



Consortium of Pacific Northwest Herbaria

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Alaska
British Columbia
Idaho
Montana
Oregon
Washington
Yukon Territory





About the Consortium (CPNWH)



How CPNWH began



Funding strategies & sources



What we're doing right now



Technology, software, & solutions



Challenges, problems, & recommendations

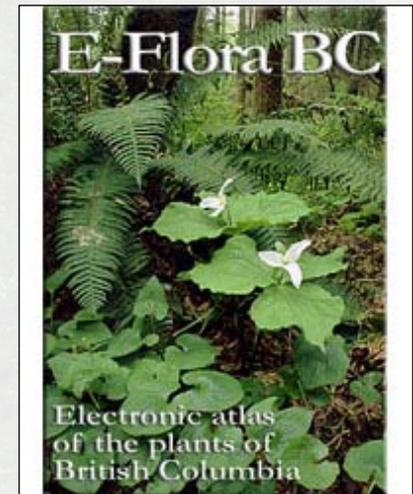
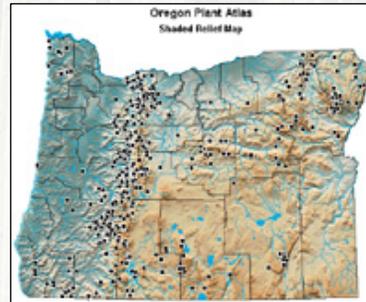


Rock Lake, Eastern Washington



Consortium of PNW Herbaria (CPNWH):

- “Created in 2007 to bring together regional herbaria and provide an online portal to the wealth of existing and emerging information about the flora of Pacific Northwest North America.”



56 public and private herbaria. 3,400,000 specimens.

Alaska

5 herbaria
250,000 specimens
(ALA)

Yukon Territory

1 herbarium
7,000 specimens
(private collection)

British Columbia

9 herbaria
900,000 specimens
(UBC, V, UVIC)

Montana

6 herbaria
279,000 specimens
(MONTU, MONT)

Washington

16 herbaria
1,150,000 specimens
(WTU, WS)

Idaho

8 herbaria
343,000 specimens
(ID, IDS, SRP, CIC)

Oregon

12 herbaria
477,000 specimens
(OSC)



Portal initiation:

- Discussions among regional curators was initiated in late 2006 by Dick Olmstead following early completion of WTU's previous NSF grant.
- Favorable support of regional curators led to submission of supplemental request to NSF. \$32,000 was awarded in early 2007.

Stated goals in NSF supplemental request:

1. Link regional herbarium specimen records through an online portal.
2. Provide a unified access point for online resources associated with participating collections.
3. Develop data-sharing protocols to minimize redundant data entry.
4. Facilitate digitization efforts at regional herbaria.



Douglasia nivalis

Results of initial work:

1. Web site providing access to ~ 400,000 specimens from 3 regional herbaria (ALA, OSC, WTU), with infrastructure in place to add more.
2. Linked list of online resources hosted by regional herbaria.
3. Contact info and statistics for regional herbaria.





A few observations:

- Initial discussions were done by email among curators and staff.
- We did not hold any meetings or lengthy debates about the concept or goals.
- Instead, we just took an early idea and quickly turned it into a working result.
- One institution (WTU) started the idea and took on the initial work.



Pasayten Wilderness, Washington



Current NSF grant:

- In 2009, WTU re-initiated discussions among regional herbaria.
- We submitted a collaborative grant proposal to NSF in summer 2009.
- **\$1.3 million** was asked for and awarded, with funds split between four institutions.
- We started work in June, 2010.

Institution	Funds
University of WA (WTU)	\$642,611
Oregon State U. (OSC)	\$325,141
U. of Idaho (ID)	\$301,351
Montana State U. (MONT)	\$71,776
TOTAL	\$1,340,879



Grant goals:

1. Image and database 180,000 vascular plant specimens from the region's last large herbaria that lack databases (ID, MONT).
2. Image and database ca. 140,000 vascular plant specimens from about 12 small herbaria in Idaho, Oregon, and Washington.
3. Database 200,000 PNW non-vascular plant, fungal, and lichen specimens at OSC and WTU.
4. Set up new data access points for herbaria with existing databases (WS, UBC, MONTU, SOU, SRP, CIC) and hopefully replace old DiGIR connections (WTU, OSC, ALA) with newer technology.
5. Provide online access to all specimen images and data available for the region (ca. 2,000,000 specimens and 300,000 images).
6. Make all of this data available to GBIF, USVH, and other data aggregators.
7. Develop software solutions and expand the functionality of the Consortium web site.



Image and database smaller herbaria in ID, OR, and WA

Washington:

Western WA U.	26,000
Whitman College	17,000
Central WA U.	25,000
Eastern WA U.	7,000
Pacific Lutheran U.	5,000+
TOTAL:	78,000

Idaho:

Lewis & Clark College	10,000
Northern Idaho College	10,000
Forest Service Herbaria	5,000
TOTAL:	25,000

Oregon:

Reed College	10,000
Portland State U.	11,000
Linfield College	2,000
Southern Oregon U.	14,000
HJA Experimental Forest	1,400
TOTAL:	38,400

GRAND TOTAL: 142,000+



Image and database smaller herbaria in ID, OR, and WA

- Small herbaria house valuable specimens not present in the larger herbaria. But they are often not examined by specialists.
- It is often challenging to justify the existence of these collections to university administrators. Can we increase their utility and prominence?
- Limitations in staff, budgets, and computer infrastructure make it difficult for these herbaria to manage a specimen database or provide online access.



Aquilegia jonesii



Image and database smaller herbaria in ID, OR, and WA

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- It is often challenging to justify the existence of these collections to university administrators. Can we increase their utility and prominence?
- Limitations in staff, budgets, and computer infrastructure make it difficult for these herbaria to manage a specimen database or provide online access.

We've proposed a model that leverages the resources at larger herbaria to assist smaller herbaria with imaging and databasing.



Our solution for digitizing small herbaria

- Centralize the image storage, databases, and software/hardware infrastructure at the larger institutions:
 1. We send imaging equipment to each herbarium and use hourly, work study, or volunteer help to image the entire collection.
 2. Images are sent to WTU and stored on the Consortium's server.
 3. We create a database for each herbarium. The database lives on the Consortium web server and is accessible through the internet via a web application interface.
 4. Label data is captured from the images by staff and personnel at the larger institutions (using the web app).
 5. The same web app is accessible to staff at each herbarium for use as their own database.



What we've accomplished thus far on the grant

- Held a meeting among regional herbaria in June, 2010.
- Configured and deployed imaging equipment to all four states.
- Have acquired ~ 110,000 images to date (of 300,000 projected).
- Set up a web server dedicated to the Consortium, and configured image processing and storage work flows.
- Created the online web application database interface.
- WTU has finished databasing nearly all of their PNW bryophyte, lichen, and fungi specimens (ca. 80,000). OSC is working on their collections.
- Deployed a new FileMaker database for the U. of Idaho Herbarium.
- I am currently developing data provider connections and rebuilding and expanding the Consortium database and web site.



Why we think we got funded

- Leveraged the success of prior grants and similar projects.
- Used small pots of money to initiate projects and develop proof-of-concepts. These may have helped convince reviewers we knew what we were doing.
- Innovation. We proposed a novel approach to assist smaller herbaria with imaging and databasing.
- Timing of grant coincided with initiation of NSF's new ADBC funding track, and with availability of federal stimulus funds to NSF.





Technology we've developed:

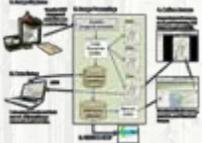


Image processing equipment & workflows



Specimen image viewer



Data entry interface



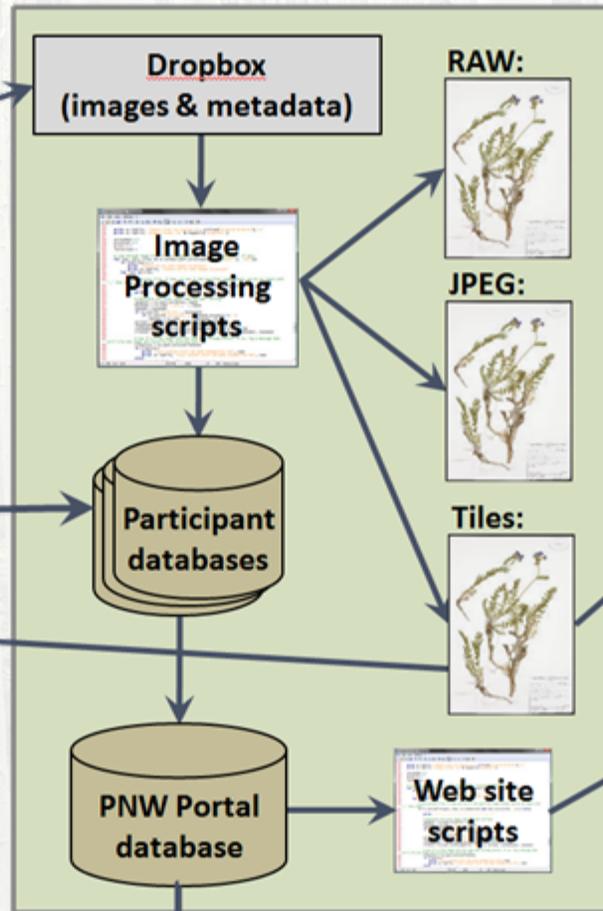
Online search interface



1. Image Capture:



2. Image Processing:



3. Data Entry:



Data entry form shows blank record. Adjacent image viewer shows label data.

4. Online Access:

Image viewer allows pan, zoom, and measure, with link to download JPEG.



Search results shows map, text data, and thumbnail images.

5. USVH & GBIF





Imaging Equipment:

Lightbox

Canon 21MP dSLR

Custom camera mount

Laptop computer

Canon software

Custom metadata form



Justification:

Easy to set up & use

Compact & portable

Reasonable price

Camera is much faster than scanner

Good image quality

A good alternative (that we don't use):





Imaging – what’s available:

- Imaging documentation on the consortium web site: <http://www.pnwherbaria.org/documentation/specimenimaging.php>
- Descriptions of hardware and software we use.
- Python scripts for metadata capture, image processing, and tiling.

Image Metadata, PNW Herbaria

File Admin Help

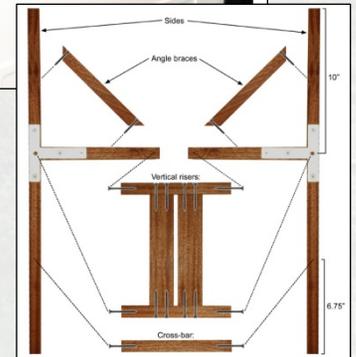
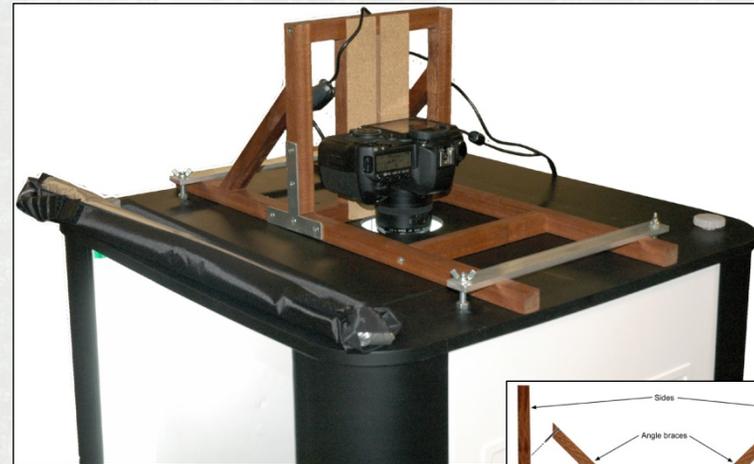
Your name: Elise LaFaneasy

Collection Acronym: ID

Add Folder

List of folders, in order imaged:

	Imaged By	Acronym	Date	Time	Family	Scientific Name	Folder Code
1	Harriet Hughes	ID	2010-10-08	10:57:01	Araceae	Arisema	non-Idaho (cream)
2	Harriet Hughes	ID	2010-10-08	11:11:16	Araceae	Calla	non-Idaho (cream)
3	Harriet Hughes	ID	2010-10-08	11:15:46	Lemnaceae	Lemna	non-Idaho (cream)
4	Harriet Hughes	ID	2010-10-08	11:25:42	Lemnaceae	Lemna minor	Idaho (red)
5	Harriet Hughes	ID	2010-10-08	11:30:31	Lemnaceae	Lemna minor	non-Idaho (cream)
6	Harriet Hughes	ID	2010-10-08	11:40:34	Lemnaceae	Lemna trisulca	Idaho (red)
7	Jacob Denton	ID	2010-10-08	12:35:42	Lemnaceae	Lemna trisulca	non-Idaho (cream)
8	Jacob Denton	ID	2010-10-08	12:38:57	Lemnaceae	Lemna turionifera	Idaho (red)
9	Jacob Denton	ID	2010-10-08	12:41:06	Araceae	Lysichiton americanus	Idaho (red)
10	Jacob Denton	ID	2010-10-08	12:47:14	Araceae	Lysichiton americanus	non-Idaho (cream)
11	Jacob Denton	ID	2010-10-08	12:52:15	Araceae	Orontium	non-Idaho (cream)
12	Jacob Denton	ID	2010-10-08	12:53:47	Araceae	Peltandra	non-Idaho (cream)
13	Jacob Denton	ID	2010-10-08	12:54:46	Zosteraceae	Phyllospadix	non-Idaho (cream)
14	Jacob Denton	ID	2010-10-08	12:55:26	Araceae	Pusa	non-Idaho (cream)
15	Jacob Denton	ID	2010-10-08	12:56:30	Lemnaceae	Spirodela polyrrhiza	Idaho (red)
16	Jacob Denton	ID	2010-10-08	12:59:42	Lemnaceae	Spirodela polyrrhiza	non-Idaho (cream)
17	Jacob Denton	ID	2010-10-08	13:03:16	Araceae	Symplocarpus	non-Idaho (cream)
18	Jacob Denton	ID	2010-10-08	13:05:23	Lemnaceae	Wolffia	non-Idaho (cream)



Specimen Image Viewer:

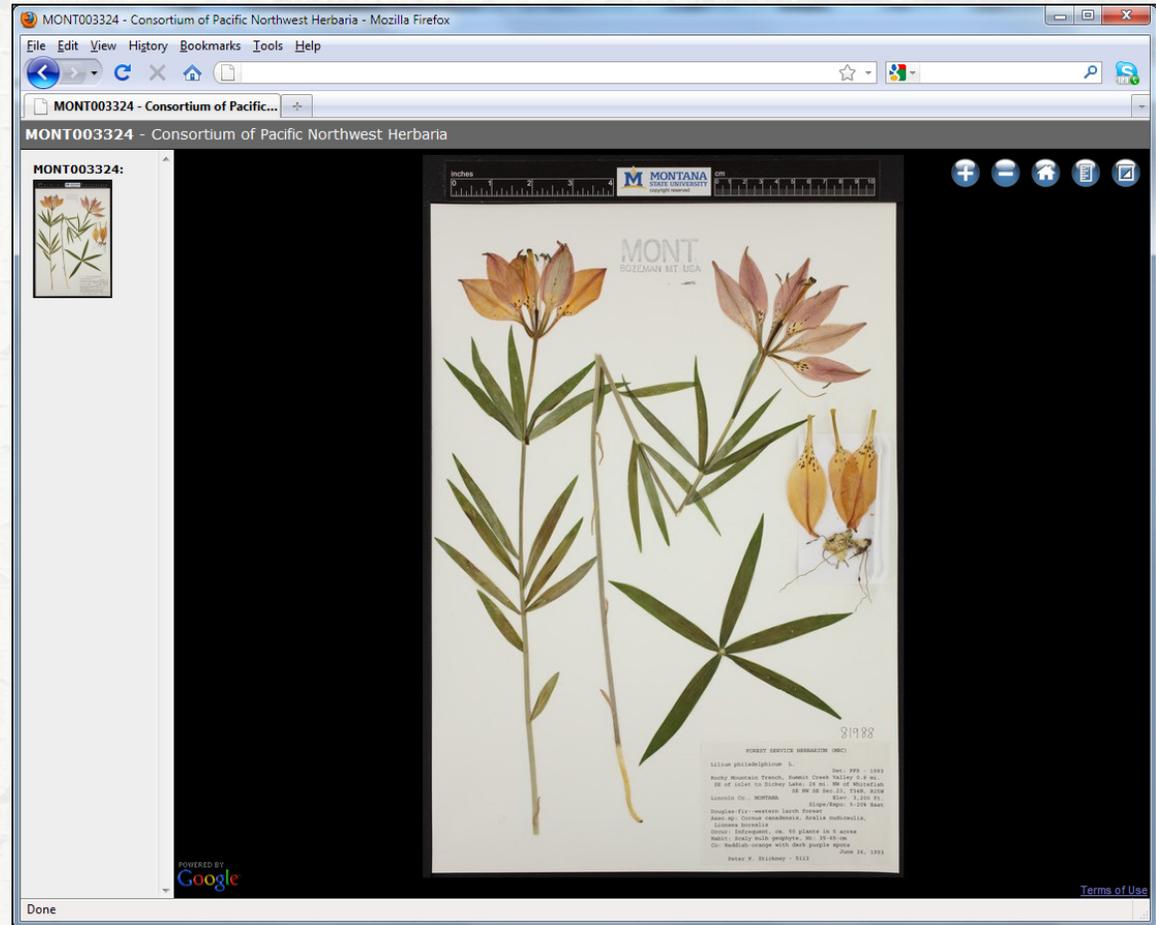
Open source

Based on Google Maps

Pure JavaScript

Fast!

Efficient storage of
Images on server



<http://www.rmh.uwyo.edu/gmapviewer/about.php>



Data Entry Interface:

We needed a solution that satisfied the following requirements:

- Can be managed centrally by the Consortium.
- Accessible to small herbaria with minimal requirements.
- Tight integration of specimen images.
- Flexible enough to allow development of novel approaches (e.g., OCR).
- Preferably, based on open source software.



Harrimanella stelleriana

Our solution:

- Develop a new database system that runs as a web application based on Apache, PHP, MySQL, Python, JavaScript, and HTML.

The screenshot shows a web browser window displaying the Montana State University Herbarium database interface. The browser tabs include 'CPNWH Database Login' and 'Montana State University...'. The page title is 'Montana State University Herbarium' and the user is logged in as 'blegler (administrator)'. The interface features a navigation menu with options: Home, Search, Data Entry, Labels & Reports, Tables, SQL Query, Reference Data, and Manage. The main content area is divided into several sections:

- Montana State University Herbarium**: A summary section with a 'Refresh' button.
- Records:**

Specimen records:	4037
Site records:	3608
Annotations:	6520
Type basionyms:	0
- Record Status:**

Verified:	0
Unverified:	3922
Incomplete:	12
Skipped:	24
Status not recorded:	20
- Images:**

Images:	23209
Images w/out a record:	19118
- Species Checklist**: Reference list of taxa names with synonymy. Add, edit, or remove names here.
- Rare Species List**: Reference list of taxa of conservation concern used to block locality data online.
- Collectors & Determiners**: Reference list of names for collectors and determiners (annotators).
- Land Owners**: List of land owners for contact info, permits, and to block locality data online if desired.
- Political Units**: Lists of countries, states, provinces, counties, and municipalities.
- Projects**: Use projects to assign specimens to field surveys or data entry tasks.
- Other Reference Lists**: Herbaria, months, phenology, origin, type designations, literature, ID qualifiers, etc.

Data Entry Interface:

CPNWH Database Login | Montana State University...

Montana State University Herbarium | bleger (administrator) | Logout | Help

Home | Search | Data Entry | Labels & Reports | Tables | Site Query | Reference Data | Manage

Specimen Data Entry | 8 of 13 | New Record | New From Image | Duplicate | Delete | Print Labels

Record ID: 550 | Status: unverified | Show Record Online? Y N

Created By: Andrea Taylor | On: 2011-02-14 11:23:35 | Project: CPNWH Imaging | Add | Show Locality Online? Y N

Modified By: | On: 2011-03-26 15:30:18 | # of Labels/Duplicates: |

Herbarium: MONT | Accession #: 67862 | Barcode: | NPS Accession: | NPS Catalog: | Replicates: |

Label Header: Forest Service Herbarium, United States Department of Agriculture | Label Footer: |

of Annotations: 2 | Add/Edit Annotations | Family: Dryopteridaceae | Folder: Dryopteris filix-mas

Full Name: *Dryopteris filix-mas* (L.) Schott

Code	Name	Name Qualifiers & Positions	Add Name
Accepted Name	dryfil	Dryopteris filix-mas	Edit Name
Hybrid?			Edit Name

Site ID: 490 | Site Lookup... | New Site | Duplicate Site | Delete Site

Collector: Stickney = Peter F. Stickney | Coll. #: 2745

Coll. With: 2745

Coll. Date: 29 Jun 1972 | Verbatim Date: |

Country: U.S.A. | State: Idaho | County: Idaho

Locality: Bitterroot National Forest, White Cap Creek 0.2 mi. above jct. of Cedar Creek; 25.5 mi. WSW of Darby, Montana.

Elevation: 3400 - | ft. | Land Owner: | Add

TRS/PLSS: 29N 14E 1 N 1/2

Latitude: | Longitude: | UTM: |

Uncertainty: | Datum: | Source: |

Georeferenced Lat/Lon: | Uncertainty: | Elev. Georef?: | Georef. Source: | Remarks: |

Georef. Datum: | Georef. By: |

Site Description or Habitat: Slope: 0%. Level. Flood plain river flat*. Vegetation type: Western redcedar-grand fir forest. *Shaded forest site.

Specimen Notes: Herb, Perennial. Scarce to infrequent.

Miscellaneous Notes: Trend: 629-4.

Phenology: Vegetative | Cultivated?: N | Origin: |

Specimen Lat/Lon: |

Is this a type specimen? N Y | Add/Edit Types

Images | Documents | Map

Show Thumbnails | Hide Image Viewer | Attach Image



POWERED BY Google | Terms of Use

Data Entry Interface:

The screenshot displays the Western Washington University Herbarium Database web interface. The browser window shows the URL and navigation tools. The database interface includes a search bar, a navigation menu with options like Home, Search, Data Entry, Labels & Reports, Tables, Site Query, Reference Data, and Manage, and a user profile for 'blegler (administrator)'. The main content area is titled 'Manage Images' and shows a folder named 'Dodecatheon pauciflorum (26 images)'. A left sidebar lists various plant families and their specimen counts, with 'Dodecatheon pauciflorum (26)' selected. The main area displays a grid of 26 individual specimen images, each with a unique ID (e.g., WWB016555, WWB016556) and 'Edit' and 'Delete' buttons below it. The browser's status bar at the bottom shows 'Done'.

Data Entry Interface:

The screenshot displays the Montana State University Herbarium Data Entry Interface. The browser window title is "Montana State University...". The page header includes the user name "blegler (administrator)" and options for "Logout" and "Help". The navigation menu contains "Home", "Search", "Data Entry", "Labels & Reports", "Tables", "Site Query", "Reference Data", and "Manage".

The main content area is titled "Species Checklist" and features a table with columns for ID, Family, and ScientificName. The table lists various species, with "Arbutus menziesii" (ID 25929) highlighted in yellow. To the right of the table is a detailed form for editing the selected species.

Species Checklist Table:

ID	Family	ScientificName
25911	Ericaceae	Agarista populifolia
25912	Ericaceae	Allotropa
25913	Ericaceae	Allotropa virgata
25914	Ericaceae	Ampelothamnus phyllireifolius
25915	Ericaceae	Andromeda
25916	Ericaceae	Andromeda glaucophylla
25917	Ericaceae	Andromeda glaucophylla var. iod...
25918	Ericaceae	Andromeda polifolia
25919	Ericaceae	Andromeda polifolia ssp. glaucop...
25920	Ericaceae	Andromeda polifolia var. concolor
25921	Ericaceae	Andromeda polifolia var. glaucop...
25922	Ericaceae	Andromeda polifolia var. jamesiana
25923	Ericaceae	Andromeda polifolia var. polifolia
25924	Ericaceae	Andromeda populifolia
25925	Ericaceae	Andromeda xjamesiana
25926	Ericaceae	Arbutus
25927	Ericaceae	Arbutus alpina
25928	Ericaceae	Arbutus arizonica
25929	Ericaceae	Arbutus menziesii
25930	Ericaceae	Arbutus texana
25931	Ericaceae	Arbutus xalapensis
25932	Ericaceae	Arbutus xalapensis var. texana
25933	Ericaceae	Arctostaphylos
25934	Ericaceae	Arctostaphylos acutifolia
25935	Ericaceae	Arctostaphylos adenotricha
25936	Ericaceae	Arctostaphylos alpina
25937	Ericaceae	Arctostaphylos alpina ssp. rubra

Species Details Form (ID: 25929):

- Name ID: 25929
- Status: [dropdown]
- Created By: Ben Legler On 2010-12-13 15:40:00
- Modified By: [dropdown] On 2010-12-13 15:47:59
- Show Specimen Records Online? Y
- Show Specimen Localities Online? Y
- Family: Ericaceae
- Genus: Arbutus
- Authors: Pursh
- Species: menziesii
- Infraspecies: [dropdown]
- Full Name: *Arbutus menziesii* Pursh
- Name Code: arbmen
- Name Rank: species
- Common Names: Pacific madrone
- Name Status: accepted
- Code: arbmen
- Scientific Name: *Arbutus menziesii*
- References: USDA Plants
- Year Published: [input]
- Publication: [input]
- Notes: [input]
- Reference Characters: x ö é é Á C ü ç à Ö

Data Entry Interface:

CPNWH Database L... x Montana State Univ... x

Montana State University Herbarium blegler (administrator) Logout Help

Home Search Data Entry Labels & Reports Tables Query Reference Data Manage

Tables: sites² images²

Tables:	Collector	Collector...	OtherColl...	DayCollec...	MonthColl...	YearColle...	Verbatim...	Country	State	County	Locality	LandOwner	SiteDescr...	Minimum...	Maximum...	Elevation...
accounts	J. C. Wright		N. L. Ander...	2	7	1953		U.S.A.	Montana	Bighorn	Grapevine ...					
annotations	R. S. Willia...			12	7	1888		U.S.A.	Montana	Cascade	Near Belt ...					
checklist	J. W. Blank...			5	7	1905		U.S.A.	Montana	Gallatin	Mt. Bridger...		8000			ft
counties	W. E. Booth			4	8	1943		U.S.A.	Montana	Gallatin	Hyllt Canyo...					
countries	Peter F. Sti...			15	7	1970		U.S.A.	Idaho	Adams	Payette For...		6500			ft
deletedannotations	P. A. Rydberg		Ernst A. Be...	29	7	1897		U.S.A.	Idaho		Mt. Chauvet...		10000			ft
deleteddocuments	S. Mathews			18	7	1989		U.S.A.	Montana	Park	Gallatin Na...					
deletedimages	Hawkins															
deletedsites	P. H. Hawk...						[no date giv...	U.S.A.	Montana	Gallatin	Gallatin Val...					
deletedspecimens	P. H. Hawk...			11	8	1917		U.S.A.	Oregon		Sandy River...					
deletedtypes	W. E. Booth			31	7	1946		U.S.A.	Montana	Beaverhead	Wisdom, M...					
documents	Porter P. L...			11	7	1979		U.S.A.	Montana	Beaverhead	Just north ...		7850			ft
folders	R. D. Dorn			24	6	1968		U.S.A.	Montana	Beaverhead	Red Rock ...		6600			ft
images	W. E. Booth			18	6	1966		U.S.A.	Montana	Big Horn	Wyola, 1 m...					
imagesold	R. S. Willia...			14				U.S.A.	Montana	Cascade	Belt Park					
labelqueue	P. H. Hawk...						[no date giv...	U.S.A.	Montana	Cascade	Belt Mount...					
landowners	Bell			3	7	1924										
listedtaxa	E. J. Bell			3	7	1924		U.S.A.	Montana	Gallatin	Rocky and ...		6000			ft
lists	S. Seidens...			20	6	1938		U.S.A.	Montana	Gallatin	Porcupine ...		6600			ft
people	M. A. Bell			11	7	1935		U.S.A.	Montana	Gallatin	West Yello...					
peopleold	Donn Dale			18	6	1971		U.S.A.	Montana	Gallatin	3/10 mile b...		7400			ft
personnel	P. A. Rydberg		Ernst A. Be...	14	6	1897		U.S.A.	Montana	Gallatin	Bridger Mo...		7000			ft
projects	W. E. Booth			3	8	1943		U.S.A.	Montana	Gallatin	Bridger Ca...					
replicates	P. H. Hawk...						[date not gi...	U.S.A.	Montana	Gallatin	Mystic Lake...					
settings	J. W. Blank...			7	7	1905		U.S.A.	Montana	Gallatin	Bear Canon...					
sites	D. B. Swingle			30	7	1927		U.S.A.	Montana	Gallatin	West Fork ...					
specimens	J. W. Blank...			27	7	1898		U.S.A.	Montana	Gallatin	Mystic Lak...					
states	F. B. Cotner			3	7	1937		U.S.A.	Montana	Gallatin	Upper Cott...					
types	R.L.H.					1948		U.S.A.	Montana	Gallatin	W. Gallatin...		6000			ft
	R. S. Willia...			17	7	1894		U.S.A.	Montana	Glacier	Summit, G...					
	G. B. Cum...			8	7	1955		U.S.A.	Montana	Glacier	Prob. old r...					
	C. E. Rouse			4	7	1959		U.S.A.	Montana	Glacier	Babb.					
	Jim Vander...			4	8	1993		U.S.A.	Montana	Granite	Anaconda ...		8200	8400		ft
	W. E. Booth			13	6	1954		U.S.A.	Montana	Jefferson	Boulder; a...					
	Allan Lovaas			16	7	1956		U.S.A.	Montana	Judith Basin	Russian C...					
	Peter F. Sti...			23	7	1959		U.S.A.	Montana	Madison	Beaverhea...		7100			ft
	Fred Knowl...			3	7	1958		U.S.A.	Montana	Madison	West Fork ...					
	C. P. Pilkes			24	6	1924		U.S.A.	Montana	Madison	Madison F...		6000			ft
	Robert Yae...			16	8	1971		U.S.A.	Montana	Madison	Gravelly Mtns.					

14/1036 Import Export SELECT * FROM sites

OCR-Assist (experimental):

The screenshot displays the Western Washington University Herbarium Database interface. The main record is for specimen #209, *Lycopodium alpinum* L., collected by Steve Wagstaff on August 21, 1980, in King County, Washington. The interface includes a navigation menu, a toolbar with actions like 'New Record' and 'Duplicate', and a detailed form for specimen data. A right-hand pane shows an image of the original herbarium label, which has been processed by OCR. The label text is as follows:

Herbarium of Western Washington State College
 PLANTS OF WASHINGTON
Lycopodium alpinum L.
 KING COUNTY: Boulder-field W. of
 Granite Lk. T23N R9E S26 NE1/4. Small
 clumps on E. aspect, bottom of 36
 slope. Assoc. with *Abies lasiocarpa*,
Luetkea pectinata, *Cladina* sp.
 21 Aug. 1980
 Steve Wagstaff #209

At the bottom right of the label image, there are buttons for 'Label', 'Accession #', and 'Annotation'. The interface also features a 'POWERED BY Google' logo and a 'Terms of Use' link.

OCR-Assist (experimental):

The screenshot displays the Western Washington University Herbarium Database interface. The main window shows a specimen record for *Lycopodium alpinum* L. with various fields for collection data, annotations, and site information. An OCR-Assist window is overlaid on the right, showing the text extracted from an image of the specimen label. The OCR window includes an 'Auto-Parse' button and a list of extracted text elements.

Database Interface Fields:

- Record ID: 7, Status: unverified
- Created By: Ben Legler, On: 2010-12-17 17:14:37
- Modified By: [blank], On: 2011-03-26 15:21:25
- Project: CPNWH Imaging
- Herbarium: WWB, Accession #: 21486
- Family: Lycopodiaceae
- Full Name: *Lycopodium alpinum* L.
- Accepted Name: lycalp, *Lycopodium alpinum*
- Site ID: 5, Collector: Wagstaff = Steve Wagstaff, Coll. #: 209
- Coll. Date: 21 Aug 1980
- Country: U.S.A., State: Washington, County: King
- Locality: West of Granite Lake.
- Site Description or Habitat: Boulder-field. East aspect, bottom of 36 slope. Assoc. with *Abies lasiocarpa*, *Luetkea pectinata*, *Cladina* sp.
- Specimen Notes: Small clumps.
- Phenology: Spores, Cultivated?: N, Origin: Native
- Is this a type specimen?: N

OCR-Assist Window:

- Mode: Select mode
- Auto-Parse button
- Extracted Text:
 - Herbarium of Western Washington State College
 - PLANTS OF WASHINGTON
 - Lycopodium alpinum* L.
 - KING COUNTY: Boulder-field W. of Granite Lk. T23N R9E S26 NE1/4. Small clumps on E. aspect, bottom of 36 slope. Assoc. with *Abies lasiocarpa*, *Luetkea pectinata*, *Gladina* sp.
 - 21 Aug. 1980
 - Steve Wagstaff #209
- Steve Wagstaff #209



Data collection in the field (experimental):

- Intended for collecting field notes for herbarium specimen labels.
- Web app using HTML5 Local Storage and phone's GPS. Works even if wireless networks aren't available (e.g., in the mountains).
- Collect your data, then, when a network is available, send it to the database server. When you return from the field, the data is waiting and ready for you to clean it, enter annotations, and print labels.

Collections Photos Sync Settings Help

New Site Delete Selected

Site #1: Feb 6, 2011 at 9:32:00
 Ben Legler, with David Giblin, Peter Zika.
 U.S.A., Washington, King County: Montlake Fill, Seattle.
 Elev. 30 ft. 44° 30' 15.2" N, 119° 36' 54.7" W.
 Uncertainty: 10 Datum: WGS 84. Source: GPS.

12075. *Holosteum umbellatum*
 Petals white; scattered. GPS: 44.327958, -119.894022.
 1 duplicate. Flowering.

Site #2: Feb 6, 2011 at 10:48:00
 Ben Legler.
 U.S.A., Washington, King County: South end of Ravenna Park, Seattle.
 Elev. 50 ft. 44° 31' 29.3" N, 119° 37' 14.6" W.
 Uncertainty: 15 Datum: WGS 84. Source: GPS.

12076. *Plantago coronopus*
 Cespitose in gravelly soil; locally common.
 GPS: 44.363923, -119.902373.
 2 duplicates. Flowering.

12077. *Soliva sessilis*
 Scattered in lawn. GPS: 44.363923, -119.902373.
 2 duplicates. Flowering.

Save Cancel Add Collection

Site # 1 **Project** Legler 2011

Date 2011-03-06 **Time** 9:32:00

Collector Ben Legler

Coll. With David Giblin, Peter Zika

Country U.S.A. **State** Washington **County** King

Locality
 Montlake Fill, Seattle.

Site Description
 Gravelly soil on edge of parking lot; with *Stellaria media*, *Poa annua*.

Elev. 30 - ft. **Lookup**

Degrees	Minutes	Seconds	Hem.
Lat. 44	30	15.2	N
Lon. 119	36	54.7	W

GPS

Zone **Easting** **Northing**

UTM

Collections Photos Sync Settings Help

Collections Database for Ben Legler

Locally Stored Records:

Collection Sites:	2
Specimen Collections:	4
Photographs:	0

Sync Status:

Synced Sites:	0 of 2
Synced Collections:	0 of 4
Synced Photos:	0 of 0

Sync

(Synchronizes locally stored records with the main database server. You must be connected to the internet.)

Collections Photos Sync Settings Help

Update Reference Lists

Set Default Values

Delete all Data



Data Entry Interface:

How well is this interface working?

- Core functionality used for the grant is operational.
- Additional features (label printing, etc.) are in development.
- Integrated OCR (optical character recognition) is in development.
- Core code base is still being refined & debugged.
(code: 800 KB uncompressed JavaScript, 100 KB PHP, and some CSS and graphics)

We are currently using this interface for five herbaria. Several other regional herbaria are considering using it independently from the Consortium.

At some point I'll release it as open-source code.

Online Search Interface:

Consortium of Pacific Northwest Herbaria

http://www.pnwherbaria.org/portal/search.php

Getting Started Latest Headlines

Consortium of Pacific Northwest Herbaria

Providing access to specimen data and digital resources from herbaria throughout Pacific Northwest North America

Home | Collections | Herbaria Info | PNW Resources | Documentation | About

PNW Herbaria Search Portal: Accessing 400,970 specimen records from 3 participating herbaria. Layout Vertical

Text Search Search results: 1390 matching records. Download: [txt](#), [xml](#), [kml](#), [rtf](#)

Search query: Genus = *Arctostaphylos*
Data provided by [OSC](#) (796 records), [UAM](#) (110 records), [UWBM](#) (484 records).

Search the collections: enter any combination of search terms into the fields below.

Perform new search
 Add to previous search

Search **Clear**

Family
Genus
Species
ssp./var./f.
Collector(s)
Collector #
Coll. Date Day Month Year
Country
State/Prov.
County
Locality
Elev. (ft.) -
Sort By
Return records per page.

Specimen map: 763 specimens displayed.

Map Satellite Terrain

Map data ©2008 Tele Atlas - [Terms of Use](#)

List **Details**

Sort: Scientific Name 501-600

501. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Klamath County: Crescent Lake, High Cascade Mts. L. Constance 9560, 17/1928. OSC-ORE65751	Ericaceae
502. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Josephine County: Lake Mt. Ridge, Siskiyou (Mts); Forest Reserve. J.R. Leach, Lilla Leach 28/1928. OSC-ORE65752	Ericaceae
503. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Curry or Josephine County: Pearsoll Peak. Lilla Leach 2928, 17/1930. OSC-ORE65753	Ericaceae
504. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Curry County: near top of Mt. Emily, near Chetco River. Roy C. Andrews 11594, 13/1929. OSC-ORE65754	Ericaceae
505. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Klamath County: woods near Anna Spring, Crater Lake Park. Lyle Wynd 2019, 22/1928. OSC-ORE65758	Ericaceae
506. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Klamath or Lake County: summit of Gearhart Mt. L. Constance 9559, 26/1928. OSC-ORE65759	Ericaceae
507. <i>Arctostaphylos nevadensis</i> A. Gray United States, Oregon, Curry County: above Bravel's, opposite Frank Moores, Chetco River. L.F. Henderson 10065, 2/1929. OSC-ORE65760	Ericaceae
508. <i>Arctostaphylos nevadensis</i> A. Gray	Ericaceae

Done

Online Search Interface:

CPNWH Database Login x Montana State University... x RM Herbarium Specimen... x

www.rmh.uwyo.edu/data/search.php

ROCKY MOUNTAIN Herbarium

Home About RM Collections Online Data Research Resources Blog

RM Herbarium Specimen Database

Browse **Search** Results

Accessing 680,064 specimen records. Last updated 4/2/2011.

Herbarium

Project Code (usually, the project lead's last name)

Accession # Barcode

Family

Genus Species ssp. or var.

Scientific Name

Collector Collector #

Collection Date Day Month Year

Country State County

Locality

Elev. (ft.) -

Restrict results to specimens that have images.

Sort By

Return records per page.

Map Search: Click "Edit Polygon" to modify the boundary of your polygon.

Map Satellite Terrain

Important: Using Map Search will restrict your results to specimens that have latitude and longitude coordinates. Search results may also take longer to display.

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University of Wyoming, Department of Botany, Dept. 3165
1000 E. University Ave., Laramie, WY 82071-3165. 1-307-766-2236.

Online Search Interface:

CPNWH Database Login | Montana State University... | RM Herbarium Specimen...

www.rmh.uwyo.edu/data/results.php?Polygon=43.53262%2C-109.703979%3B43.265206%2C-109.951172%3B43.004647%2C-109.951172%3B42.573319

ROCKY MOUNTAIN Herbarium

Home | About RM | Collections | Online Data | Research | Resources | Blog

RM Herbarium Specimen Database. Accessing 680,064 specimen records.

Browse | Search | **Results**

54 matching records. Query: Imaged = Y, Genus begins with Balsamorhiza, Polygon=((43.5326,-109.704),(43.2652,-109.9512),(43.0046,-109.9512),(42.5733,-109.4568),(42.4843,-109.2645),(42.4843,-108.7427),(42.6097,-108.5284),(43.1491,-108.9294),(43.5485,-109.5337),(43.5326,-109.704))

Download: [txt](#) [xml](#) [kml](#) [rtf](#)

Specimen map: 54 specimens displayed.

List	Details
Sort: Scientific Name	1-54
1. <i>Balsamorhiza</i> hybrid	Asteraceae
U.S.A., Wyoming, Fremont County: East Slope Wind River Range and Vicinity: south slope of Ed Young Mountain from Forest Road 352, ca 14.5-15.5 air mi S of Lander; ca 9.5-10.5 air mi N of Atlantic City.	
B. E. Nelson 64769, 6/7/2005	
with Rob Massatti & Rachel Newton	
Accession: USFS (unassigned), Barcode: USFS0025037	
2. <i>Balsamorhiza</i> hybrid	Asteraceae
U.S.A., Wyoming, Fremont County: East Slope Wind River Range and Vicinity: Peabody Ridge and into Placerita Gulch S of Forest Road 322, 1-1.5 air mi W of Miners Delight; ca 21 air mi S of Lander.	
B. E. Nelson 65077, 6/10/2005.	
Accession: USFS 842942, Barcode: USFS0026454	
3. <i>Balsamorhiza</i> hybrid	Asteraceae
U.S.A., Wyoming, Fremont County: East Slope Wind River Range and Vicinity: base of Indian Ridge, ca 9 air mi SW of Lander.	
Rob Massatti 1096, 6/25/2005.	
Accession: USFS 842943, Barcode: USFS0026455	
4. <i>Balsamorhiza</i> hybrid	Asteraceae
U.S.A., Wyoming, Fremont County: East Slope Wind River Range and Vicinity: southeast side of Fairfield Hill, ca 6 air mi SW of Lander.	
Rob Massatti 320, 6/13/2005.	



Some lessons learned:

- Everything seems to take more time than anticipated.
- Managing several dozen hourly personnel (mostly students) leads to challenges with data and image quality and consistency.
- Mission creep – try to stay focused on the goals and minimize distractions or desire to add in more.
- It's a collaborative grant. Each partner has autonomy and can diverge from the grant goals to use the money on unrelated projects.
- Developing a new database system isn't a trivial task! Maybe we should've tweaked an existing system to “make it do.”
- Image processing work flows are not fully automated like I had originally planned. Instead, I prioritized image quality and consistency.

An aerial photograph of a mountain valley. The landscape is rugged, with steep slopes covered in a mix of green forest and greyish-brown rocky or scree areas. A river winds through the valley floor. The sky is overcast, and there are patches of snow or ice on the higher elevations.

Questions?

Ben Legler
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