

No. 81 February 2019

Iris

The Alberta Native Plant Council Newsletter



In This Issue

Alberta Conservation Information Management System Needs Help.....	1
Stewardship of Nisku Prairie	3
A Focus on Change: 30th Annual Workshop	5
Botanizing at J.J. Collett Natural Area	6
News and Events.....	7, 16
Bison and Slender Mouse-Ear-Cress.....	8
Help Us Monitor Bees in AB	11
Alberta PlantWatch: Nature's Calendar	12
Northern Bladderwort in Montana	14

Look for more information on the ANPC's website.
www.anpc.ab.ca



Cover photo: Janine Lemire
Beaver Mines Lake, Alberta.

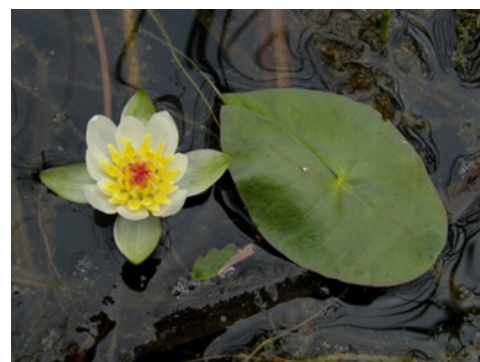
Alberta's Conservation Data Centre (ACIMS) Needs Help

Linda Kershaw

Most Canadians aren't aware of the national network of Conservation Data Centres (CDCs) that operate across our vast country under the umbrella of NatureServe Canada. Each province or territory has its own CDC, with the exception of Atlantic Canada, which encompasses New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland/Labrador. Most CDCs (i.e., Atlantic Canada, British Columbia, Manitoba, Northwest Territories, Nunavut, Saskatchewan and Yukon) go by the title Conservation Data Centre, but Ontario's is the Ontario Natural Heritage Information Centre (ONHIC) and Alberta's is called the Alberta Conservation Information Management System (ACIMS).

These centres provide many important services for anyone interested in the environment, from avid naturalists to researchers, developers, land use managers and environmental consultants. CDCs do biological inventories, keep track of our rare species and rare ecosystems and analyze/

review environmental data and reports. However, their most important role is probably that of providing reliable, up-to-date scientific information on the great number of plants, animals and ecological communities in their region. This includes sorting through the confusing collection of scientific and common names for thousands of species (elements) so we can all apply the same name to the same thing. In addition to sorting out names (classification), CDCs also determine how rare



This tiny white waterlily, *Nymphaea tetragona*, is a rare species tracked by ACIMS and in need of protection.

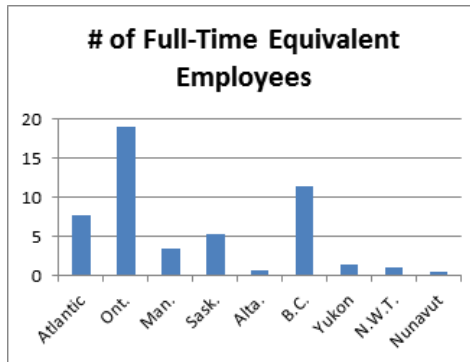
Linda Kershaw

ACIMS Needs Help, from page 1

or common each element is (this can change with each information update), and whether each is native or introduced. This information is invaluable, and it's also available to everyone (check out the lists at www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/download-data/). The data provided by CDCs is essential for identifying, mapping and understanding the biodiversity of our vast and varied landscape. Without it, we can't evaluate environmental impact assessments or identify sensitive areas, rare species and unique ecosystems. The data in our CDC provides a common foundation on which all of these assessments can be based.

So, with thousands of species to keep records for and hundreds of environmental reports to review each year, you may wonder how many biologists, ecologists, taxonomists and other specialists are employed in Alberta to deal with the mountain of data that needs to be assessed and processed each year. The answer is embarrassing and alarming. At

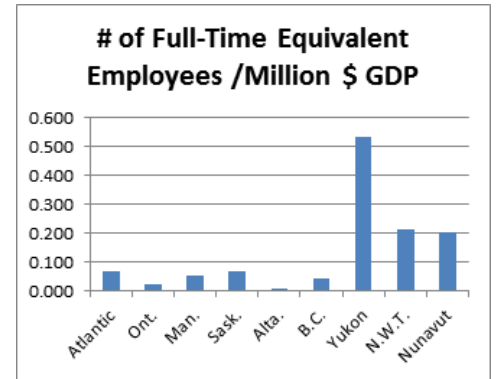
present, there is less than one full-time position / full-time equivalent (FTE) allocated for this work in Alberta. Although several people are involved in ACIMS work, this is only a small part of their jobs, and the total time allocated for everyone adds up to less than a single full-time position. Of all of Canada's CDCs, the only one with less support is that of Nunavut.



This looks pretty sad, but let's look at it another way. Alberta's population is about 100 times larger than that of Nunavut, and we are a relatively rich province. On a per capita basis, our gross domestic product (GDP) is quite a bit higher than that of other regions. So, let's think of it in terms of the dollars available. In 2016, GDP ranged from almost \$800 million for Ontario

to less than \$2.5 million for Nunavut. How many FTEs does each region support for every \$1,000,000 GDP?

Alberta's bar is even harder to see in the second graph, because it represents



only 0.002 FTEs. The next lowest is Ontario with 0.024 FTEs, ten times as many as Alberta. Over the past 10-15 years Alberta's CDC (previously called ANHIC, and now ACIMS) has gradually faded away and almost disappeared. How can the equivalent of one part-time person be expected to accomplish the work of 5-10 full-time employees? The fact that we have any current information available at all is amazing, and it speaks volumes for the hard work and dedication of the few remaining staff. Let's give them all the support we can, and let the government know that we have to reverse this trend! A good start would be a letter to Minister of Environment and Parks (the department that currently houses ACIMS) at:

Honorable Shannon Phillips
Office of the Minister
Environment and Parks
208 Legislature Building
10800 - 97 Avenue
Edmonton, AB T5K 2B6

Conservation and environmental protection depend on reliable, up-to-date ecological data that is available to everyone. This requires an adequate number of qualified people working on our behalf in the public service. We no longer have this. Perhaps the current government can get things back on track. ♦



Dragon's-mouth orchid (*Arethusa bulbosa*), a beautiful rare wildflower tracked by ACIMS

Ongoing Stewardship of the Nisku Prairie

Patsy Cotterill, Stewardship Coordinator

Nisku Prairie was the scene of some active grassland management once again in 2017. The Nisku Native Prairie Park Reserve is a 31-acre remnant of aspen parkland located south of Edmonton, east of the Nisku Industrial Area and south of Highway 625. Protected as a municipal reserve by Leduc County since 1994, it is one of ANPC's environmental stewardship areas. Throughout the 2017 growing season, 14 dedicated Nisku Prairie volunteers logged 147.50 hours during 17 individual site visits.

This was an excellent year for grasses in the Prairie, presumably due to high precipitation during the winter and spring. Sweet grass (*Anthoxanthum nitens*) was particularly abundant, as was intermediate oatgrass (*Danthonia intermedia*), and there were an unusual number of patches of northern reedgrass (*Calamagrostis stricta* ssp. *inexpansa*), also suggestive of adequate moisture. Plains rough fescue (*Festuca hallii*), a sporadic flowerer, did flower this year, and we were able to collect seed. The population of provincially uncommon Canada ricegrass (*Piptatheropsis canadensis*) is maintaining itself in the centre field. Spike muhly grass (*Muhlenbergia glomerata*) was less evident this year, although we are propagating this from the Prairie as it is rhizomatous and hence (theoretically) a good fill-in species on bare ground.

Northern bedstraw (*Galium boreale*) was particularly prominent this year and is a good natural colonizer of bare patches within the Prairie. The beautiful white camas (*Anticlea elegans*) hangs on as one or two plants only, and it is our impression that populations of prairie crocus (*Pulsatilla patens*) are lower than they were a few years ago.

During our May visits to the Prairie, we observed with some dismay that several of our planting beds were heavily disturbed with diggings, and there were considerable quantities of scat in them. A wildlife expert informed us that coyotes use such disturbed areas to mark their territories, so we don't need to blame local dogs and their owners!

As in previous years, we concentrated on the rehabilitation of a disturbed area parallel to the east (roadside) fence. Perennial and annual weeds were removed from planted beds and replaced with home-grown native species. In most cases, this native stock was courtesy of the Edmonton Native Plant Society as the previous McLeod Creek Farm salvage site was destroyed by development early in 2017.

Rocky Mountain fescue (*Festuca saximontana*) grass was previously sown on the north side of the south field to provide a quick groundcover to deter weeds. By 2017, this tactic appears to



Volunteers enjoy a break from their work at Nisku Native Prairie Park Reserve.



have been successful and weeds were few. Although this does not represent the native grassland community (we plan to interplant with natives later to improve diversity), its success as a groundcover prompted us to try further grass sowings in other small patches. We used a native grass seed mix supplied free by Innotech, and by late in the season the wheatgrasses had shown good growth. As usual we collected seeds that are high priority for propagation; these seeds are grown out by Edmonton Native Plant Society volunteers for later transplanting in Nisku Prairie.



From left: Giant hyssop (*Agastache foeniculum*); wild bergamot (*Monarda fistulosa*); white camas (*Anticlea elegans*); meadow blazingstar (*Liatrus ligulistylis*); yarrow (*Achillea millefolium*) and goldenrod (*Solidago* sp.); northern bedstraw (*Galium boreale*) and harebell (*Campanula rotundifolia*); bee on goldenrod

See Nisku Prairie, page 4

Nisku Prairie, from page 3

Other changes implemented in 2017 include:

- Using grass clippings as a mulch on replanted beds both to retain moisture and to deter weed growth; it seemed to help.
- Weed-whacking the trail in the south field to create an easier walking trail. We better defined the trail giving access to the various planted beds in the disturbed area using wood chips.

On June 24, the Edmonton Nature Club (ENC) organized a field trip to the Prairie, which nine people attended. During this trip a new species, spotted coralroot (*Corallorhiza maculata*), found in the southwest corner aspen woods, was added to our plant species list. The expert birders from the ENC also compiled a bird list of 27 species. Some of the more common birds included house wrens (nesting), cedar waxwings and American goldfinches. A sora and several LeConte's sparrows were spotted in the vicinity of Blackmud Creek. Clay-colored and savannah sparrows were common, as would be expected in grassland habitat.

Much of the fieldwork planned in 2018 will continue to focus on revegetating the beds in disturbed areas. This will involve weeding and transplanting native species grown elsewhere from



Patsy Cotterill

seed collected in the Prairie as well as some sowing of native commercial (or prairie-collected) grass seed. Smooth brome (*Bromus inermis*) is spreading in some areas, particularly down the south boundary of the south field. Mowing is planned in these areas to control its spread.

Our volunteers look forward to further adventures in restoration and enjoyment of the Prairie in the 2018 season! If you are interested in assisting with stewardship in Nisku Prairie or any of ANPC's other stewardship areas, please get in contact with the ANPC at info@anpc.ab.ca. ♦



Patsy Cotterill

Above: Volunteer examines a plot planted a year earlier and disturbed by coyote activity over the winter. One of the unexpected hazards of restoration projects! (Buildings in the background are on an adjacent acreage.)

Left: Plains rough fescue (*Festuca hallii*) had a good flowering year in 2017.

Below: Northern bedstraw (*Galium boreale*) was abundant in 2017 and is a good colonizer of bare spots.



Patsy Cotterill



Social Media Update

The ANPC started its Facebook page two years ago now and has seen a tremendous amount of activity since. From likes

and follows to questions and inquiries, it has been a great way to get the message of the ANPC out there to a wider audience.

At the time of writing, there are currently 570 people who are following the page and who receive all of the updates via Facebook. We have also seen a ton of great content posted to the page by the community, which I think is the best part of the page. It is a great way to share with others all of the beautiful and unique

native plants that we find in the province. I think in this way the Facebook page can be a great extension of the ANPC's mission to share knowledge and support conservation all over our beautiful province.

~ Cam Johnston

Nature Alberta Magazine

The Alberta Native Plant Council is a member club of Nature Alberta. As such, all ANPC members in good standing are eligible to receive the electronic version of the *Nature Alberta* magazine. If you would like to be included in this special offer, please send along an email expressing your interest to info@naturealberta.ca.

Revising the Rare Vascular Plants of Alberta – Photos Needed

The *Rare Vascular Plants of Alberta* book is in the process of being brought up to date with a second edition. The book committee is still seeking photographs for a selection of species.

A list of species requiring photographs, instructions for photo submission and a photo release form can be found on the ANPC website at http://anpc.ab.ca/?page_id=667. This is your opportunity to get your botanical photographs in print! We look forward to your contributions! If you have questions please email: ABRRarePlantBook@gmail.com.

A Focus on Change: The 30th Annual ANPC Workshop

Joelyn Kozar, 2017 Workshop Committee Co-chair

The ANPC hosted its first annual workshop on February 13, 1988. Twenty-nine years later, ANPC reflected on change for the 30th ANPC Workshop with a theme of Biodiversity in Alberta's Changing Landscape. Hosted on April 29, 2017, in Ponoka, Alberta, the program was diverse yet cohesive, interesting and instructive.

During the first presentation, it became clear that grasping the complexities of biodiversity can be daunting, but that it is an important tool for government, conservation and more. As the day progressed, we learned about several initiatives at different levels of government. From a provincial level, we heard from the Alberta Biodiversity Monitoring Institute whose mission it is to track the changes in Alberta's wildlife from border to border, and they mean that! And at the municipal level, the City of Calgary's many initiatives to promote biodiversity, including their 10-year strategic plan "Our BiodiverCity," were discussed. At the national level, we discovered the Blood Tribe Land Management Environmental Protection Division, and the Kainai Ecosystem Protection Association (KEPA) that is striving to adapt and learn to efficiently manage the Blood Tribe's ecosystems through partnerships and furthering education. We also learned about the struggles of preventing the spread of invasive species, including working in overlapping jurisdictions, and the rewards of acting early. Other insights covered the challenges, knowledge gained, and rewards of many other ongoing initiatives and research in the province. One of these initiatives was the efforts of the Alberta Riparian Habitat Management Society ("Cows and Fish") to collaborate with landowners with a goal of healthier riparian areas. It proved to be a packed day as there is much to be said about biodiversity!

In 2010, ANPC was the recipient of the Emerald Award from the Alberta Emerald Foundation. To continue the legacy, the award is passed along each year from the previous volunteer Recipient of the Year to another passionate volunteer of the ANPC. At the end of the workshop, Dana Bush presented the award to Derek Johnson for his efforts in conserving and promoting knowledge of Alberta's native plant species and their habitats. Congratulations Derek!

To end a spectacular day, the usual affair of dinner and a keynote speaker was swapped for dinner and botany trivia. There were 13 presenters during the day, after all! There were pictures of plant species to identify, questions about ANPC's history, and some plays on words. In the end, the winning team, composed of many of our long-standing ANPC members, showed us that wisdom really does come with experience, and perhaps so does a little sass. With trivia finished, the last of the participants made their way home with what I would like to think was an overall tired but pleased demeanour from the day.

Many thanks were passed along during the day, but here is another thank you to all the volunteers who helped make this workshop possible. Planning for the ANPC workshop starts as early as September; if you would like to volunteer for the upcoming 2019 workshop please contact: info@anpc.ab.ca. ♦



ALBERTA
Native Plant
COUNCIL

Alberta Native Plant Council

Garneau P.O. 52099
Edmonton, AB T6G 2T5

website: www.anpc.ab.ca
email: info@anpc.ab.ca

President

Eri Hiraga
president@anpc.ab.ca

Vice-President

Laurie Hamilton
laurie@zanshinenvironmental.com

Secretary

Jennifer Muir
secretary@anpc.ab.ca

Treasurer

Julie Figures
treasurer@anpc.ab.ca

Directors

Marsha Hayward (**Northern**)
wildloonart@mcsnet.ca
Kristen Andersen (**Central**)
bluestems@hotmail.com
Christina Metke (**Southern**)
christina.metke@gmail.com
Kim MacKenzie (**Nature Alberta**)
kmackenzie@goldpaw.ca
Trish Hiley (**Communications**)
communications@anpc.ab.ca

Membership Secretary

Kelly Ostermann
membership@anpc.ab.ca

Conservation Action

Laurie Hamilton
laurie@zanshinenvironmental.com

Information and Education/Outreach

Kristen Andersen
bluestems@hotmail.com

Rare Plants

Vacant

Reclamation and Restoration

Vacant

Webmaster

Carole Dodd
webmaster@anpc.ab.ca

Social Media

Cam Johnson
cam@makoj.com

Newsletter Committee

Dana Bush
Patsy Cotterill
Alfred Falk
Eri Hiraga
Patricia McIsaac
Jen Muir
Kelly Ostermann
Mélanie Violette
And many volunteer writers ...

Bountiful Botanizing at the J.J. Collett Provincial Natural Area



Jacqueline Redburn

The weather was great for the ANPC fieldtrip to J.J. Collett Provincial Natural Area on April 30, 2017, which followed the annual workshop.

We were fortunate again to have Dr. Charley Bird lead our excursion, providing information about the J.J. Collett Provincial Natural Area and the local flora and fauna.

The group of 17 ANPC members made their way through aspen stands, shrublands, patches of grassland, and along a few wetlands. Lichens, mosses and fungi provided interest for the group with spring foliage allowing for easy observations.

Some vascular plants were starting to flower, such as prairie crocus and hazelnut, while others were leafing out. With songbirds singing, a few wood frogs calling, and early aspen leafroller moths fluttering about, a great walk was enjoyed by the group.

A special thank you to Charley for sharing his local knowledge and leading our enjoyable walk, and to those members who attended and provided their expertise and enthusiasm! ♦



Charles Bird



Charles Bird



Jacqueline Redburn



Alan Dodd



Alan Dodd



Alan Dodd



Charles Bird



Alan Dodd



ALBERTA
Native Plant
COUNCIL

Alternate for Endangered Species Conservation Committee

ANPC participates as a stakeholder on the Endangered Species Conservation Committee. The ESCC meets three to four times annually, and meetings last one to two days. ESCC meetings are held in Edmonton and Calgary (they alternate).

ANPC is currently looking for an alternate to represent us on this committee. The role of the alternate is to attend meetings when the primary representative is not able to and to provide support to the primary as needed. If you are interested in putting your name forward as alternate representative, please contact us at info@anpc.ab.ca, and we can provide more information on this opportunity.

ANPC Volunteers Needed

Volunteer board positions:

- Volunteer Coordinator
- Information and Education Committee Chair
- Rare Plant Committee Chair
- Newsletter Committee Chair

Committee membership:

- Rare plants committee members
- Conservation action committee members
- Education and outreach committee members and short-term volunteers
- Reclamation and horticulture committee members
- Newsletter committee members
- Fundraising policy committee members
- Privacy policy committee members

If you'd like to be a little more involved in ANPC, this might be a good opportunity for you. Please contact communications@anpc.ab.ca (SUBJECT: ANPC Volunteer). She'll put you in touch with the right person to give you more information.

News and Events

ANPC Rare Vascular Plants Committee

The rare vascular plants committee has spent the last year concentrating on writing new species descriptions and preparing updates for the existing species accounts. We had 27 wonderful volunteers agree to help write species descriptions. Assignments for most of the new species were distributed, and 52 new species descriptions have been received so far (we expect the remainder to come in after the field season as most of our volunteers are professional botanists).

Of the species in the original book, 49 have been re-examined for phenological/habitat changes (species account updates). We still have a few species descriptions outstanding (e.g., 2 Onagraceae species, 2 Portulacaceae species, 3 Isoetaceae species, 2 Fabaceae species, 1 Polygonaceae species, 1 Hydrocharitaceae species, 1 Campanulaceae species). If you are interested in volunteering to write up any of these species, please contact us at ABRarePlantBook@gmail.com.

The next step in the process is to get the species descriptions reviewed. Internally, we have reviewed 41 species

descriptions, and two species have been reviewed and edited by a taxonomic expert. This project initiated the development of a new ANPC policy that will provide a process for us to engage taxonomic experts to review the species content. With this new policy in place, we are positioned to submit new species descriptions to taxonomic experts this fall/winter.

The complete set of North American distribution maps have been compiled. Permission to use the *Flora of North America* illustrations has also been obtained, and we are working on permissions to use illustrations from the *Illustrated Flora of BC*.

To complete our collection of photos that illustrate the rare plant species descriptions, we have a "wish list" of photos on the ANPC website as well as instructions for photograph submission (<http://anpc.ab.ca/wp-content/uploads/2015/01/Instructions-for-Photographers-2017-11-22.pdf>). Please consider providing photographs you have of identified rare plants that are on the list. ♦

Committees Need Members

- The ANPC has created an ad hoc committee to create a fundraising policy, with Kim MacKenzie as chair. This is a call-out for volunteers, especially those with not-for-profit fundraising experience and knowledge of the intricacies of the *Alberta Charitable Fundraising Act*. Please contact kim.mack@goldpaw.ca to volunteer.
- The ANPC has created an ad hoc committee to create a privacy policy, with Julie Figures as chair. This is a call-out for volunteers to join this temporary privacy policy committee, particularly those familiar with the

Personal Information Protection Act (PIPA). Please contact ANPC.

secretary@gmail.com to volunteer.

- The ANPC is seeking volunteers for the Rare Plants Committee to help with calendar fundraising and northern publications. Please contact ANPC. secretary@gmail.com to volunteer.

2019 Workshop Committee

The ANPC workshop committee is looking for extra hands to help out with planning for our annual workshop. We're looking to fill various roles, including committee chair, registration, program planning, and more! Please email president@anpc.ab.ca for more information or to sign up.

Plains Bison and Slender Mouse-Ear-Cress (*Halimolobos virgata*): Disturbance and Dispersal

Cheryl Hendrickson

Some of the puzzling characteristics of a threatened plant species — notably its widely disjunct (separated geographically) populations in the mixed-grass prairie and its “large, inexplicable population shifts” (Environment Canada n.d.) — may be explained by the absence of a keystone species, the once nearly extirpated plains bison (*Bison bison*).

Slender mouse-ear-cress (*Halimolobos virgata*) is a Schedule 1 Threatened species under the *Species at Risk Act*. In Canada, it is at the northern part of its range in southeast Alberta and southwest Saskatchewan in the dry mixed-grass prairie (Environment Canada 2012, Alberta 2015).

Its occurrence in Alberta is characterized by 16 disjunct populations ranging as far north as the 1915 historical record at Rosedale near Drumheller; the next closest “fail to find” occurrence (not found despite search by an experienced observer at a time and under appropriate conditions) approximately 75 km east between Brooks and the Red Deer River; approximately 100 km further east, 11 extant (remaining), and “fail to find” occurrences clustered north of Canadian Forces Base (CFB) Suffield; and the remaining three along the South Saskatchewan River in the National Wildlife Area from the northeast corner of CFB Suffield (extirpated, “fail to find” subpopulations) south approximately 100 km to its extirpated 1884 Medicine Hat location (Alberta 2015).

The most extreme example of the “large inexplicable population shifts” is at Remount Pasture north of CFB Suffield where populations went from 398 in 2004 to zero six years later. Eight other examples exist of more modest numbers declining to zero over a four to six year



Lorne Fitch

Researcher working in grassland near Empress, AB, where slender mouse-ear-cress has been found.

survey period, resulting in the same declining trend being observed for nine of the 16 identified subpopulations in Alberta (Alberta 2015).

The puzzle of plummeting populations

It is plausible that the distribution patterns and plummeting subpopulations are the symptom of an absent dispersal vector and disturbance agent: the plains bison. In his Iowa State University 2015 thesis, *Bison-mediated seed dispersal in a tallgrass prairie reconstruction*, Peter G. Eyheralde shows how the mechanisms of epizoochory (the external transport of seeds on hair, fur, feathers, feet) and endozoochory (the internal transport of seeds through dung) function in existing bison herds. From the dynamics of existing herds, we can begin to picture how their absence has impacted the distribution and population dynamics of slender mouse-ear-cress in Alberta.

Herd dynamics at the local level influence the type of seed picked up. Bison of all ages and both sexes prefer graminoids over forbs. Cows and calves under the age of three herd together until the rut, when small groups aggregate and bulls join them. After the rut, the males separate again choosing an abundance of lower quality grasses, while pregnant females select higher quality forage, such as new growth on recovering burns. Older bulls who do not participate in the rut are solitary. All of these patterns suggest that mechanisms of seed transport vary by sex and age, both in where animals graze, the propagules they carry externally and internally, and where they are finally deposited through dung, hair shedding or sloughing of the seeds. Seeds collected from bison hair and dung show the animals to be generalized seed vectors for a variety of species with a varied seed morphology (in Eyheralde 2015).

See **Bison & Slender Mouse-Ear-Cress**, page 9

Bison & Slender Mouse-Ear-Cress, from page 8

The Alberta Draft Recovery Plan (2015) has identified the absence of bison and differences in their grazing and wallowing habits from domestic cattle as contributors to the population decline of slender mouse-ear cress. Specifically, bison wallows create(d) a favourable disturbance for forbs that have difficulty competing in mature grassland (in Eyheralde 2015). This type of wallowing behaviour creates favourable microsites for germination, and grazing mitigates grass competition. This reaction to changed grazing regimes would make slender mouse-ear-cress an “increaser” under conventional rangeland management terms: a plant that increases with grazing pressure. Conversely, it is possible that the dramatic crash in some subpopulations from hundreds to zero (making it a “decreaser” in rangeland management terms) can be explained over time and space by an absence of wallowing or similar behaviour that creates new habitat for germination, and to a lesser extent, by an absence of grazing.

Within subpopulations, the distribution is characterized as one to many in



Hairy stem of slender mouse-ear-cress
(*Halimolobos virgata*)

scattered patches (Smith, pers. com. 2017). In the absence of more frequent and intense disturbance caused by bison activity, the best conditions for germination in a maturing mixed grassland are found at the base of the parent plant, where the first year basal rosette of this mostly biennial species disappears during the second year, leaving a tiny gap. Therefore, the current characteristic patchy distribution pattern can also be seen as



Flowers and fruit pods of slender mouse-ear-cress
(*Halimolobos virgata*)

the result of the absence of bison-type disturbance, resulting in a suboptimal germination microsite. In other words, the characteristic patchy distribution seen today may not have been typical until the disappearance of bison from the landscape.

Former wallowing sites as critical habitat also explains why sites are described by many sources as “vernally moist”: these sites were likely wallows in the halcyon days of the bison. Current subpopulations of slender mouse-ear-cress may be relics of former wallows and wallow activities, surviving only in the absence of bison disturbance and epizoochory



Mature fruit pods of slender mouse-ear-cress
(*Halimolobos virgata*)

by germinating in the minimally favourable gap of the previous year's plant.

Slender mouse-ear-cress also has an adaptation for dispersal on the legs and hooves of bison and other grazers. In late April, previous year stems up to approximately 20 cm are erect in spite of snow loads, rain and wind that flatten surrounding vegetation. Siliques (the fruiting pod) are split open revealing about one-quarter of the seeds intact. Apparently, over half of the seeds have fallen to the ground nearby, or perhaps have blown a short distance by wind and/or have been carried by overland flow of water. These would have been available to stick to passing hooves, and the standing stems with seeds bared were available to fall into the leg hair of passing grazers and to be transported more widely.

The puzzle of widely disjunct populations

The above scenarios show how slender mouse-ear-cress relied on bison-created

See **Bison & Slender Mouse-Ear-Cress**, page 10

disturbances at a site scale to persist, and also how bison may have received and dispersed seed. The absence of free-roaming herds across their former range is likely a factor in their current disjunct distribution.

Disjunct subpopulations could be a factor of the microsite conditions described above, where historic populations declined and crashed in the absence of suitable disturbance leaving large gaps between subpopulations. It can also be explained by an absence of long-term and long-range dispersal through annual migration within a herd's territory that could carry seed to new favourable sites, and also promote a wider genetic outcrossing in the larger population.

Although bison herds were estimated to be 28 million across North America, they were assembled into distinct herds with a usual roaming distance of about 50 km, but as great as 500 km under some environmental or climatic circumstances (in Eyheralde 2015).

The absence of roaming, grazing and wallowing bison herds in the order of thousands, tens of thousands or even hundreds of thousands, is likely the most important missing element impacting the distribution of slender mouse-ear-cress across suitable habitat in southern Alberta, Saskatchewan and the adjacent US states. It is likely the reason that the Alberta Recovery Plan (Alberta 2015) reported that surveys for slender mouse-ear-cress in suitable habitat came up empty. These candidate areas may have had populations that crashed because of lack of suitable disturbance in addition to the lack of population renewal from the distribution of seed on the hoof and hair of bison as they crossed their range. We cannot know the real pre-settlement distribution of slender mouse-ear-cress in North America, nor of the real ecological impact that the end of free-roaming bison herds has had on the prairies.

Implications for recovery and action plans

Based on the evidence presented above, the interaction between bison and slender mouse-ear-cress may be critical to its survival, with domestic cattle and/or horses substituting for part of the grazing and disturbance function. (Interestingly, horses also roll in mud, and repeatedly in the same spot, so that some current populations may owe their persistence to feral horses that formerly roamed CFB Suffield until 1994.) No recovery plan is complete without taking this into consideration, either by assessing management strategies to introduce grazers and wallowers to historic, extant or "failed to find" populations; or conversely, by introducing slender mouse-ear-cress into suitable habitats where bison already exist. As Eyheralde (2015) suggests, habitat "fragments large enough to support bison may increase the persistence of native species, including those that are patchily distributed or naturally rare." While we cannot replace the vastly roaming bison populations that provided appropriate disturbance in critical habitat or carried the seed to a particular location, these concepts can be creatively integrated into management plans in a way that is appropriate for current landholders and land use practices. Without the appropriate kind of disturbance on which this species seems to depend, it is likely that more populations may crash, elevating the at-risk level, possibly to the point of extirpation.

Finally, this study shows the value of examining rarity status of any taxa in a broader ecological, spatial and temporal context to find clues to account for present distribution. In doing so, there may also be the opportunity to find solutions for recovery. This is particularly true for other prairie species at risk that may also have required some level of disturbance from free-roaming bison herds. Each one deserves to be examined in this context.

Acknowledgment

Thanks to Bonnie Smith of the University of Calgary Herbarium for sharing her expertise on *Halimolobos*, and for her dedication to stewarding the herbarium collections for all Alberta field botanists.

Cheryl Hendrickson is a consulting biogeographer and President of LandSaga Biogeographical Incorporated. Her biogeographical approach to field botany has identified remnant channels of moved streams and the subsequent disturbance which initiated the novel ecosystem replacement forest, and the anthropogenic source of the invasion of the ruderal asian weed coltsfoot (Tussilago farfara) in Gros Morne National Park, Newfoundland.

References

- (Draft) Alberta Slender Mouse-ear-cress Recovery Team. 2015. Alberta Slender Mouse-ear-cress Recovery Plan, 2015-2025. Alberta Environment and Parks, Fish and Wildlife Policy Branch, Alberta Species at Risk Recovery Plan No. 37. Edmonton, AB. 25 pp.
- Environment Canada. 2012. Recovery Strategy for the Slender Mouse-ear-cress (*Halimolobos virgata*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, represented by the Minister of Environment, 2012.
- Environment Canada. Species at Risk Public Registry, Species Profile Slender Mouse-ear-cress (*Halimolobos virgata*). www.registrelep-sararegistry.gc.ca. n.d.
- Eyheralde, Peter Gregory, "Bison-mediated seed dispersal in a tallgrass prairie reconstruction" (2015). Graduate Thesis and Dissertations. Paper 14830 <http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=5837&context=etd>
- For primary references cited in Eyheralde regarding herding behaviour: Berger and Cunningham 1994; Bowyer *et al.* 2007; Knapp *et al.* 1999, *inter alia*; Coppick and Detling 1986, *inter alia*; Coppedge and Shaw 2000.
 - For primary references cited in Eyheralde regarding wallowing behaviour: Knapp *et al.* 1999, *inter alia*; Polley 1984, *inter alia*.
 - For primary references cited in Eyheralde regarding plains bison range, Widga *et al.* 2010.
- Smith, Bonnie. Personal communication, University of Calgary Herbarium, April 26. 2017. ♦

Help Us Monitor Bees in Alberta

Alexandria Farmer

“Save the bees” has become a common mantra in recent years, and the internet and social media have become an endless source of information on how people can help these declining pollinators. Lost in translation, however, is which bees really need “saving.” For example, many people have come to believe that urban honey beekeeping is helping to abate pollinator declines, but nothing could be further from the truth.

Honeybees (*Apis mellifera*) used for beekeeping are a domesticated, non-native species from Europe, which have even become an invasive species in places such as Australia where feral colonies can survive year round. There is evidence that adding honeybees into an urban area just makes life more difficult for our native pollinators.

The need for better education about Alberta’s wild, native bees (did you know there are more than 300 species in the province?) was a major reason why the Alberta Native Bee Council (ANBC) was founded in 2017. The ANBC is

a group of like-minded ecologists, bee researchers, citizen scientists and naturalists with the goal of conserving Alberta’s native bee diversity.

“In the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught.” (Baba Dioum, 1968.)

An important objective of the ANBC is to improve the general public’s understanding of the conservation issues faced by our native pollinators, and one of the ways we are increasing awareness is through the implementation of a citizen science Bumble Bee Monitoring Program.

There are an impressive 27 different species of *Bombus* (bumble bee) residing in Alberta. Like other native pollinators, bumble bees face many challenges in finding suitable nesting habitat in our highly modified landscapes, in particular urban settings. Currently within Alberta, COSEWIC has designated the gypsy cuckoo bumble bee (*Bombus bohemicus*) as endangered (2014), the yellow banded bumble bee

(*Bombus terricola*) of special concern (2015), and the once-prevalent western bumble bee (*Bombus occidentalis*) as threatened (2014). The Bumble Bee Monitoring Program will serve both to increase our overall understanding of bumble bee populations and to engage citizen scientists in conservation issues.

Bumble bee nest box workshops will be occurring in various locations in southern Alberta. Participants will assemble their own bee boxes, learn some bumble bee identification, and be inspired to create bee-friendly gardens and properties. The boxes built at these workshops can be taken home and monitored, reporting back to ANBC so that data can be collected and used in scientific studies. ANBC is also encouraging Albertans to photograph bumble bees they see visiting their gardens and to submit these photos to a North America-wide citizen science project called Bumble Bee Watch (BumbleBeeWatch.org). Together, we really can “Save the bees”! For more information on how to build nest boxes, or to find out the times and locations of our bumble bee nest box workshops, please visit our ANBC website (www.albertanativebeecouncil.ca), check out our Facebook page or email us at info@albertanativebeecouncil.ca. ♦



Alexandria Farmer

Left: Bumble bee nest box with occupants.

Below: Close-up of bumble bee nest in nest box.



Alexandria Farmer

Plants for Pollinators Project

Ecoregion-specific native plant selection guides to support native pollinator species.

The following guides are currently available: aspen parkland, fescue grassland, mixed grassland and the moist mixed grassland. <http://pollinator.org/guides#can>

Alberta PlantWatch: Nature's Calendar

Alan Hingston

Reprinted with permission from the Parkland Naturalist, the nature magazine of the Edmonton Nature Club

Dr. Elisabeth Beaubien has coordinated Alberta PlantWatch for three decades, encouraging citizen scientists to observe and report flowering times for selected plant species. This project is based in the Renewable Resources Department at the University of Alberta.

In her presentation at the Edmonton Nature Club meeting on October 20, 2017, Elisabeth told us what she has learned from studying 30 years of data from Alberta PlantWatch, applications for the data, and how the results correlate with climate warming.

Timing is everything

The study of the science of appearances or of biological timing is known as phenology, which is derived from the Greek *pheno*, meaning “to appear.” Phenology is principally concerned with the dates of first occurrence of biological events in their annual cycle – the date of flowering, emergence of butterflies, or arrival dates of migratory birds, for example. By studying phenology, researchers can identify patterns of relationships between biological events and data related to weather and climate. How early (or late) flowers appear from one year to the next is controlled by accumulated temperature above a threshold value. Warming winter and spring temperatures provide for more rapid temperature accumulation and earlier appearances of flowers. Similarly, a spell of cold weather in late spring will



Charles Bird

Male catkins of aspen (*Populus tremuloides*)

delay flowering that might have been imminent had the warmer temperatures continued.

Alberta PlantWatch data is collected by citizen scientists who observe one or more of 26 plant species. Observers report the dates for first bloom and mid-bloom as well as leafing-out for certain tree species. Botanically, the harbinger of spring is the prairie crocus, which usually flowers in mid-April. That event is quickly followed by male aspen trees, which “bloom” by shedding pollen. Between mid-April and mid- to late June, the indicator plants in the PlantWatch program are observed and their respective flowering dates recorded by PlantWatch volunteers. These flowers are predictable in their sequencing from year to year: for example, while prairie crocus and aspen appear early in the growing season (mid-April on average in central Alberta), yarrow and northern bedstraw appear weeks later (about June 20), with the other

indicator species flowering within these dates. Suitable indicator species are those which observers can confidently identify without confusion, and which bloom quickly so their flowering period is short.

Don't plant before the Victoria Day weekend?

The seasonal timing of events has always been of interest to farmers and gardeners in central Alberta. When can one safely plant seeds in warm ground or avoid having tender plants killed by late frost? As an example, Elisabeth quoted the advice that “tomato plants may go outside when the lilac starts flowering.” Should that occur before May 24, there is no need to wait for the Victoria Day weekend and lose valuable growing days. Samuel de Champlain was advised by Indigenous people in 1605 that he should plant corn on the day when the “white oak leaf is the size of a red squirrel’s footprint.”

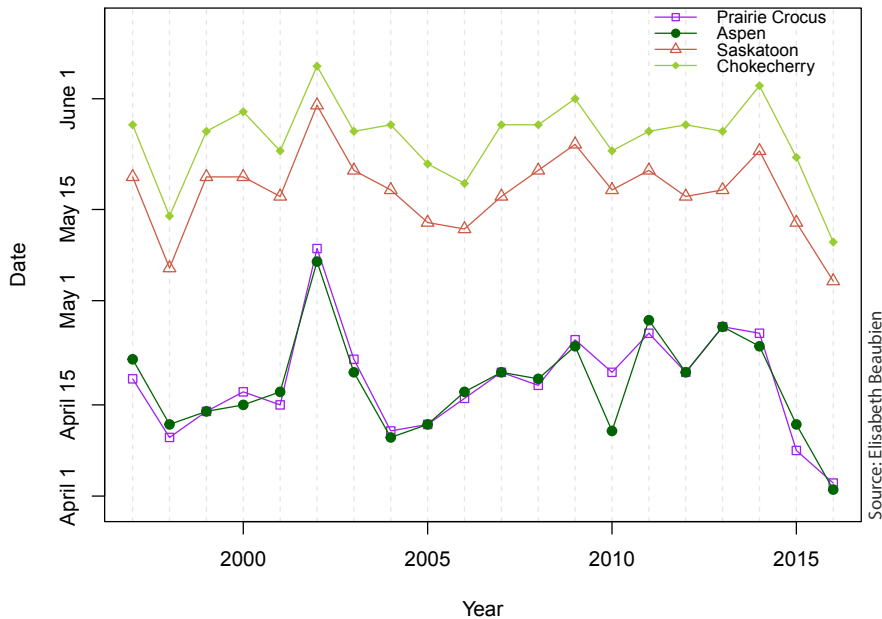


Prairie crocus (*Anemone patens*)

Iren Crosland

See *Alberta PlantWatch*, page 13

Alberta Central Parkland: First Bloom Dates 1997–2016

Chokecherry (*Prunus virginiana*)Saskatoon (*Amelanchier alnifolia*)

Plants and insects develop in a predictable sequence. Therefore, it is possible to predict the onset of certain pest species that affect agriculture or forestry so they may be controlled with a minimal application of pesticides or biological controls. The data is also beneficial for allergy sufferers, as accumulated temperature readings accurately predict when certain plants will shed pollen that can cause difficulties. Elisabeth has recently been looking at the PlantWatch data to help firefighters predict the timing of spring forest fires. She noted that when poplar trees leaf out, the transpiration of this canopy increases the humidity, and the spring fire season comes to an end.

Getting warmer?

By comparing average flowering dates for different areas, year-over-year comparison can be made. For example, spring arrived very early in 1992, while in 2002 it was notably late. In recent years (2009–2014) spring has been late, while in 2015 and especially 2016 it was early. Elisabeth has looked at data for Alberta's central parkland dating back to 1936. This data, collected over many years, shows how spring timing has changed and how plants are responding

to climate change. Winters are now warmer, with the biggest change being February temperatures: the average February temperature has increased by 5.3 °C, while the minimum (overnight) temperature has increased by 6 °C over the seven decades up to 2006. This increase has coincided with a decreased amount of snowpack: the average depth of snow on the ground at the end of February has decreased by 4 cm for each decade.

Due to the more rapid warming of air and soil, prairie crocus and aspen are blooming two weeks earlier. Elisabeth noted comparable changes are also shown by other phenology studies. Long-term studies of butterflies show they are emerging earlier (six days for each 1 °C temperature increase), and certain bird species are nesting earlier, which means the young can be fed on caterpillars that now emerge earlier due to warmer spring temperatures.

Additional information is available at plantwatch.naturealberta.ca, and at www.plantwatch.ca. ♦

Iris is published three times a year by ANPC. The Council aims to increase knowledge of Alberta's wild flora and to preserve this diverse resource for the enjoyment of present and future generations.

If you have an announcement, article or other item, you are invited to submit it to the editor for publication. Items concerning native plants will be given highest priority.

The editors reserve the right to edit submissions, but will review changes with the authors whenever possible. Disputes will be resolved in favour of the audience.

Copyright remains with the authors except where noted. Permission to reprint is generally granted, but please contact the editors for details.

Submission deadline for the next issue:
March 15, 2019

A subscription to *Iris* is included with membership in the ANPC. To join, contact the secretary, or check our website, www.anpc.ab.ca.

Northern Bladderwort (*Utricularia ochroleuca*) in Montana and Plant Carnivory

Peter Lesica, Montana Native Plant Council (peter.lesica@mso.umt.edu)

Reprinted with permission from the Botanical Electronic News #489; March 17, 2015

Bladderworts (*Utricularia* spp.) are Montana's most common carnivorous plants. There are nearly 20 species of *Utricularia* in North America north of Mexico. Of the five species occurring in western North America, *Utricularia ochroleuca* is the least common. Over 100 years ago this plant was collected in Yellowstone National Park (Martin s.n., POM). The specimen label lists the state as Montana, but I believe it is more likely from Wyoming because a recent floristic study (Hellquist et al. 2014) found *U. ochroleuca* several times in Wyoming but not Montana. The first bona fide collection from Montana was made in a rich fen just east of Glacier National Park on the Blackfeet Indian Reservation in 2012 by Tara Luna, a botanist who lives on the Reservation, and me. Adolf Ceska tentatively identified our plants as *U. ochroleuca*, and Garrett Crow, author of the as yet unpublished *Flora of North America* treatment,¹ confirmed his determination. Connelly Fen, where we found *U. ochroleuca*, is on the plains well east of the mountains, harbours several other plants considered rare in the state, and is listed as an Important Plant Area by the Montana Native Plant Society (<http://www.mtnativeplants.org/Important%20Plant%20Areas>). A second location for *Utricularia ochroleuca* in Montana was discovered just this past year in another calcareous fen halfway between the Blackfeet Reservation and Yellowstone Park. Again Garrett Crow verified the determination. This fen complex also supports populations of other rare plants, such as *Thalictrum alpinum* and *Primula incana*.

Utricularia ochroleuca has not been observed to flower in Montana. Without flowers *U. ochroleuca* can be mistaken for *U. minor*; however, *U. ochroleuca* has setose leaf margins and *U. minor* does not. *Utricularia intermedia* is also similar

but it has bladders only on white, leafless branches, while *U. ochroleuca* has bladders on both leafless and leafy branches. However, the best way to distinguish among the three species is by microscopic examination of the hair-like glands on the inside of the bladders called quadrifids. Garrett Crow performed the necessary dissections and provided me with photographs of the quadrifids of the three species in question. The shape of and the angle between the arms of the quadrifids are diagnostic.

More than one-third of all species of carnivorous plants on earth are bladderworts, and species of *Utricularia* occur from the tropics into the arctic. Some species of these rootless plants grow in mud or even as epiphytes in rainforest trees, but most, like Montana's four species, are aquatic. They all produce bladder-like traps with doors that open and close. Touching the hairs around the door causes it to open and suck in whatever is just outside. The traps are capable of capturing small animals and absorbing nutrients from them. But there's more to the story; it seems that some bladderworts may be more gardener than carnivore.

Several years ago researchers at the University of Wisconsin made a confusing discovery. They found that *Utricularia vulgaris* (= *U. macrorhiza*, our most common species) grown in water with a high density of invertebrates (potential prey) did not respond by producing more traps. However, they did produce more traps when the water was higher in nutrients. Apparently, bladderworts produce traps for a reason other than just capturing prey, a reason related to the fertility of their surroundings.

Recently Jennifer Richards at Florida International University made some observations that may help explain the Wisconsin findings. Richards examined 1,400 traps from *Utricularia purpurea* in the Everglades. She found that 63% had something in them. Of these only 8% contained dead prey items, but all contained algae, diatoms or other photosynthetic organisms. I have made the same observation here in Montana. All the old bladders have green stuff in them, but it's devilishly hard to show people a trap with a dead bug in it.

See **Bladderwort**, page 15

Northern bladderwort
(*Utricularia ochroleuca*)



Peter Lesica

Bladderwort, from page 14

Richards proposes that bladderwort bladders act not so much as traps but as tiny microcosms, absorbing the waste products produced by their photosynthetic and bacterial occupants. This hypothesis may also explain the Wisconsin finding that bladderworts produce more traps in nutrient-rich water but not in prey-rich water. Algae grow better in nutrient-rich water, so a bladderwort's captive algae gardens will be more productive. In addition, the bladders may also absorb nutrients directly from the water. This is an unusual strategy to compensate for a lack of nutrient-absorbing roots, but it is not unique.

Certain tropical epiphytes called tank bromeliads obtain nutrients in a similar fashion. These plants live in tree canopies and are unable to absorb nutrients through their roots. Instead they hold water at the base of their leaves. These miniature "ponds" support all manner of aquatic life including mosquito larvae and even frogs. The bromeliads absorb the waste products from these little ecosystems directly into specialized cells at the base of the leaves.

More research needs to be done to prove that algal waste products are contributing to bladderwort nutrition. Still, it seems likely that bladderworts are really omnivores, obtaining more

of what they need from gardening than from carnivory. It's just another case of "whatever works." So it looks like I lost my cool story about bladderwort carnivory. But that's okay because the real story is even more fascinating.

Further Reading

- Ceska, A. & M.A.M. Bell. 1973. *Utricularia* (Lentibulariaceae) in the Pacific Northwest. *Madrone* 22: 74-84.
- Crow, G.E. 2015. The taxonomic value of internal bladder-trap quadrifids in recognizing and identifying *Utricularia ochroleuca* (Lentibulariaceae). *BEN* (Botanical Electronic News) # 487 <http://www.ou.edu/cas/botany-micro/ben/ben487.html#6> <http://www.ou.edu/cas/botany-micro/ben/ben487.html#6>
- Hellquist, C.E., C.B. Hellquist & J.J. Whipple. 2014. New records for rare and under-collected aquatic vascular plants of Yellowstone National Park. *Madrone* 61: 159-176.
- Knight, S.E. & T.M. Frost. 1991. Bladder control in *Utricularia macrorhiza*: lake-specific variation in plant investment in carnivory. *Ecology* 72: 728-734.
- Lesica, P. 2001. Carnivores Turn to Gardening. *Kelseyia* 14(2): 4.
- Richards, J.H. 2001. Bladder function in *Utricularia purpurea* (Lentibulariaceae): is carnivory important? *American Journal of Botany* 88: 170-176.

¹Editor's note: Since the original publication of this article, a provisional FNA Lentibulariaceae key can be found at the following link: <http://floranorthamerica.org/files/Lentibulariaceae%20provisional.pdf>

Alberta Species in the Lentibulariaceae Family

Common Name	Scientific Name	S-rank	Tracked by ACIMS?
small butterwort	<i>Pinguicula villosa</i>	S3	No
common butterwort	<i>Pinguicula vulgaris</i>	S4	No
horned bladderwort	<i>Utricularia cornuta</i>	S1	Yes
flat-leaved bladderwort	<i>Utricularia intermedia</i>	S4	No
small bladderwort	<i>Utricularia minor</i>	S3	No
northern bladderwort	<i>Utricularia ochroleuca</i>	S1	Yes
common bladderwort	<i>Utricularia vulgaris</i>	S5	No

Source: The Alberta Conservation Information Management System (ACIMS) List of Vascular Plant Elements in Alberta - March 2018 (downloadable here: <https://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/download-data/>). ♦

ANPC ANNUAL WORKSHOP**Every Plant Tells a Story:
Documenting Native
Plants in Alberta**

When: March 16, 2019
8 a.m. to 4 p.m.

Where: University of Lethbridge
(Lethbridge, AB)

Presenters and Exhibitors:

Organizers are working to develop the workshop program. Check the ANPC website for details.

Informative displays will be set up for viewing.

Seed Share: Bring native seed to share with others or find interesting native seed to take home.

If bringing seed to share, please ensure the seeds are from native plants and package the seeds in labelled small envelopes with scientific and common names as well as the harvest location.

Book Sale: ANPC is hosting a botany book sale again this year at the workshop. Similar to previous years, the funds will be used to support Alberta PlantWatch.

If you have botany books (plant identification books, field guides, wildflower gardening books, books on medicinal and edible uses of plants, botany textbooks) that you'd like to donate (or trade) for the sale, please contact Jacqueline at mjredburn@hotmail.com before mid-March.

Check out www.anpc.ab.ca for registration information and workshop details. ♦

More News and Events

Plant Study Groups

There are several rare plant ecology study groups associated with ANPC. Some meet throughout the year. One is a summer-only field study group. And new groups are just beginning in the Peace Region.

Group participants nurture their interest in and expand their knowledge of Alberta's native plants and communities and local ecology. **Please contact facilitators for details and to confirm attendance.**

Peace Region Native Plant Study Group (Peace River)

Location: NAIT Boreal Research Institute, 8102 - 99 Avenue, Peace River (beside Northern Lakes College). Date: First Wednesday of the month; October to May inclusive. Facilitator: Melanie Bird (mbird@nait.ca).

Peace Region Native Plant Study Group (Grande Prairie)

Location: Meeting room, Ernie Radbourne Pavilion, Muskoseepi Park. Date: Second Tuesday of the month; November to April inclusive. Time: 6:30 to 8:30 p.m. Facilitator: Kristin Kendrew (kristinkendrew@gmail.com).

Central Alberta Plant Study Group (Edmonton)

Location: University of Alberta Herbarium, B-521 (botany wing), Biological Sciences Building (east end), Saskatchewan Drive, Edmonton. Date: Last Wednesday of the month; October to April inclusive. Time: 6:30 to 8:30 p.m. Facilitator: Varina Crisfield (vcrisfield@gmail.com).

Southern Alberta Plant Study Group (Calgary)

Location: University of Calgary Herbarium, Biological Sciences Basement, Room 13. Date: First Saturday of the month; October to April inclusive. Time: noon to 4:00 p.m. Facilitator: Jennifer Muir (jen.muir@gmail.com).

Medicine Hat Plant Study Group

Location: Medicine Hat College Herbarium (L155). Date: Last Saturday of the month; October to April, inclusive. Facilitator: Cathy Linowski (clinowski@memlane.com).

Northern Plant and Ecology Study Group (NPESG)

This is a field-based study group, active through the growing season and into early autumn. Plant walks planned for 2019 will be held at Crow Lake Provincial Park, between Lac La Biche and Ft. McMurray, and at Hutch Lake Campground and Fire Tower Road, in the High Level area. Contact Marsha Hayward for more information (wildloonart@mcsnet.ca).

SHARING KNOWLEDGE Alberta Vascular Plant Species Keys

Linda Kershaw and Lorna Allen are graciously making plant keys available for several of Alberta's vascular plant families on ANPC's website.

Available families include **Polygonaceae, Primulaceae, Salicaceae, Saxifragaceae, Violaceae, Caryophyllaceae, Ericaceae, Grossulariaceae, Ranunculaceae** and **Rosaceae** as well as illustrated and revised editions of **Amaranthaceae, Asteraceae** and **Brassicaceae**.

See Publications > Keys to Alberta Vascular Plants on the ANPC website. http://anpc.ab.ca/?page_id=3089.

Please share the keys with anyone who might find them useful.

Linda and Lorna ask that you try the keys and note if there are ways the draft keys can be improved. Please pass on your comments to Linda at linda.kershaw1@gmail.com.

Livingstone Porcupine Hills Report from AEP

Fred Wrona, Chief Scientist for Alberta Environment and Parks, has released the findings of a scientific review initiated to improve understanding of the relationship between ecological responses and the use of motorized vehicles on linear disturbance in the Livingstone Porcupine Hills region of Alberta's eastern slopes. The report can be found on the Environmental Monitoring and Science Division website at: <http://environmentalmonitoring.alberta.ca/>

The study further expands our understanding of the area since the completion of a similar report for the Castle region. The study concluded that motorized vehicle use of trails is likely the most significant stressor related to human activity in the region. The findings of the Livingstone Porcupine Hills report and advice from the Chief Scientist are consistent with the management options and actions developed for motorized vehicle use in this region.

Please direct any questions regarding this report directly to AEP's Environmental Monitoring and Science Division:
Tel: 780-229-7200
Toll Free: 1-844-323-6372
Email: EMSD-Info@gov.ab.ca

Plant Happenings

Plant Happenings newsletter informs readers of a wide range of topics related to botany — meetings, conferences, activities, publications and more.

Plant Happenings is available on ANPC's website http://anpc.ab.ca/?page_id=2795.

If you have submissions for Plant Happenings or want to subscribe via email, please contact Anna at amozolik@gmail.com.

You don't have to be an ANPC member to receive this publication — all you have to do is ask. But we hope you'll consider becoming an ANPC member.