarium specimens are used more and more to document natural resources, elucidate evolutionary relationships and processes, describe the effects of climate change, and to identify organisms and landscapes of conservation concern. Protecting and caring for these invaluable and irreplaceable resources should be a high priority for universities and society. The stories they will tell in the future may be more important than we can possibly guess.

## A very brief history of the RM

- 1893, RM founded by charter faculty member Aven Nelson (later 9<sup>th</sup> president of UW)
- 1960, moved to current space in the Aven Nelson building, with approx. 265,000 specimens
- 1975, Ron Hartman became 4<sup>th</sup> curator; RM had about 303,000 specimens
- 1982, Forest Service herbarium (120,000 specimens) added to RM
- 1986, NSF-funded mobile storage system installed
- 2009, Plant Specimen Database went online with approx. 700,000 specimens
- 2016, Ernie Nelson named Curator following Hartman's retirement.

## The RM is ranked

- 3<sup>rd</sup> largest herbarium at a public university in the US
- The 10<sup>th</sup> largest herbarium out of 750 in the US
- The herbarium most actively collecting in N. America.

The RM contains:

- 1.3 million specimens from around the world. Most are from the Rocky Mountain region.
- Of those, 825,000 specimens can be searched online. The remainder of the specimens are being incorporated into the database, and are being imaged.
- Images of >130,000 specimens, accessible to a global audience through joint efforts of the UW Libraries and RM.

Each specimen provides information about morphology, phenology, ecology, and genetics at the time and place at which it was collected.



## Federal grant support since 1997

Sources of funding	Dollar amount	
US Forest Service	775,148	38 projects
National Science Foundation	425,542	6 projects
Bureau of Land Management	238,673	26 projects
National Park Service	80,714	7 projects
US Fish and Wildlife Service	16,000	2 projects
Natural Resources Conservation Service	10,000	2 projects
Other	129,987	3 projects
<b>Total</b>	<b>1,676,064</b>	<b>84 projects</b>

These federal dollars are part of a cooperative effort to support and fund the RM graduate program in which students conduct floristic inventories of designated areas throughout the Rocky Mountain region. These studies provide baseline data on plant diversity and on species of conservation concern. In collaboration with UW Libraries, the funding also supports undergraduate students involved in the databasing and imaging of specimens, thus making this invaluable information available to all on the RM website.

The image is a composite of two parts. On the left is a screenshot of the Rocky Mountain Herbarium website's specimen search results. The search criteria are set to 'Aven Nelson' and '1901'. The results list seven specimens, all identified as *Plantaginaceae*. The first entry is: '# 1. *Plantagon glaber* Pursh Plantaginaceae U.S.A., Wyoming, Park County, Southeastern Absaroka, junction of Cabin Creek, South Fork Shoshone River and county, ca 40 mi. SW of Cody. Natl Snow 2641, 1/24/1901 (unassigned)'. The right side of the screenshot shows a detailed view of the first specimen, including its collection location and date. On the right is a photograph of a pressed plant specimen, likely *Plantagon glaber*, mounted on a herbarium sheet. The specimen shows the roots, stems, leaves, and a cluster of small flowers. A color calibration chart and a ruler are placed next to the specimen for scale and color reference. A handwritten label on the bottom right of the sheet reads: 'Plantagon glaber Pursh (unassigned) 1901' and 'Aven Nelson, July 24, 1901'.

Screen shot of the results of an RM database search, and the retrieved image of an Aven Nelson specimen, collected in 1901.

# The RM is a resource for land managers

- The online database is an essential tool for those who need to identify and locate plant materials for reclamation and restoration of landscapes affected by energy production and other types of development.
- The RM assists in identification of noxious weeds and invasive species, and supports the ranching and agricultural communities in the state. Specimens in the RM are records of the introduction and spread of weeds across Wyoming and the western states.
- The RM supports archiving voucher specimens for ongoing research and Seeds of Success, the national native seed collection program led by the Bureau of Land Management.

Science is a collaborative effort, and RM has made its digitized specimens available for research through multiple portals, including:

RM Database: [rmh.uwyo.edu/data/search.php](http://rmh.uwyo.edu/data/search.php)

Rocky Mountain Region Digital Herbarium website: [www-lib.uwyo.edu/digitalherbaria/index.php](http://www-lib.uwyo.edu/digitalherbaria/index.php)

Global Biodiversity Information Facility (GBIF): [www.gbif.org/](http://www.gbif.org/)

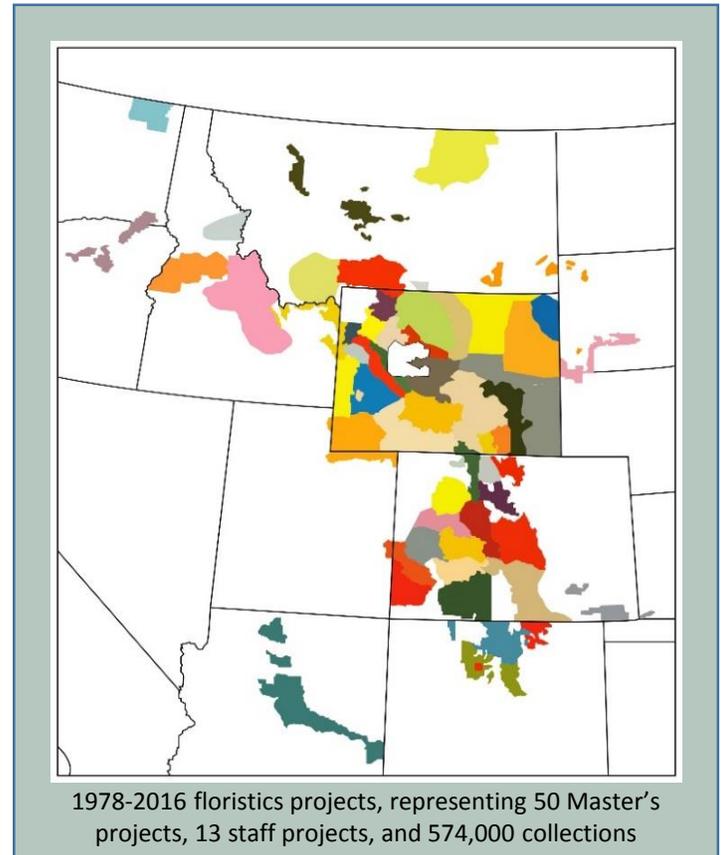
Consortium of Pacific Northwest Herbaria: [www.pnwherbaria.org/](http://www.pnwherbaria.org/)

SEINet (regional herbaria portals): [swbiodiversity.org/seinet/collections/index.php](http://swbiodiversity.org/seinet/collections/index.php)

- Northern Great Plains Herbaria
- Intermountain Regional Herbaria Network
- Rocky Mountain Regional Consortium

Mycology Collections Portal: [mycoportal.org/portal/index.php](http://mycoportal.org/portal/index.php)

Digitizing specimens enables data aggregation and sharing, so that scientists anywhere on the globe have access to large datasets. However, digitized specimens cannot fully replace real specimens. Herbarium specimens are increasingly used as sources of DNA, and for the study of inadvertently-collected plant associates, such as viruses, fungi and insects, that may be of ecological or agricultural interest.



## Increasing knowledge of rare species

The projects completed during the 1990s in Colorado, Idaho, Utah, Washington, and Wyoming resulted in the inventory of 79,391 mi<sup>2</sup>. Most importantly, 414 species of conservation concern were documented at 1,459 sites; most of these sites of occurrence were new. Additionally, projects completed during the 2000s in Arizona, Colorado, Idaho, Kansas, Nebraska, New Mexico, Oregon, South Dakota, Washington, and Wyoming resulted in the inventory of an additional 89,363 mi<sup>2</sup> of mostly state and federal lands. During this period, 430 plant species of conservation concern were documented at 1,678 sites. The continuing addition of new occurrences prevents the listing of potential or proposed species from the Federal Threatened and Endangered Species List.



## Education and Outreach



The RM has directly supported

- 50 graduate students, most of whom have gone on to successful careers as professional botanists, environmental consultants, and as educators.
- >300 undergraduates who have learned specimen preparation and curatorial skills, databasing, imaging and some science vocabularies working at the RM.

RM staff, affiliates and research associates share their knowledge and enthusiasm for the native flora by leading outdoor plant walks, a very popular public program of UW Extension, and with other groups like the Wyoming Native Plant Society.

Elementary through high school students visit the RM and use RM specimens as part of their science curriculum. Specimens allow students to become familiar with Wyoming native plants, weeds, vegetation and ecosystems, and support state science standards.

**Friends of the RM** was inaugurated in the fall of 2015, with the goal of providing support to the RM by

- raising public awareness about the value of herbaria through public programs, and
- establishing a volunteer program to increase the rate of specimen processing.

Open houses and public talks have successfully brought local attention to the RM, giving community members opportunities to visit, and promoting the volunteer program. As of October 2016, the RM has been the fortunate recipient of nearly 4000 volunteer hours!



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