Edmonton Native Plant Society

WILDFLOWER NEWS

'Growing Nature's Garden'

JUNE 2021

K. Mpulubusi

Marsh marigold, *Caltha palustris,* Clifford E. Lee Nature Sanctuary

From your editor:

Welcome to the Wildflower News for June. The marsh marigolds are in their glory, the yellow lady's-slippers will soon be, the spring-blooming natives in our gardens are at their very best! Wander the river valley or head out to a natural area, and see what's up!

In This Issue:

Native Plants in Local Gardens

From Liz Deleeuw:
Wild blue columbine*, Aquilegia brevistyla;* prairie crocus, *Pulsatilla nuttalliana,* showing blooms and young seed heads; three-flowered avens, *Geum triflorum.*

From Hubert Taube:
Fairy Bells, *Prosartes trachycarpa;* Canada violet, *Viola canadensis;* pincherry, *Prunus pennsylvanica.*



From Alan Jones:
Yellow columbine, *Aquilegia flavescens (WN:* native to mountain meadows, open woods, and alpine slopes of the Rocky Mountains from Utah north to British Columbia and Alberta.); saline shootingstar, *Primula pauciflora*.


From Manna Parseyan: Early blooming beauties in my native plant garden in Edmonton! Golden/buffalo bean, *Thermopsis rhombifolia*; prairie buttercup, *Ranunculus rhomboideus*; pussytoes, *Antennaria* sp. and three-flowered avens, *Geum triflorum*.



WN: Keep sending us pics of your "natural" flower beds and yards that include some or a lot of local Edmonton native wildflowers. We love 'em! Overviews of the beds, and close-ups of the flowers would be lovely, as would some info on whether the plants are in full sun, early morning sun, dappled sun, or full shade.
Your general location in the city (i.e. SE, NW, Central, etc.) would be appreciated.
Send your photos to engedmonton@gmail.com

EVENTS - if you would like to post an event that involves native flowers, please email us at engedmonton@gmail.com

June 5 - World Environment Day - The theme for World Environment Day 2021 is "Ecosystem Restoration" and will see the launch of the UN Decade on Ecosystem Restoration. Ecosystem restoration can take many forms: Growing trees, greening cities, rewilding gardens, changing diets or cleaning up rivers and coasts. This is the decade when we can make peace with nature. For more information and good suggestions on how you can help: https://www.genevaenvironmentnetwork.org/world-environment-day/ Also see Patsy Cotterill's article below on *UN Decade on Ecosystem Restoration: Time to gear up on volunteering for nature?*

June 10 - 13 - Edmonton BiodiverCity Challenge - Join our region's naturalists, species experts, and environmental groups in documenting as many species as you can! Simply upload your photos of birds, plants, mammals, moss, lichen, mushrooms and insects to iNaturalist or NatureLynx. Your contributions will be used to help understand more about the species that call our region home. https://biodivercity.ca includes a map of the project boundaries for both Edmonton and Calgary.

Participants will have until June 20th to upload their sightings to NatureLynx or iNaturalist. Use the apps available for mobile phones, or take pictures and upload them later using the NatureLynx or iNaturalist website. Don't forget to tag the 2021 project! iNaturalist will automatically capture all observations made to it in the metro Edmonton area during that time period.

Sunday, June 13 - *Wagner Natural Area* Father's Day orchid walks. This year, because of Covid, there will not be guided Orchid Walks. However, people are encouraged to come out the week before Father's Day - June 13, rather than June 20 - and expect that they will get a good show of blossoms.

June 19, 20 and 26 - Lady Flower Gardens Bioblitz This is the second year for this bioblitz which is conducted in order to better understand the composition, abundance, and distribution of vegetation in the New Jubilee Forest. If you are interested in volunteering for this project here is more information: https://www.ladyflowergardens.com/bioblitz.html
Time: 10:00 am until 2:00 pm

NEWS... If you have a news item involving native plants that you would like posted, please email us at engedmonton@gmail.com

Bunchberry Meadows is once again open to the public, effective May 27. A new boardwalk has been built over the part of the trail that had been subject to flooding. Please do not park on the range or access road. If the parking lot is full, the property is at capacity.
https://www.natureconservancy.ca/en/where-we-work/alberta/featured-projects/bunchberry-meadows.html

ENPS receives Fortis Alberta grant of $1,200
The ENPS has received $1,200 in grant funding from Fortis Alberta, an energy provider, under their Community Naturalization and Tree Planting Program. Grants of $2,500 were awarded to 20 municipalities at the end of May, mainly for tree planting, and another 50 awards of $1,200 were made. Our grant is targeted for Fort Saskatchewan Prairie restoration. The plan is to plant native shrubs in two areas of the Prairie where the ground is more moist and native forbs are outcompeted by smooth brome. The project should be completed by the end of next year.

Survey of Canadian Plant Conservation Practitioners and Researchers
Designed by a working group of Canadian scientists who study plants and plant conservation, led by Dr. Jenny McCune, University of Lethbridge

Dr. Jenny McCune (ULeth) is looking for participants for an online survey on the gaps in plant conservation and research in Canada. The information is below. It takes about 15 minutes to complete and is anonymous. She needs more representation from non-academic folks. Also please pass it along to anyone you know (past students, etc.) who work in plant ecology/ evolution/conservation. They are especially eager to also get non-academic participants (e.g. from governments, NGOs, etc.). https://uleth.qualtrics.com/jfe/form/SV_0kCq8elH656TIhM

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Habitat Garden in St. Albert Botanic Park by Lorna Duke. Photos by author.

The St. Albert Botanic Park is a city park dedicated to many varieties of botanical plants in themed garden beds such as the Dahlia beds, the Asiatic Lilly beds, the Day Lilly beds, Iris lily beds and many others. Also featured in the park are the Rose garden and the Cottage garden which is very popular with wedding parties. The park also features a pondless water fall with various shrubs and plants and a Heritage garden dedicated to plants that early settlers to Alberta would have cultivated around their homesteads.

A relatively new addition to the park and an ongoing work in progress that was begun in 2019 is the Habitat Garden, a garden dedicated to local native plants that support plant pollinators which have struggled so badly with the advent of urban sprawl and dramatic global climate change. The initial approach to developing the garden has been to have three raised beds centered by a pergola, one raised bed for plants to attract birds, one to attract bees and the other for plants that would attract butterflies. This habitat themed garden, albeit still under development, has certainly inspired many visitors to inquire about the availability of native plants so they can create such gardens in their own yards.

Having the native plants in raised beds gives the opportunity for children and adults alike to engage and enjoy the pollinators much more closely than in a regular garden bed.

Close to the Bee Bed we have a bee hotel; this allows us to help bees that are in decline due to increased pesticide use and the decrease of natural habitat. Having this Bee hotel is one way to help the many species of the solitary bees that are in decline.

We have essentially only had one full year with the native plants in the raised beds. The survival rate for these plants was extremely high and we look forward to the same success throughout this coming season. A good time to be at the park is of course in July.

L. Gaillardia, meadow blazingstar, and giant hyssop in background; C. Heart-leaved alexanders and fleabane. R. 2 solitary bees on a wild white, or Richardson's, geranium.

UN Decade on Ecosystem Restoration: Time to gear up on volunteering for nature? by Patsy Cotterill. Photo by author.

It seems I was prescient with my articles on restoration in the last two WN issues, as 2021-2030 is, apparently, the UN Decade on Ecosystem Restoration (https://www.decadeonrestoration.org), with an official launch on June 5, World Environment Day. It is a time for "preventing, halting and reversing the degradation of ecosystems worldwide, on every continent and in every

ocean." According to the UN website, restoration can help to end poverty, combat climate change and prevent a mass extinction. It asks, what will *you* restore?

Well, why not volunteer with ENPS? With Covid restrictions easing for the summer, it will soon be possible to join in larger gatherings at ENPS events. Although growing native plants for demo beds and gardens isn't usually how we think of restoration, it does contribute towards restoration goals. And learning how to grow native plants is the first step in knowing how to do larger-scale landscape restorations. (If you do grow native plants, why not let us know how you get on, and add to our information base?)

It will be interesting to see if the media can forget Covid for once and make a fuss about the launch of the decade on June 5th. Even if they don't, we can mark it ourselves with some restorative action.

Don't forget that funding is important to enable restoration. Consider making a generous donation to your local land trust or any of the national and international non-profits that carry out environmental protection and restoration services.

According to the IUCN (International Union for the Conservation of Nature) literature:

ecosystem – dynamic complex of plant, animal and microorganism communities and their non-living environment, interacting as a functional unit

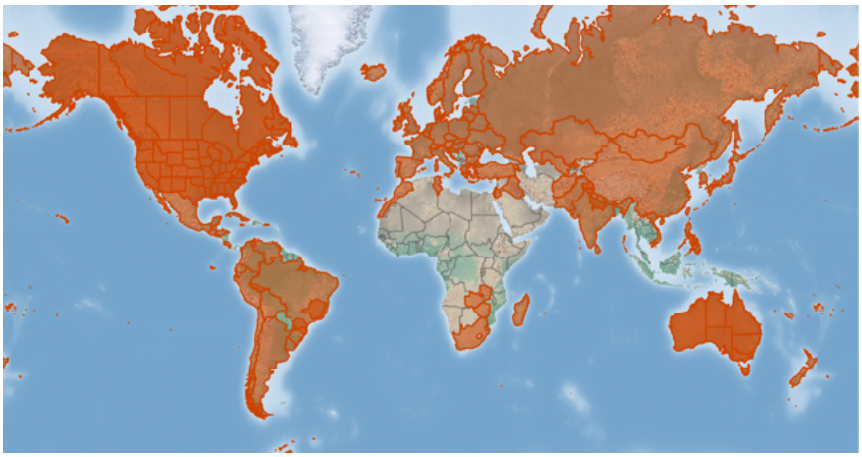
restoration – any intentional activity that initiates or accelerates the recovery of an ecosystem from a degraded state.

Forest "eco-island" planted in a field in Wagner Natural Area (May, 2021). ENPS is administering the grant funding and serving as project manager for this restoration initiative. Previous restoration efforts in this field have included planting spruce trees around the perimeter to accelerate natural forest succession. The poplars in the top left of the picture have spread by natural suckering.

The Common Dandelion — Eco-imperialist Supreme by Patsy Cotterill. Photos by author unless otherwise noted.

"The sun never sets on the empire of the dandelion."
Alfred W. Crosby in "Ecological imperialism: The biological expansion of Europe, 900-1900."

First of all, I should probably apologize for taking up space in WN with a non-native plant, especially in the month of June when native wildflowers are at their most prolific best. However, I admit to a grudging admiration of dandelions, and when a friend recently sent me a video of an orchard owner extolling their virtues, I got to thinking about them again. I found the video theme rather strange, as there is a common belief (possibly erroneous) that dandelions are serious competitors of fruit trees for pollinators. But perhaps his video was intended as a subtle anti-herbicide message. He even suggested that his dandelion population had spontaneously declined with time. In any case, I thought he was omitting most of the really fascinating attributes of dandelions. What really annoyed me, though, was his insinuation, no doubt to win better acceptance for dandelions with his audience, that they were doing what they do for our benefit. You hear this often; plants are portrayed in terms of their benefit to humans, animals, pollinators, etc., rather than for their intrinsic qualities. Dandelions, like all plants, are in it for themselves, their mutually beneficial cooperation with insect pollinators being of course primarily self-serving. Pondering once again the common dandelion's many adaptations that contribute to its abundance and near-global distribution, I decided to revisit the literature.



World-wide distribution of the *Taraxacum officinale* complex

https://www.cabi.org/isc/datasheet/52773#toDistributionMaps

First of all, let's be clear what we are talking about. The genus *Taraxacum* is a large genus of north temperate regions, its species count depending on how you recognize or define a species. There are 14 species recognized as distinct in Canada, and four in Alberta, of which two are native and occur in high boreal or arctic-alpine areas, and two are non-native, the common dandelion, *Taraxacum officinale*, and the red-seeded dandelion, *T. erythrospermum*. (Occasionally I remember to look for this, checking for the characteristic reddish achenes, but so far I have never found it.)

Common dandelion is well known as a troublesome weed, even in countries where it may be considered native, and there are plenty of reasons for its weedy success. In terms of biological fitness it has a lot going for it (see Table 1.). I am, however, going to concentrate on two adaptations that are not apparent to the ordinary observer, apomixis and polyploidy.

Table 1. Attributes and strategies of the common dandelion

Roots: long (up to 1-2 m) and thick (1-2 cm) branched taproot, a perennating and anchoring organ that is efficient at finding water at lower depths, so drought resistant, and stores food reserves (inulin, proteins and amino acids) which can be mobilized to support early growth in the spring; forms mycorrhizal association; can regenerate from fragments of root if these are large enough, which provides some ability to survive cultivation; contractile roots which pull the growing point below the surface, making the plant resistant to trampling, mowing and grazing, and providing protection in winter **Leaves** persist throughout the winter but form new growth in spring and fall; they stake their claim to sunlight and other resources with outspreading, flat rosettes where the ground is bare or sparsely vegetated, and deploy allelopathic chemicals (ethylene) to deter competing vegetation and fungal pathogens; however, if surrounded by tall vegetation the leaves grow erect or at an angle to avoid being shaded; leaves and scapes contain a white latex that is bitter tasting and deters herbivores to some extent	**Florets** using pollen-presentation mechanism, whereby the style pushes up through the cylinder of stamens, collecting pollen on its outer surface; if cross-pollination does not occur the style arms bend backwards to reach the pollen on their inner surfaces, effecting self-pollination **Fruits:** developing fruits are protected by the involucre of bracts surrounding the flower head, which also encloses the flower during wet weather fruits (achenes/cypselas) are equipped with a parachute-like pappus of hairs on the end of a long stalk; pappus can close in wet weather and achene remains attached; the achene surface is rough with upwardly pointing barbs that help catch in the soil **Seedlings** germinate throughout the year; germination and growth are rapid
Phenology: flowers and fruits early (May, June), so less competition for pollinators (though I am not sure why it needs them, at least in North America!) and disperses fruits early (9-12 days after flowering) while there is little tall vegetation to obstruct wind dispersal; scape elongates when fruit is ripening for better exposure to wind **Flowers**: flower-head is of the typical Asteraceae type with many (up to 250) florets, each with an ovary that forms an achene (technically, a cypsela), allowing for abundant seed production flower heads are produced on a leafless, hollow stalk or scape), which is short-lived, therefore investment only in vascular tissue, not supporting tissue	**Polyploidy and apomixis**: have different levels of ploidy (i.e., number of chromosome sets different from the normal double (or diploid) set of matched chromosomes) which confers advantages regarding ability to spread and colonize a variety of habitats; is mostly apomictic, producing seeds asexually and clones; "apomixis promotes range expansion by exploiting the advantages of clonality and polyploidy." (North American *T. officinale* is triploid.) **Variability/adaptability**: species shows great adaptability, either through genotypic variation between the various clones or phenotypic plasticity; variation in traits includes ruderal strategies (e.g., high seed production) and competitive ability

Apomixis

Dandelions produce abundant seeds, their main form of reproduction (one Canadian study found an average of 252 per flower head, for a total of over 23,000 seeds/plant). Who would guess then that in fact this seed is produced asexually, and that despite pollen production, normal fertilization does not take place? Asexual seed production, giving rise to clones of the mother plant, is known as apomixis (literally, Greek, *apo*, without, and *mixis*, mingling). In normal sexual reproduction, the organism is diploid, having two matching sets of chromosomes (2*n*) in all cells. During the reproductive process a reducing cell division (meiosis) occurs, producing haploid gametes with only a single set of chromosomes (*n*); fertilization of the female gamete with a haploid male gamete restores the diploid number and creates a viable embryo (2*n*). In apomictic plants, meiosis is skipped, or does not occur completely, and a female gamete with a double set of chromosomes (2*n*) becomes a viable embryo. (The actual process of sexual reproduction in flowering plants is quite complicated, and I urge readers to consult a biology textbook or information online, to get a better understanding of it. Try: https://www.youtube.com/watch?v=9F6TfdN4wU0). As well, a second fertilization with a haploid male nucleus usually takes place to initiate the development of endosperm, the food source that provisions the seed during germination. Sexual reproduction is at a premium in nature; it allows the recombination of genetic material, the basis of genetic variability on which the ability to adapt to environmental change depends and which counteracts the effects of deleterious gene mutations. So, wouldn't that put apomictic common dandelions at an evolutionary disadvantage?

Polyploidy

The great majority of apomicts are also polyploids. Polyploids are plants that have more than the two sets of chromosomes possessed by diploid plants (2x). They can be triploids with three times the base number (3x), tetraploids (4x), pentaploids (5x) and hexaploids (6x). If they have an uneven number of chromosomes they are called aneuploids. Polyploids arise during crossing within the same species, or by hybridization between different species. Often this leads to sterility, because chromosomes cannot undergo meiosis and recombination as in normal sexual reproduction. However, polyploids can get around this if they bypass the sexual process with apomixis and reproduce by clones. Apomixis thus both promotes polyploidization by producing unreduced gametes (2x instead of x) and enabling otherwise sterile polyploids to persist through apomictic production of viable seed.

Polyploidy is an important and widespread phenomenon in the plant world. (Possibly about half or more of vascular plants are considered to be polyploids, and polyploidy is especially common in ferns.) It is involved in determining plants' origin and history, and their geographic range. It explains the ability to spread of many of our introduced invasive species.

Adaptation and variability in polyploids

Polyploids generally have a wider geographic range than their sexual parents: they are able to exploit a greater variety of habitats, and are better adapted to cold conditions; for example, many arctic and alpine plants are polyploids. Grime et al. (1990) estimate that *T. officinale* in Europe consists of 10% diploids, 45% triploids, 28% tetraploids, 5% pentaploids and about 11% aneuploids. The presence of diploids would allow genetic variation to occur if pollen from triploid apomicts was able to fertilize meiotically reduced female gametes in diploid plants. Such variation can become "fixed" by subsequent production of apomictic clones, and indeed some 2000 such distinct clones have been recognized as "microspecies" in Europe. (They are a great headache for the taxonomist, who relies largely on distinct discontinuities in form to be able to recognize species.)

Origin and spread of the common dandelion

It makes sense that diploids would occur in Europe as the genus *Taraxacum* is thought to have originated in Eurasia and the fossil record shows it was present in Europe in glacial and interglacial times. The cold climates of the Pleistocene could have stimulated the occurrence of polyploidy. In North America diploids have not been found, and most plants are triploids (the base number is 8, so cells would contain 24 chromosomes). Moreover, microspecies are not recognized in North America. Does that mean that our plants form genetically uniform clones with no possibility of gene flow, so they could be facing an evolutionary dead end? Intriguingly, though, although genetic variation is low within clones, it has been found to exist between clones, which show different traits and preferences for different habitats. While *T. officinale* probably first entered North America via Beringia, most plants today are thought to be the result of human introductions since the 17th century, and the genotypic variation now present has been imported rather than generated in situ. It has been suggested that multiple hybridizations producing microspecies occurred in Europe prior to their introduction to North America during settlement times, and mutation, generally considered the major cause of genetic variation, has played a relatively minor role. European settlement and agriculture also created the new open, disturbed or semi-permanent habitats in North America that apomictic,

polyploid common dandelions, being good travelers and ambitious colonists, are superbly placed to exploit! Given that clones/microspecies/genotypes differ in their preferences for environmental niches, it is just possible that the video orchard man was correct in saying that his original dandelion population declined in abundance and was replaced by a population with fewer plants. What if the first group belonged to a clonal genotype that was adapted to disturbed, open soil (a characteristic that is known as ruderal), but as the grassy path population stabilized, they were replaced by a clone with a genotype that could compete better with vegetation and was more adapted to permanent pasture? It seems like a long shot, but who knows?

The mystery of pollen production in common dandelions

Another major question, and one to which I have not been able to find a satisfactory answer in the research literature is: if triploid common dandelions are reproducing by asexually produced seed, and there is no possibility of mating with diploids, why do they bother to produce pollen, and why do they also produce nectar, both at great nutritional cost, to attract pollinators? Have these become anachronistic traits? One answer might lie in the phenomenon of secondary fertilization or pseudogamy, whereby fusion with pollen nuclei is needed to kickstart the development of endosperm. Many apomicts maintain pollen function for this purpose. But common dandelion produces very little endosperm, relying instead on protein in the seed coat for nourishment of the embryo. It is possible, of course, that there simply hasn't been enough time (some 400 years since its arrival in North America) for *T. officinale* to abandon pollen and nectar production.

Evolution into the future?

We are entering into the realm of science fiction here, but what if common dandelion, complacent in the notion that Man's generously provided habitats will last forever, did evolve to stop producing pollen and nectar? What difference would it make? Dandelions themselves would continue along their present trajectory. They would still produce flowers, although the flowers wouldn't need to be that bright yellow. They could be green, even, though that seems a bit of a wasted effort assuming that the leaves are more than adequate to meet photosynthetic needs. The flowers are the vehicles of seed production of course, and since seed is its main way of reproduction and spread, the dandelion would want to retain its beautifully adapted seed morphology and dispersal mechanisms simulating sexual plants. Ecologically speaking, although the pollinators would suffer, dandelions would still of course be part of the food web; their nutritious leaves, packed with minerals and vitamins, would still be eaten by herbivores, and insects, birds and mammals would eat their seeds.

Apomixis and agriculture

As a footnote, I note that there seems to be a resurgence of research interest in apomixis, particularly by central European plant scientists. Why, you might ask? Well, it's another case of humans trying to exploit nature for their own benefit. The idea is that genes for apomixis might be introduced into crops, thereby creating stable, easily reproducible clones that are well adapted to a given environmental (agricultural) niche. Indeed, many of our crops are already polyploids: the classic examples are wheat (with 2x, 4x and 6x species), *Brassica* species, potatoes (*Solanum tuberosum*) and coffee (*Coffea arabica*). Apart from the complexity of the research, what gives pause is the thought that, worse even than your usual genetically modified crops, such apomictic crops might spread genes for apomixis into wild populations, thereby hobbling their chances for evolutionary change and adaptability!

Outer and inner rings of green involucral bracts protect the flower head at night and during seed development.

Manna Parseyan

Canadian swallowtail butterfly on dandelion.

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Additional notes on polyploids:

Like your coffee? *Coffea arabica* is a tetraploid with 44 chromosomes (x – 11), the result of a cross between *C. canephora* and *C. eugenioides*, which is estimated to have taken place between the one-half to a million years ago; its spread it thought to be a response to environmental changes in East Africa. This shows the importance of polyploidy! (Wikipedia)

Here is another interesting example of polyploidy, which is fairly common in the Rosaceae. In the Flora of Alberta (1983) just three species of hawthorn, *Crataegus*, are listed. Yet in the new Vascular Flora of Alberta key guide (Kershaw and Allen), 11 species are listed. How come? Surely, nine new species of hawthorn haven't suddenly entered Alberta in the last 40 years? No, Canadian botanist James Phipps did a lot of work on *Crataegus* across Canada and recognized these polyploids as distinct species, although possibly they might be better considered as "microspecies." Several of them are extremely rare and localized in Alberta. A good challenge for an aspiring botanist to see if the key works!

Last word regarding bees and dandelions

Long-time gardener Robert Pavlis from southern Ontario has this to say on the relatively poor quality of protein dandelions provide for bees: "A lawn full of dandelions is better for bees than a weed-free lawn, but not nearly as good as a garden with a variety of plants and no dandelions. If you must have a lawn, consider planting fruit trees, even ornamental ones, and skip the dandelions." He suggests that a lawn full of dandelions may distract honey bees from more nutritious pollen sources, although bumble bees may be more selective. Dandelions are, however, a good source of nectar.

Websites of the Month:

North American Native Plant Society's Spring 2021 issue of their Blazingstar newsletter:
Some interesting articles such as *Insights from NANPS Video Contest Finalists,* and *People and Nature.* There is also a review of Douglas Tallamy's book *Nature's Best Hope: A New Approach to Conservation That Starts in Your Yard*
https://mcusercontent.com/c14d6ac0b8a79c347bb9b3235/files/16ad387e-806f-4e93-aae3-d6863cada5ac/Blazing_Star_Spring_2021.pdf

Wagner Natural Area
An article from CBC on Wagner: https://www.cbc.ca/news/canada/edmonton/wagner-natural-area-dave-ealey-ben-rostron-orchids-adrienne-lamb-1.6041602

Lifetime ENPS Membership
You can now become an Edmonton Native Plant Society member for life. Memberships are $20 and can be purchased by emailing EdmontonNPSociety@gmail.com or visit one of our booths at plant events in your area.

Aims of the Edmonton Native Plant Society:

- ✤ Promote knowledge of the Edmonton area native plants.
- ✤ Conserve our native plant species and their habitats.
- ✤ Preserve native plant species and habitat for the enjoyment of present and future generations.
- ✤ Educate individuals, business and local governments about native plants.

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Cherry Dodd, editor
Judith Golub, publisher
www.edmontonnativeplantgroup.org

Annual Elk Island flower count day - *Viola selkirkii,* great-spurred violet; *Viola palustris,* marsh violet; *Chrysosplenium iowense,* golden saxifrage; *Vaccinium myrtilloides,* common blueberry.