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Subject: Inventory of Asteraceae vouchers collected from properties related to National Park Service areas in the University of South Dakota Herbarium

Introduction

The National Park Service's (NPS) Inventory and Monitoring (I&M) Program is attempting to document the flora and fauna of all units of the National Park System (hereafter referred to as parks). Work is currently focused on completing inventories of five taxa, including vascular plants. Either publication in a scholarly work or collection of a specimen voucher must support documentation of a species. As there are many vouchers pre-existing for the parks, one part of this effort is to find and catalogue those existing vouchers. Documentation of a species occurrence is recorded in a web-based database program called NPSpecies. Herbaria whose holdings are kept in an electronic database format are being systematically searched and records are added to the NPSpecies database. However, those herbaria that are not in an electronic format may also have very valuable collections of interest to parks, but those records must be manually searched and entered into the program.

I was given the opportunity to assist in cataloging park specimen at one such herbarium, located at the University of South Dakota where I am a graduate student in botany. As I am also a regular government employee currently working as the Resource Management Specialist at Badlands National Park, the Northern Great Plains and Heartland Inventory and Monitoring networks agreed to pay my regular government salary for up to 18 hours per payperiod to inventory the USD Herbarium for park specimen during the Fall 2002 semester.

Project oversight was provided by Dan Licht, Northern Great Plains I&M Network Coordinator. Guidance was also provided by Mike Williams, Heartland I&M Network Data Manager. Technical assistance was provided by Simon Kingston, NPSpecies Developer.

Dr. Molly Nepokroeff of the University of South Dakota is the Herbarium Manager. She provided access to the facility and guidance in determining the organization of the herbarium and interpreting some of the terminology used on the specimen labels.

Methods

The Herbarium of the University of South Dakota is listed in "Index Herbariorum" and is identified by the code "SDU." The herbarium is divided into nonvascular plants, gymnosperms, angiosperm monocots, and angiosperm dicots. Within each division, it is grouped by specimen collected in South Dakota and specimen collected outside of South Dakota then arranged alphabetically by family and genera within each group. The herbarium is not computerized so all searches involve manually locating and reviewing each voucher.

Once a voucher was determined to be of interest to a park, all available data was recorded in NPSpecies version 1.7. Within this program, the "Voucher Profile" component for each specimen was completed as much as possible based on the data available on the label(s). By assigning a specimen to a park, the species name was automatically added to the "Park Species Profile" component but no additional information was added to that component because that is information that only the park can provide. All data were taken from the label(s) of each specimen. The most recent annotation or annotation label was used to complete the "Std Scientific Name" field. In some cases, this name differed from the name recorded on the original label, which was noted in the "Doc. Scientific Name" field. All scientific names beyond the original documented scientific name were noted in the "comments" field with determinavit information, if available. If the entered scientific name was not in the ITIS database, it was added as a new "species" with the authority information if it was available. All information on the label(s) was entered somewhere in the Voucher Profile. If the label was not a University of South Dakota Herbarium label but was preprinted, the label title and collector name was included under comments as it may assist in locating original field notes for some of these specimen that may be of interest to researchers.

The original voucher label was used to determine the location where the specimen was collected. If it said it was collected in a park, it was listed for that park and the "from park?" field was marked yes. In many cases, the specimen was not identified as being collected in a park but other label information, such as a geographic landmark, indicated that it might have been collected in a park or on lands that are now in a park. In those cases, the species was listed for that park and the "from park?" field was marked unknown.

There are approximately 40,000 vouchers housed in the herbarium including many large historic collections from the intermountain west. Based on the relatively large number of park specimen encountered in the first several genera inventoried, it became apparent that the 126 work hours planned for this project would not be enough to complete very much of the inventory. In consultation with Dan Licht and Mike Williams, it was decided to concentrate on the Asteraceae family, as a rather large family well represented in the Northern Great Plains and Heartland networks. In many ways, this effort served as a pilot project

to determine the time necessary to complete such an inventory in a herbarium that is not computerized and may help determine the usefulness and practicality of this effort.

Based on the dozens of specimen encountered in cataloging Asteraceae, there were likely hundreds of specimens collected in Yellowstone National Park by a collector named Howard Asmussen in 1954-55. Because these specimen were so numerous, outside the networks of interest, and their data entry would substantially slow the progress of this project, the project managers agreed that the Asmussen collections would no longer be included in this effort. The last Asmussen specimen recorded was *Arnica mollis* (Asteraceae).

A digital camera was used to photograph vouchers, although a few vouchers were missed due to operator or camera error. The images were cropped and renamed using Kodak Picture Software then organized by park. The naming convention is the four letter park code followed by the USD voucher number. All images are in jpg format and are stored in a stand-alone file.

Findings

Approximately 5000 Asteraceae specimens were reviewed, representing about 13% of the total collection housed in the University of South Dakota Herbarium. Of this 5000, 331 specimen were entered in NPSpecies based on recorded or possible affiliation with a park. Results are summarized in Table 1. Below are some general observations regarding the types of collections encountered while conducting this inventory. The purpose of providing this observations is to help understand what kinds of collections may be found in similar regional herbaria and what value they may have to the parks.

Large, recent collections:

Although most of the larger, more recent collections are known to the National Park Service and have probably been catalogued in ANCS, not all of the label information has been recorded in ANCS. For example, I know that at least some of the several hundred specimen collected by Lester E. Lindstrom in Badlands National Monument in the 1950s are catalogued in ANCS, but I know that the ANCS records usually did not include location or habitat information. Furthermore, ANCS files have not yet been included in NPSpecies so it is not possible to systematically determine whether a given specimen is in ANCS, if the record is complete, or if it will eventually be added to NPSpecies. After discussion with the NGP I&M Coordinator, it was decided to treat all park or potential park specimen the same way. That is, all of the label information was recorded in the Voucher Profile as described above regardless of whether it was already recorded in ANCS.

Table 1. Summary of catalogued vouchers from Northern Great Plains parks

Park unit	# Vouchers catalogued
Northern Great Plains Network	
AGFO – Agate Fossil Beds National Monument, Nebraska	3
BADL – Badlands National Park, South Dakota	163
DETO – Devils Tower National Monument, Wyoming	1
JECA – Jewel Cave National Monument, South Dakota	5
MNRR – Missouri National Recreation River, S. Dakota & Neb.	66
MORU – Mount Rushmore National Memorial, South Dakota	3
NIOB – Niobrara National Scenic Riverway, Nebraska	4
SCBL – Scotts Bluff National Monument, Nebraska	4
THRO – Theodore Roosevelt National Park, North Dakota	7
WICA – Wind Cave National Park, South Dakota	3
<i>subtotal</i>	259
Parks outside of the Northern Great Plains Network	
ARCH – Arches National Park, Utah	12
BIBE – Big Bend National Park, Texas	2
BRCA – Bryce Canyon National Park, Utah	1
CARE – Capital Reef National Park, Utah	1
GLAC – Glacier National Park, Montana	5
GRCA – Grand Canyon National Park, Arizona	3
GRTE – Grand Teton National Park, Wyoming	2
GUIS – Gulf Islands National Seashore, Florida & Mississippi	1
MEVE – Mesa Verde National Park, Colorado	4
NABR – Natural Bridges National Monument, Utah	1
ORPI – Organ Pipe Cactus National Park, Arizona	1
WACA – Walnut Canyon National Monument, Arizona	7
WUPA – Wupatki National Monument, Arizona	3
YELL – Yellowstone National Park, Wyoming & Montana	29
<i>Subtotal</i>	72
<i>Total</i>	331

Student collections:

It appears that many students from the University of South Dakota have collected vouchers that are now held in the herbarium. Additionally other specimen from other herbaria, most notably teachers colleges, has been collected by students and are now held in the herbarium. Generally, these specimen labels include less documentation than is found on the “professional” collections, particularly with regard to documenting habitat characteristics or exact locations. As would be expected, there were many specimen collected from the vicinity of the University, including along the Missouri River. These Missouri River collections may be of interest to Missouri National Recreation River and so were entered into NPSpecies, however, without exact location information it is impossible to determine positively if they were collected within the lands administered by the park.

Historic collections:

Of particular interest and some difficulty were the “historic” collections, many of which were collected before parks were established or the park boundaries were different from the present. Based on my experiences as a Resource Management Specialist in the National Park Service, I thought that these collections were most likely to be unknown to the parks and may be of the most use in determining “pre-park” floral composition, species persistence, or weed invasions. Because of the potential value of these collections, I gave extra attention and effort to recording the specimen in NPSpecies that could be associated with a park and I made lists of locations or collections that may be of interest to the parks.

Examples of historic specimen would be the extensive collections of the South Dakota State Geological and Biological Survey Collections. Based on collectors' numbers, It appears that thousands of specimens were systematically collected throughout the state, first by SS Visher and later by WH Over during the 1900s and 1910s. Although township and range locations were not recorded, most labels did indicate geographic landmarks and county name. As the counties of South Dakota were rearranged several times from about 1890 – 1920, this caused some difficulties in determining if the landmark noted on the label was the same geographic feature that now exists in a park. For example, there were many records for “Cedar Pass” in Stanley County. After consulting some historic county maps (Gilman 1908) and reviewing place names (Workers 1941), with help provided by the South Dakota Geographic Survey and the Badlands National Park librarian, I determined that this Cedar Pass is probably the same Cedar Pass that is now located in Jackson County in Badlands National Park. Similarly, I determined that specimen collected at “Sheep Mountain Table” in

Washington County (Rand McNally 1895) probably referred to the same Sheep Mountain Table that is now located in Pennington County in Badlands National Park. These determination and its reason is noted in the comments section of each voucher.

Over the years, it is apparent that USD became the repository for specimen from other university or private herbaria. Table 2 is a partial list of some of these herbaria that were encountered in reviewing Asteraceae specimen of interest to national parks.

Table 2. Some of the collections assimilated into the USD Herbarium that include park specimen. Note geographic area of the collection is indicated in brackets if its not discernable from the title of the collection.

Herbarium / Collection	Collector(s)	Dates
Herbarium of JF Brenckle, Kulm, ND	JF Brenckle F. Bergman	1910s
South Dakota State Geol. And Biol. Survey	SS Visher WH Over	1900-1920
Herbarium of Black Hills Teachers College, Spearfish, SD	FL Bennett	1910s
McIntosh Collection [southwestern states]	McIntosh	1930s
Yellowstone Park Tour [Northern Great Plains and Yellowstone Country]	OA Stevens JF Brenckle	Late 1930s
Herbarium of JF Brenckle, Mellette, SD	JF Brenckle	Late 1930s
Herbarium of John Mack Winter [western Nebraska and western S. Dakota]	JM Winter C Winter	1930s
Northwestern Collection [northern Rockies and Pacific Northwest]	JF Brenckle LH Shinnars	Early 1941
Herbarium of Brigham Young University, Provo, Utah [Utah and Colorado Plateau]	SL Welsh and others	1960s
Herbarium of he Northeast Louisiana State College, Monroe, LA	RD Thomas	1960s
Herbarium of Arizona State University	W Dullas	1960s
Herbarium of Chadron State College, Chadron, NE	R Weedon	1968

Of particular relevance to the NPS Intermountain Region are the vouchers transferred from Brigham Young University. There are many vouchers from parks on the Colorado Plateau that were apparently part of an organized inventory effort in the 1960s. If the label stated it was collected in a park, it was recorded in NPSpecies with the "in park?" field marked yes. As I am familiar with some of the Intermountain parks, in some cases I was able to use the geographic landmark description (ie. South Rim of the Grand Canyon) to determine that a voucher was likely to have been collected in a park and recorded that specimen in

NPSpecies with the “in park?” field marked unknown. However, there were many more specimen that could have been from parks but were not identified as such and I was unfamiliar with the landmarks, particularly in southwestern Utah.

As I didn't have location coordinates for the parks not located in Northern Great Plains or Heartland Networks, and I am not familiar with geographic landmarks of all the parks in the system, there could be many more vouchers that were not catalogued. Here is a list of specimen locations that were encountered more than once, were not recorded in NPSpecies, but may be of interest to other parks.

- San Juan County, Utah
- Coconino County, Arizona
- Flathead County, Montana
- Yukon River, Alaska
- Gallatin County, Montana
- Iron County, Utah
- Virgin River, Washington County, Utah
- Wayne County, Utah
- “near” Tucson, Pima County, Utah
- Lake Powell, Kane County, Utah
- John Day Ferry, Wasco County, Oregon
- Cumberland Falls, Whitley County, Kentucky
- Bellingham, Whatcom County, Washington
- Grand Coulee, Grant County, Washington
- Mojave Desert, Inyo County, California

Incidental collections:

In some cases, there were relatively recent collections from the 1980s or 1990s that were clearly collected from a park, sometimes even recorded on standard NPS herbarium labels, but there was no indication that the park was aware of the collection. These were entered in NPSpecies as well, but may be worth parks following up with those same collectors to determine if they are still collecting in the parks and advise of the NPS policy and procedures for Scientific Research and Collecting Permits.

Recommendations

Based on this inventory of Asteraceae specimen, I think it would be useful to continue this project. I think this is the most likely way to find the historic collections from parks. As parks move into the monitoring phase of the I&M effort, knowing something about the historic flora could be useful in determining “baselines” and current trends.

Although I'm not a contracting officer or personnel officer, I see three possible ways to continue this project. Each approach has pros and cons.

- 1) Using the Cooperative Ecosystem Studies Unit (CESU), transfer funds to the University to establish a work-study position to continue the inventory and data entry.
 - Pros: Once the paperwork is in place, it could easily be a recurring position and would be relatively inexpensive because the hourly wage is low. Also the NPS would not have to provide day-to-day administrative support (ie. payroll) or supervision.
 - Cons: The NPS would have no control over the selection for the position and may in fact have trouble filling the position some semesters. There would also be high turnover, forcing frequent training and potentially inconsistencies in the data entry. It would also require a substantial amount of cooperation from the University of South Dakota and from the CESU, thus there would likely be some overhead costs to the project. Termination of the position upon completion of the project or lack of funds may be complicated or require substantial advance notice.

- 2) Establish one or more GS-4 or GS-5 Student Temporary Employment Program position(s) to continue the cataloging. This position could either report to the I&M Coordinator, the regional office, or to a park (most reasonably Missouri National Recreation River). I would strongly recommend that the STEP position be limited to USD students, as this would resolve a lot of the access issues.
 - Pros: The NPS would be able to recruit, select, and train someone for this position. As pay would be higher and the work hours more flexible compared to other on-campus jobs, it may be possible to retain the same employee for more than one semester thus resulting in more consistent data entry. There would also be no overhead, although some sort of general agreement should probably be established with the University. As a STEP position, it could be easily terminated when the project was completed or funds were no longer available.
 - Cons: The NPS would be responsible for day to day administrative support and supervision of the position, thus requiring time from a supervisor, payroll, and personnel. Remote supervision could be especially challenging. There would need to be a position established and funds available to pay for it. The NPS would also need to provide equipment for the position, namely a laptop computer. Based on the time it took to complete 13% of the collection, one position working 10 hours per week would take about 8 semesters to finish the job. Of course, it may be possible to hire two positions working 10 hours per week or find students willing to work more hours per week and over holidays and summers, thus getting the job done more quickly.

- 3) Compete and issue a contract for the work. Some sort of legal instrument would be needed to allow access to the University.

- Pros: The job gets done quickly and with minimal involvement by the NPS.
- Cons: This approach would be substantially more expensive. There would also be fewer opportunities to make judgement calls that affect the quantity of work to be done.

References

Gilman, D.C., ed. Map: South Dakota in 1908. New International Encyclopedia, Volume XIV. Dodd, Mead, & Company, New York.

Rand, McNally, and Company. Map: South Dakota in 1895.

Workers of the Writers Program of the Work Projects Administration in the State of South Dakota. 1941. Book: South Dakota Place Names. Sponsored by the Department of English, University of South Dakota. Published by the University of South Dakota, Vermillion, SD.

Electronic Enclosures

NPSpecies datafile

JPG photo file