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Iris

The Alberta Native Plant Council Newsletter



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Cover photo: C. Dana Bush;
Winter snow on rushes.

The climate and bloom times are changing: Update from Alberta PlantWatch

Dr. Elisabeth Beaubien

Spring flowers are blooming earlier in Alberta in response to warming winter temperatures. Temperatures in February have really changed; nighttime temperatures in the central parkland increased by 6 °C over the 7 decades from 1936 to 2006 (Beaubien and Hamann 2011a). Prairie crocus (*Anemone patens*) and aspen poplar (*Populus tremuloides*) bloomed earlier by 2 weeks over those decades.

Since 1987, Alberta dates have been reported by the citizen science program PlantWatch, which gathers observations on when plants bloom and leaf. This study is called phenology, "the science of appearances." Current research uses PlantWatch data to predict the end of the spring forest fire season. Spring fires are a serious threat to Alberta, where firefighting costs \$200 million every year. On average, nearly 1,400 fires burn approximately 130,000 ha in Alberta every year with most fires occurring in the spring.

Spring fire danger starts when the snow melts, and ends when leaves emerge on trees and "the big green humidifier" turns on. Because the timing of spring

events is largely driven by the pace of increasing temperatures, warm winter and spring conditions lead to early blooming. Cold weather results in later blooming. We are developing a model to predict the timing of forest greenup, using the dates for early plant events such as pollen shed in aspen trees and the two-week weather forecasts in spring. Knowing this timing in advance will help the forest service position their firefighting resources for maximum efficiency. Analysis shows a high correlation; the years when flowers bloom early are also years when spring fires happen early (e.g., 1992, 1998 and 2006).



Greg Baxter

Prescribed forest burn lit by researchers to test conditions.

See **PlantWatch**, page 2

Plantwatch, from page 1

How else is PlantWatch useful?

Knowing when plants flower or leaf out in springtime can also help predict the best timing for activities in gardening, farming, forestry (planting, pest control, harvesting) as well as in wildlife management, allergy control, and remote sensing.

Using spring timing to predict best times for farming goes back a LONG way. When Samuel de Champlain landed at what is now Cape Cod in Massachusetts, First Nations people told him that they planted corn on the day when the white oak leaf was the size of the red squirrel footprint. By that time the air and soil temperatures were ideal.

Here are some current gardening tips for Albertans:

- When you see the first bloom of early blue violets (*Viola adunca*), put the first vegetable seeds in the ground.
- When leaves pop out on aspen poplar, plant potatoes.
- By the time saskatoon (*Amelanchier alnifolia*) reaches full bloom, grain should all be planted.
- When common purple lilac (*Syringa vulgaris*) first opens flowers, tomatoes can go outside.

Here is more planting advice from the Colorado website <http://www.gghorganics.com/Phenology.html> :

- When the common lilac plant has leafed out, plant lettuce, peas and other cool weather varieties.
- When its flowers are in full bloom, plant beans and squash.
- When its flowers have faded, plant cucumbers and squash.

Do you enjoy fly fishing? Alberta sports writer Bob Scammell (1995) wrote a book, *The Phenological Fly*, that tells you when to grab your rod and head to your favourite river, based on which wildflowers have started to bloom. Like spring flowers, river mayflies and stoneflies are also emerging, in response to warming spring temperatures.

Elisabeth Beaubien



Saskatoon (*Amelanchier alnifolia*) in full bloom.

Would you like to join us?

PlantWatching is easy and fun. Start by selecting one or two from 26 possible Alberta plant species. It is best to select your plants on relatively level ground, away from walls or other heat sources. The ideal area is where you live or work, so that you can see your plant regularly as the flower buds swell. Note down the date when it starts to open flowers (first bloom stage). If you can, also note when it has opened about half of the buds (mid bloom) and for some woody plants, the date when leaves first unfurl. Report those dates using the webpage www.naturewatch.ca or on a data sheet that you can then submit by email or post. In early spring, Alberta observers are mailed a colourful newsletter which includes PlantWatchers' interesting comments on the previous season, from around the province. See <http://plantwatch.naturealberta.ca/newsletters/> for past editions. Alberta PlantWatch is part of Canada PlantWatch, which in turn is part of NatureWatch. Our NatureWatch group is working towards a smart phone application for easy reporting outdoors and has an updated webpage.

Alberta PlantWatch will be 30 years old in 2016. We have engaged over 650 Albertans in the first 20 years. Observers seem to enjoy this spring activity – half the 47,000 observations

were from volunteers who reported bloom dates for over 10 years (Beaubien and Hamann 2011b)! Observers find they learn a lot about nature from watching closely every spring.

What can we expect for spring 2015?

A weak El Niño event started to develop in the fall of 2014. In the past, El Niño and the resulting increased Pacific Ocean temperatures have led to warmer and drier conditions in much of Alberta, from the fall through the following spring. Check this page to see an update on the El Niño conditions http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml.

I hope you will join our PlantWatch team! I look forward to hearing from you.

Dr. Elisabeth Beaubien works as a Research Associate with the Wildland Fire group at the University of Alberta and runs Alberta PlantWatch.



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Beaubien E. and Hamann, A. 2011a. Spring flowering response to climate change between 1936 and 2006 in Alberta, Canada. *BioScience* 61: 514–524. doi:10.1525/bio.2011.61.7.6.

See **PlantWatch**, page 12

Anemophily – Wind pollination

Dr. Elizabeth E. Dickson

Have you ever seen yellow powder floating through the air or outlining pools of water in the spring? I am always amazed by the amount of pale yellow dust that coats the porch, driveway, and puddles near my house every year. This occurs when pollen is released by white spruce (*Picea glauca*) and is carried by the wind to receptive female cones. Such an abundance of wasted pollen shows there is little chance of pollen reaching a stigma. Although much pollen may be lost, it is more than just chance when those airborne pollen grains reach a waiting stigma.

Anemophily is the technical term for wind pollination, and 18% of all flowering plant families contain wind-pollinated species (1,4). Gymnosperms (conifers), catkin bearing shrubs and trees (such as within birch, walnut and oak families), and some herbaceous plant species (such as the grass and sedge families) rely predominantly on wind pollination. Some flowering plant families (for example, within the aster family) have both wind- and insect-pollinated species and a few plant species are pollinated both ways (ambophily). Wind-pollinated species tend to grow in moderate to high density populations at higher latitudes, and the vegetation surrounding them is usually open (3,4,6).

Among plant families with wind-pollinated species, different forms of flowers and inflorescences have evolved that enhance the wind's effectiveness to release pollen from the anthers and deposit pollen on stigma surfaces. As there is no need to attract pollinators, the flowers tend not to be showy or carry rewards like nectar. Flowers are generally very small and have small, round, dry pollen grains, which are buoyant in air. In addition, the amount of pollen produced is much greater per ovule (higher pollen to ovule ratios) than is found in insect-pollinated flowers. Because only a

small proportion of pollen actually reaches receptive ovules, wind-pollinated species compensate by releasing large amounts of pollen.

In general, the most favorable wind speeds for wind-pollinated species are low to moderate in intensity (3). Fast flowing air helps release pollen from anthers, while slow flowing air allows pollen to land on a stigma (6). Structures (male inflorescences) that hold up the male flowers are often elongate, bendable and extend outward, whereas their female structures are usually short, rigid and sessile. They are designed so that male parts are prone to shaking and female parts are stiffer (5). Grass and sedge flowers are good examples, having long, loose stamens that shake in the wind releasing pollen and large feather-like stigmas that capture pollen from the air.

Scientists have found that the shape of the branches, bracts, ovules and carpels can influence the movement of air and flow of pollen toward the stigma (5,6). The physics of these structures can help push the air towards the stigma and slow the air enough to allow pollen to drop onto the stigma. In some conifers, the receptive female cone (strobilis) exudes a drop of fluid at night that picks up deposited pollen grains and then retracts by morning pulling the pollen toward the ovule (nucellus) (7).

Although the strategy of wind-pollinated species includes producing an excess of pollen, there are other factors that come into play. The morphologies of the flowers and inflorescences have roles in directing the flow of air currents that shake loose and deposit pollen.



Elizabeth Dickson

Male balsam poplar (*Populus balsamifera*) flower structures.

For further reading:

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3. Culley, T. M., Weller, S. G. and A. K. Sakai. 2002. The evolution of wind pollination in angiosperms. *Trends in Ecology and Evolution* 17(8): 361-369.
4. Friedman, J. and S. C. H. Barrett. 2008. A phylogenetic analysis of the evolution of wind pollination in the angiosperms. *International Journal of Plant Sciences*. 169(1):49-58.
5. Harder, L. D. and P. Prusinkiewicz. 2013. The interplay between inflorescence development and function as the crucible of architectural diversity. *Annals of Botany* 112:1477-1493.
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See **Pollination**, page 12

A hostile takeover: Invasive plants in Alberta

Lindsey Wallis

The sea of purple thistle on the hillside may look gorgeous, and that sunny white and yellow daisy may brighten your day, but both the Canada thistle and the ox-eye daisy are interlopers that can push out native vegetation and upset a delicately balanced ecosystem.

Both flowers, though pretty, are invasive species in Alberta – fast-growing plants with the ability to reproduce quickly and disperse widely, often because of the absence of predators or diseases found in their natural environment. Invasive species are also characterized by a tolerance to a wide range of environmental conditions and the ability to adapt to new surroundings.

Most invasive species are non-native plants that have been introduced to the province either by accident (seeds carried in by birds or brought in on tires, boot treads, boats or farm equipment) or through ignorance (planted in gardens as ornamental plants, such as purple loosestrife and Himalayan balsam or as forage crops for livestock, such as smooth brome and crested wheatgrass).

Invasive species outcompete native species for resources such as light, water and nutrients, creating monocultures that are harmful to habitat biodiversity and can upset natural cycles such as fire frequency. This negatively affects not only native plant species, which are often eradicated, but also birds, mammals and other species that may rely on the native plants for cover, nesting sites or forage. Worldwide, invasive species are generally considered to be the second greatest threat to biodiversity after habitat destruction. Endangered species are especially at risk – in the United States, approximately half

Marsha Hayward



Butterfly on bull thistle (*Cirsium vulgare*), an invasive plant.

of the species listed as threatened or endangered under the *Endangered Species Act* are considered to be at risk primarily because of competition with or predation by non-indigenous species.

In addition, some invasive species are unpalatable or even toxic to livestock and can reduce quality and yield of agricultural products. A few invasive species are also toxic, either by contact or ingestion, to humans and pets.

The Weed Control Act

The *Weed Control Act* was enacted in Alberta in 1907 to prevent the spread of invasive plants. In 2010, after extensive work with stakeholders (including the ANPC), the government revised the Act and reclassified invasive plant species into two categories, Prohibited Noxious and Noxious.

Prohibited Noxious Weeds are plants that are not currently found in Alberta or are found in so few places that eradication is possible. Under the *Weed Control Act* a person has a responsibility to “destroy a prohibited noxious weed

that is on land the person owns or occupies.” There are 46 weeds listed as Prohibited Noxious in the province of Alberta.

A **Noxious Weed** is one that is usually considered too widely distributed to completely eradicate. Weeds in this category are most often managed by “containment.” Under the *Weed Control Act*, a person “shall control a noxious weed that is on land the person owns or occupies.” Creeping (Canada) thistle is a noxious weed.

Nuisance weeds, such as dandelion, are no longer on the provincial list, but may be regulated by cities or counties.

Agronomic species that invade native ecosystems, such as smooth brome, timothy, Kentucky bluegrass and crested wheatgrass, are not considered weeds by the province, although ANPC does (Posey’s Rogues list). These species can cause serious problems for reclamation and can invade native prairie and forest.

See **Invasive Plants**, page 5

Invasive Plants, from page 4

Identification and control

Many invasive species are already widely established across our province. No matter whether you are managing for agriculture, preservation, forestry, grazing or a decorative garden, control of invasive species can be a challenge.

Identification of invasive species in a landscape is the first step in the province's Invasive Species Management Framework. The Framework splits invasive species into three categories – Established Species have existing data on their location, population and movement patterns; New Invasive Species are data deficient, and therefore more unpredictable in their movement patterns; Potential Invasive Species are ones which have not yet been identified in Alberta but which occur elsewhere in similar environments. Early identification of potential invasive species to prevent an invasion is the most cost-effective management option. While government ministries are responsible for identifying invasive species in their respective jurisdictions, NGOs, land owners, community groups and the general public are invaluable resources when it comes to gathering information.

Prevent invasion

Once a species has been identified on a landscape, there are three possible options. The most cost-effective option is usually prevention. This is achieved by identifying the ways these species are introduced and implementing education and enforcement campaigns, which can intercept species at points of entry or change behaviours that may cause introduction of the species.

Control, contain, eradicate

The most common option is to “control, contain, eradicate.” For some invasive species, populations may already be too widespread or control methods are unable to entirely eliminate the species. In these cases, measures will instead attempt to control the population and limit spread, using the following methods:

- **Hand pull.** Bag and burn plants with flowers or seeds. Some flowers (some Asteraceae) will produce seed after picking.
- **Mow** before flowering. Note that some weeds continue to flower and produce seeds below the height of the mower.
- **Till** fallow fields before seed production.
- **Promote** the growth of desirable plants so they outcompete the invasives for water, nutrients and light (this can be especially effective for dandelions in lawns).
- **Graze** with cattle or goats. Grazing requires intense management and is time sensitive.
- **Mulch** ornamental gardens to suppress weed growth through a physical barrier, e.g., plastic, bark chips and straw. Plastic mulch is best reserved for special situations, like solarization, as it will eventually break down into the soil.
- **Apply bio-controls.** Utilizing “natural enemies” of a particular weed can help manage infestations. Bio-control agents can include insects or fungal pathogens. This has been effective in the control of some species of toadflax in BC, as well as creeping thistle. There is the risk that these measures could also attack native species, which is why there are stringent guidelines in place to ensure that the bio-controls are species specific. This necessarily means that progress on this front is very slow.
- **Apply herbicides.** Herbicides can be very effective on some species, but if herbicides are contemplated, first read the ANPC policy on use of herbicides.

Sometimes the Framework will direct that no action be taken if the management of an invasive species is not economically feasible because the spread is too extensive, or if the environment has the capacity to control the spread of the invasion. Another reason for no action being taken is that the affected region may “prefer the status quo despite the potential

problems associated with an invasive species.”

One example of this management strategy is found in agronomic species. These include timothy, sweet clovers, crested wheatgrass and smooth brome – species that were introduced to the Prairies more than 100 years ago in a misguided effort to improve the productivity of pastures. These species remain good forage for livestock, but timothy, Kentucky bluegrass and smooth brome have aggressively invaded native rough fescue landscapes and outcompete the native vegetation. It is difficult to impossible to reclaim the lands already colonized by these invader species, but it is possible to check their spread by minimizing disturbance of the soil in native prairie environments. If the native landscape is healthy, the invaders cannot colonize the area, but once the land is disturbed, either by agriculture, oil and gas development or other reasons, the invasive grasses will take over and rough fescue will not be able to reestablish itself.

What can you do to help?

- Prevent the spread of invasive species by cleaning hiking boots, boats, equipment and other items on which invasive species could hitch a ride.
- Use certified weed-free seed and feed.
- Feed hay in areas that can be regularly checked for weed growth in case the hay is contaminated with weed seeds.
- Plant your garden with native species or non-invasive ornamentals (purchase plants from a “Certified Invasives-Free Retailer”) (City of Calgary website).
- Maintain a healthy garden – a well fed, properly watered and disease- and pest-free garden is more resistant to invasive species. Weed control is the key – weeds also thrive if a garden is well fed, watered, disease and pest-free.

See **Invasive Plants**, page 6

Invasive Plants, from page 5

- Manage invasive species on your property using the province's Invasive Species Management Framework (see control methods above).
- Dispose of invasive species properly – remove invasive plants before flowering and burn them or bag for landfill disposal. Never compost invasive species.

Examples of invasive species in Alberta

Leafy spurge (*Euphorbia esula*) (Noxious)

Introduced as an ornamental in the 1800s, all parts of this plant contain a milky coloured latex that can poison livestock and cause skin irritation on humans. The roots spread, forming dense patches and excluding native vegetation. Fish Creek Park in Calgary and nearby area are extensively infested. Infestations are encroaching on the small patches of grasslands on south-facing slopes along Whitemud Creek in Edmonton. Severe infestations often occur after a fire and prevent recovery of the previously established vegetation.

Smooth brome (*Bromus inermis*)

A robust grass, which spreads vigorously via an underground root system, as well as on the wind. Infestations spread and form near-monocultural patches, eliminating most of the original vegetation once established. This species' spread is limited mainly by moisture – it prospers in moist areas but is limited to snowdrift areas in drier prairie. Mature plants are unpalatable to livestock as fodder. It is not controlled by fire, but applying herbicide with a wick applicator after a spring fire can help, since it is one of the first plants to re-establish. It is too widespread to contain and is not listed in the *Weed Control Act*.

Bigheaded knapweed (*Centaurea macrocephala*) (Prohibited Noxious)

A long-lived perennial, bigheaded knapweed is still widely sold as seed, plants and cut/dried flowers. It needs disturbance to establish a colony but

is then difficult to control. It competes with native vegetation for nutrients and light.

Creeping (Canada) thistle (*Cirsium arvense*) (Noxious)

A colony-forming aggressive perennial that spreads primarily by its creeping root system. Dense riparian infestations can impact wildlife by reducing food and access and nesting cover for waterfowl.

Purple loosestrife (*Lythrum salicaria*) (Prohibited Noxious)

Used for medicinal purposes in Ancient Greece, purple loosestrife became a favoured ornamental pond plant in English gardens. Referred to as "the beautiful killer," it is a hardy perennial that takes over ponds, beaches, marshes, farm dugouts and irrigation canals. A mature plant can produce millions of seeds. It forms dense stands that exclude native species including mammals, birds and native plants. Seedlings quickly develop a strong taproot from which new shoots arise annually. It can also disrupt water flow in wetlands.

Common dandelion (*Taraxacum officinale*)

Originally from Eurasia and cultivated for a variety of medicinal purposes, it arrived in North America with early settlers. As much as homeowners hate it, the dandelion is not considered a noxious weed in Alberta. The best way to control it is to maintain a healthy lawn or use alternate landscaping methods.

Yellow toadflax (*Linaria vulgaris*) (Noxious)

Brought over from Europe over 100 years ago as an ornamental plant, it has escaped and become a serious problem from rangelands to mountain meadows across North America. This perennial plant reproduces from seed, but the primary form of reproduction is by sprouting from its extensive, creeping root system (rhizomes). The ability of the plant to form colonies allows it to crowd out other vegetation. Yellow toadflax is easily confused with

leafy spurge before flowering, but yellow toadflax stems do not contain the milky latex that leafy spurge does. It is also known as common toadflax, butter and eggs or spurred snapdragon.

Ox-eye daisy (*Leucanthemum vulgare*) (Noxious)

This attractive, hardy "daisy" is often seen in gardens, particularly as a component of "Wildflower" seed mixes. The ox-eye daisy has also invaded pastures and natural areas, reducing biodiversity and decreasing crop yield. It is unpalatable to livestock and wildlife. It reproduces both by seed and a shallow root system. It is difficult to differentiate from shasta daisy, a hybrid of this and several other species. Shasta daisies are under review as a possible invasive species. Any daisy resembling ox-eye daisy grown for ornamental purposes should be dead-headed before seed matures, and eliminated if it shows a tendency to spread.

Yellow clematis (*Clematis tangutica*) (Noxious)

A climbing vine with yellow pendant flowers and fuzzy white seed heads, this invasive species is aggressive once established, displacing native flora and increasing fire hazard. Initially found mostly in urban industrial areas, it is rapidly expanding its range and is currently moving into mountain parks. Vines grow rapidly along the ground or will climb and cover bushes, fences or structures. It is widely available as an ornamental plant under a variety of names including golden clematis.

Himalayan balsam (*Impatiens glandulifera*) (Prohibited Noxious)

This plant is a garden ornamental introduced in the 19th century. It grows rapidly, outcompetes native vegetation and often dominates vegetation stands in riparian area. First reported in Edmonton natural areas, it is an aggressive self-sower. It is likely as invasive as purple loosestrife, if not more so. Native to the western Himalayas, it was introduced to Kew Gardens in the early 1800s.

See **Invasive Plants**, page 9

New weed species for Edmonton: Burnet-saxifrage

Patsy Cotterill

This year impending development of a trail system in a part of the North Saskatchewan River valley in the west end of Edmonton prompted a group of us from the Edmonton Nature Club and the Edmonton Native Plant Group to do some careful botanizing in this area, now known as Oleskiw River valley. Our visits spanned May through October.

The Oleskiw area is a great arc or bow of old floodplain land very gently sloping towards the river from a steep escarpment on the western edge, following the curve of the river. Most of the area is occupied by an old hayfield, the legacy of decades of cultivation under private ownership. Forming a deep fringe closest to the river, however, is balsam poplar forest with a native shrub understorey. This is gradually replaced on the upland side by a younger, successional aspen forest. The bank on this west side of the river is steep but low, forming a distinct terrace.

This summer we discovered that the hayfield and areas along the forested trails contained very large populations of an umbelliferous weed from Eurasia not known elsewhere in Edmonton and uncommon in Canada as a whole: burnet-saxifrage, *Pimpinella saxifraga* L. This was not recognized in the environmental impact assessment that was done for the area in 2013, even though the basal leaves of this plant are evident in spring, and the fruiting heads persist through the fall and are even visible above snow cover. Nevertheless, the extent of the infestation indicates that the plant has been there for a long time, presumably decades.

The following species description is based on literature and on plant specimens from Oleskiw.

Burnet-saxifrage *Pimpinella saxifraga* L.

Family: Apiaceae (Carrot)

Herbaceous perennial, with erect, sparingly branched, solid stems that grow 70-100 cm high. Stems are short-hairy and shallowly ridged and become glabrous and purplish as they mature. Some basal leaves are once-divided (once-pinnate) into paired oval, toothed leaflets and a terminal leaflet. Other basal and all cauline leaves are twice-divided into narrow segments which give them a more feathery appearance.

Flower clusters are borne terminally in compound umbels, with 12-16 primary rays, each 2-2.5 cm long. The flowers are borne singly in small, dense umbels on pedicels 3-4 mm long, with 12-17 flowers in each secondary umbel.



S. Coulson



S. Coulson

Flowers are white, 2-3 mm in diameter, lack sepals, and have 5 white, rounded petals alternating with 5 white stamens. A divergent, 2-branched style projects from the top of the stylopodium and persists in young fruits. Fruits are round-oval, ca. 2 mm long, glabrous and prominently few-ribbed.



S. Coulson

According to the British Flora (Stace 1999)¹, the base of the stem is sheathed by a mass of fibres, but in our specimens the remains of the leaf bases appear to be more membranous.

Burnet-saxifrage can be readily confused with caraway, *Carum carvi*, which is a much more common weed of pastures and waysides in western Canada. However, the basal leaves of caraway are all divided into filiform segments, and the plant is characteristically aromatic. It is biennial rather than perennial.

See *Burnet-saxifrage*, page 8

Burnet-saxifrage, from page 7

Burnet-saxifrage, a native of temperate Europe and Asia, occurs in dry grassland and open rocky places, which are often calcareous.

Distribution in North America:

burnet-saxifrage is recorded from several states in the eastern U.S., Montana and Washington. In Canada it occurs in Ontario, Quebec and the Atlantic provinces, excepting Labrador. Edmonton specimens have been deposited in the University of Alberta's vascular plant herbarium (UALTA).

Notes: The population in Oleskiw River valley is the only known occurrence of this plant in Edmonton (and likely in the province, as no herbarium specimens had previously been deposited in the University of Alberta vascular plant herbarium).

The infestation in the old hayfield is probably the result of agricultural activity or of a garden escape. The basal leaves can occupy extensive patches of open ground, and even form ground cover under smooth brome, the predominant component of the pasture. Only a proportion of the population produces flowering stems, possibly because the plant requires sufficient light and/or other conditions to flower. Unfortunately, burnet-saxifrage has also penetrated into the riparian forest area, apparently along the informal trails. An explanation of why the plant has not already spread to similar habitats in Edmonton may be the hitherto limited public access to the Oleskiw land. Until recently the area was only accessed by golf course personnel who dump vegetation waste at the base of the escarpment on their own property. More recently still, public access has been created by means of a gravel trail leading from a subdivision on top of the escarpment to close to Fort Edmonton footbridge.

Control of burnet-saxifrage

Wisconsin is considering a Restricted Status for this weed.² Suggested control methods are hand-pulling or digging (taking care to remove all roots), mowing to reduce seed set, and application of glyphosate.

Recommendation: We recommend that the City of Edmonton set up a program of weed control immediately, particularly aimed at preventing the spread of burnet-saxifrage to other parts of Edmonton river valley during footbridge and trail construction and afterwards, if necessary, because of the resulting increased public access to Oleskiw River valley. (Note that in the specimens collected the root did not come up cleanly, suggesting that digging may not be an efficient method of control.) Removal of plants should be concentrated on the trails in the riparian forest, where they interfere with native ground cover. Mowing in the field and along the main trail should help control this weed, which is not rhizomatous and reproduces by seed. (Large-scale infestations may occur from the seed bank following clearing for trails or transplanting.) Its confined presence in the field can probably be tolerated, at least for the time being.

Yellow or lady's bedstraw (*Galium verum*) in the Oleskiw River valley

Another unusual Eurasian weed present in the hayfield and forested areas in the Oleskiw River valley is yellow or lady's bedstraw, *Galium verum*. A perennial herb, growing to a maximum of 80 cm, this is rhizomatous and can form dense patches, both in the field and in open areas in the

riparian forest, where again it seems concentrated along the trails. It has small yellow flowers in dense clusters, compared with the native northern bedstraw (*G. boreale*), also present, which has white flowers in somewhat more open clusters. In *G. verum* the leaves are in whorls of eight on hairy, rounded stems, and are very narrow and pointed; in *G. boreale* they are in whorls of four and are broader, with three distinct nerves. Fruits are densely hairy in *G. boreale* but smooth in *G. verum*. A hybrid between these two species appears to occur sporadically in both the field and the forest. It has leaves with revolute margins in whorls of six to eight as in *G. verum*, together with smooth fruits, but its flowers are white and its leaves intermediate in width between the two species and with rounded tips; its stems are square and smooth. Yellow bedstraw occurs widely across North America except for the far south but is apparently absent from Saskatchewan.

Rare plants in the Oleskiw River valley

Three rare native species occur in the riparian forest, of which the most interesting is bristle-leaved sedge, *Carex eburnea*. This very fine-leaved, clumped sedge occurs widely across Canada and much of eastern U.S. but is uncommon in the Edmonton area. Its habitat is river terraces, including open-wooded areas. Like burnet-saxifrage and yellow bedstraw, it is a calciphile. In the Oleskiw forest, it favours the slightly raised edges of the informal trail and shallow banks in partial shade. With some further exploration we confirmed that numerous populations of this sedge also occur along the river terraces paralleling the south end of 199 Street in the west. A record of the plant from Fulton Creek ravine near downtown was investigated, but no plants were found there this summer.

GPS linear polygon recorded for *Carex eburnea* along riverside trail, Oleskiw, from south to north: From NAD 83 12U 0327902 E 5929088 N (635 m elev.)

See **Burnet-saxifrage**, page 9



Patsy Cotterill

Burnet-saxifrage, from page 8

to 0328195E 5929523 N (628 m elev.), a distance of approx. 435 m. About 61 populations (patches or isolated plants) were recorded in this stretch. One outlying population was recorded at 0328086E 5930015 N (620 m elev.).



Bristle-leaved sedge (*Carex eburnea*) habitat (above) and specimen (below).



The other tracked species occurring in Oleskiw are green muhly, *Muhlenbergia racemosa*, a grass which grows on dry, eroded slopes in various places in the river valley and ravine system; and flat-topped white aster, *Doellingeria umbellata* var. *pubens*, a rhizomatous species forming patches in moist parts of forests both in the river valley and in the Edmonton area generally.

Endnotes

1. Stace, C. 1999. Field flora of the British Isles. Cambridge University Press.
2. See <http://dnr.wi.gov/topic/Invasives/fact/Pimpinella.html>. Website supplied by Alec McClay. ♦

Invasive Plants, from page 6

Creeping bellflower (*Campanula rapunculoides*) (Noxious)

Creeping bellflower is found in lawns, gardens, fence lines, roadsides and occasionally in cultivated fields. It is sometimes planted in ornamental gardens but spreads into adjacent areas by underground root systems (rhizomes) as well as by seed. Roots can travel under fences, and even under sidewalks or roads. It can survive periods of drought and tolerates a range of environmental conditions. Its creeping root system and resistance to some herbicides makes it extremely difficult to eradicate.

Resources

Alberta Invasive Species Council website: Weed Identification Book. <https://www.abinvasives.ca/resources>.

Alberta Agriculture and Rural Development. Diseases/Insects/Pests: Weeds. <http://www.agric.gov.ab.ca/app21/infopage?cat1=Diseases%2FInsects%2F%20Pests&cat2=Weeds>

Alberta Native Plant Council: Posey's Rogues: a gallery of exotic invasive and non-invasive plants of Alberta. http://www.anpc.ab.ca/wiki/index.php/Main_Page

Alberta Weed Spotter App for smartphones: available at the app store

City of Calgary: Invasive Plant Prevention and Management. <http://www.calgary.ca/CSPS/Parks/Pages/Planning-and-Operations/Pest-Management/Invasive-plant-prevention-and-management.aspx>

City of Calgary: Garden centres free of invasive plants. <http://www.calgary.ca/CSPS/Parks/Pages/Planning-and-Operations/Pest-Management/Invasive-plant-prevention-and-management.aspx>

City of Edmonton: Weeds. http://www.edmonton.ca/for_residents/pest_management/weeds.aspx ♦

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Native plant portrait: Pussy-toes or everlasting (*Antennaria* species)

Dr. Al Fedkenheuer

If you are looking for a native plant to use as low growing ground cover, this genus of the sunflower family is an excellent choice. This is one of the more difficult plant genera in which to differentiate various members, as there are 14 species identified in *Flora of Alberta*, originally published by E.H. Moss and revised by J.G. Packer in 1983. This article introduces two of them, *Antennaria parvifolia*, which may also be called *A. nitida*, (small-leaved pussy-toes; small-flowered everlasting) and *A. rosea* (rosy pussy-toes; rosy everlasting). This does not mean the others should not be used, it just means I have limited space. The name “pussy-toes” comes from the impression that the flower heads resemble an upside down cat’s paw.

Small-leaved pussy-toes (*A. parvifolia*) can provide an excellent low-growing ground cover in a wildflower or rock garden. It has small greyish leaves that hug the ground, generally only getting 1–3 cm tall while the flower stalks range from 10–25 cm tall. The flower stalks grow from greyish basal rosettes of leaves and have a cluster of small, whitish flower heads which appear in June–July attracting bees and butterflies. The fluffy seed head is visually attractive and is present for up to a month after flowering. This species forms dense mats and expands via creeping leafy branches which take root and develop new plants. Plants can be divided or started from seeds collected when mature. Store the seeds in a paper bag in your garage or basement and start indoors in pots or direct seed outside. Cover very lightly with soil. Small-leaved pussy-toes love full sun but do well in partial sun too. It is drought tolerant and widespread in Alberta and is well adapted to the harsh climate in Calgary.

Rosy pussy-toes (*A. rosea*) is also a mat-forming species but doesn’t hug the ground as tightly as small-leaved

pussy-toes and has leaves that are somewhat larger and more pointed. The rosettes of densely white woolly basal leaves are under 3 cm in height with flower stalks of 15–20 cm in height. There are a few small leaves on the flower stalk. The flower heads are in a cluster but instead of white, translucent bracts as in small-leaved pussy-toes, rosy pussy-toes has bracts that are pinkish at the tips. It too is an excellent ground cover plant and attractive in rock gardens when flowering and after with fluffy seed heads. Propagation is as above. This species is drought tolerant and grows well with medium soil moisture in full to partial sun on a variety of soil types. Good topsoil is not required to grow either species.



Rosy pussy-toes (*Antennaria rosea*).



Small-leaved pussy-toes (*Antennaria parvifolia*).

Dr. Al and Pat are owners of ALCLA Native Plant Restoration Inc. of Calgary and have been growing and out-planting Alberta native plants for over 30 years.
Email: fedkenhp@telus.net ♦

Digging baby’s breath – again

Kimberly Gould

Digging out weeds is back breaking even when freeing them from the relatively loose soil of a garden bed. How much more difficult is it to dig out the 30 cm tap root of baby’s breath (*Gypsophila paniculata*)? A coalition in Medicine Hat found out.

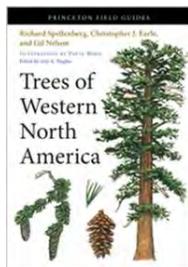
Just north and east of the city lies the Rangeland Environmental Reserve, 32.4 ha (80 ac) isolated to protect its tiny, rare denizen, tiny cryptanthus (*Cryptantha minima*). Work on eliminating the noxious weed began in 2012 when plants were cut and the tops removed. More successful, in 2013, the top 30 cm were excavated and the root broken or pulled. Like the tops, these roots were buried in the local landfill.

The 2013 and 2014 extractions happened because of Sean Allen’s initiative. He approached Calfrac for collaboration. Over 45 volunteers joined in, including members of the Grasslands Naturalists and Hyperion Research. Together they toiled for 5 days in May to extract 22,000 plants! This massive ordeal amounted to 1,235 kg of plants gathered and hauled to the landfill for burial.

The effort in 2014 was a success in part due to the extraction the previous year. Rather than a site with baby’s breath throughout, the plants were found primarily in catchment and disturbance areas. These included a well head and access road, the fence line, and the eastern edge of valleys. It is expected that next year (2015) will be further advanced by this success, and seedlings may not be as large.

The project was well received by the media and citizens throughout the province and became a finalist for an Emerald Award. Although the award went to someone else, all the organizations and individuals involved should be very proud of the difference they have made. ♦

Trees of Western North America



Review by Kimberly Gould

Trees of Western North America is filled with colour illustrations of trees and large shrubs. In the first 20 pages, definitions are matched with diagrams of leaf margins, tips and bases as well as flower arrangements and parts. When paired with the glossary in the last pages, the intrepid botanist can describe the characteristics they find in their specimen be it tree, shrub or forb. Handiest of all might be the quick guide to leaf types for coniferous species and leaf shapes for some typical flowering trees.

The introduction admits that the separation of trees from shrubs is arbitrary based on height. In general, all the species included are larger than 2 m, or taller than the average person. However, there are several willows that exceed this limit and are not listed. See the table (right) for what is included and omitted.

The sorting of species within families varies throughout the guide. In the case of the willows, they are organized from those with narrow, linear leaves to those with thicker, rounder leaves. In other families the species are listed alphabetically.

Each species has an illustration and a full description including bark, twigs, leaves, cones or flowers, and fruit. The habitat and range are described, often with an elevation. Some species have distribution maps, but not all. Species are listed by common name with scientific name and authority before any synonyms. Immediately beneath this is the QuickID, pointing out the specific characteristics that distinguish the species from others in the same genus

and family. These characters are always included in the diagram, usually with a depiction of the growth form and a close-up of leaves or needles. Cones, pollen cones, fruit and seeds are varyingly included or omitted to reflect the uniqueness of the species. This can be disappointing if looking for an example of the seed and finding only cones, but keeps the reader focused on the key attributes.

Several common horticultural species are included as well. This is very useful for urban botanists who want to specifically identify a tree in a neighbouring yard or boulevard. Unfortunately, it isn't always clear immediately upon looking at a species in the guide that it is introduced rather than native. The habitat/range section always states this, but introduced are filed with the native throughout.

This guide is great for identifying trees throughout western Canada and the United States, particularly for botanists on the move. Of course, with only a few dozen trees in Alberta, this guide is probably overkill for those staying within the province.

Family	Included	Excluded (species <2m tall not listed)
Pinaceae	All species in Moss (1983)	
Taxaceae	<i>Taxus brevifolia</i> (western yew)	
Salicaceae	All <i>Populus</i> species in Moss (1983) except hybrids	
	<i>Salix exigua</i> (narrowleaf willow or coyote willow)	<i>Salix boothii</i> (Booth's willow or blueberry willow)
	<i>S. interior</i> (sandbar willow)	<i>S. barclayi</i> (Barclay's willow)
	<i>S. lasiandra</i> (Pacific willow)	<i>S. drummondiana</i> (Drummond's willow)
	<i>S. amygdaloides</i> (peachleaf willow)	<i>S. lucida</i> (shining willow)
	<i>S. petiolaris</i> (meadow willow)	<i>S. lutea</i> (yellow willow)
	<i>S. sitchensis</i> (Sitka willow)	<i>S. maccalliana</i> (MacCalla's willow)
	<i>S. arbusculoides</i> (littletree willow)	<i>S. planifolia</i> (diamondleaf willow)
	<i>S. discolor</i> (pussy willow)	<i>S. pseudomonticola</i> (false mountain willow)
	<i>S. proxima</i> (MacKenzie's willow)	<i>S. serissima</i> (autumn willow)
	<i>S. pyrifolia</i> (balsam willow)	
	<i>S. scouleriana</i> (Scouler's willow)	
	<i>S. alaxensis</i> (feltleaf willow)	
	<i>S. bebbiana</i> (Bebb's willow)	
Betulaceae	All species >2m tall in Moss (1983)	
Rosaceae	<i>Amelanchier alnifolia</i> (saskatoon)	
	<i>Prunus pensylvanica</i> (pin cherry)	
	<i>Prunus virginiana</i> (chokecherry)	
	All <i>Sorbus</i> species in Moss (1983)	
Fabaceae	<i>Caragana arborescens</i> (introduced)	
Sapindaceae†	All species in Moss (1983)	
Rhamnaceae	<i>Ceanothus velutinus</i> (tea bush)	
	<i>Rhamnus catharticus</i> (buckthorn)	
Adoxaceae*	<i>Sambucus racemosa</i> (elderberry)	<i>Viburnum opulus</i> (high-bush cranberry)

† Listed as Aceraceae in Moss (1983)

* Listed as Caprifoliaceae in Moss (1983)

Spellenberg, Richard, Christopher J. Earle & Gil Nelson. 2014. *Trees of Western North America*, edited by Amy K. Hughes. Princeton University Press, Princeton, New Jersey. <http://press.princeton.edu/titles/10216.html>. ♦

Pollination, from page 3

Wind pollination has evolved independently in several lines of flowering plants. It is likely that insect pollination evolved prior to wind pollination and is only occasionally reversed (2). Environmental changes that reduced the availability of insect pollinators may have been an important factor driving the evolution of wind pollination (3). Evolution of wind pollination occurs more frequently in lineages with monoecious (male and female flowers on the same plant) or dioecious (male and female flowers on separate plants) species, rather than lineages with bisexual flowers (4).



Elizabeth Dickson

Sedge (*Carex retrorsa*) plants with male flowers (brown) above and female flowers (green) below in the inflorescence. ♦

PlantWatch, from page 2

Beaubien E. and Hamann, A. 2011b. Plant phenology networks of citizen scientists: recommendations from two decades of experience in Canada. *International Journal of Biometeorology*. Volume 55, Number 6, 833-841. doi:10.1007/s00484-011-0457-y. Direct link: <http://www.springerlink.com/content/jk756680n80n847k/>

Golden Harvest Organics–Phenology. <http://www.ghorganics.com/Phenology.html>

Scammell, Robert. 1995. *The Phenological Fly*. Johnson Gorman Publishers. 65 pages. ♦

News and Events

Botany Alberta 2015

Last year's attendees identified the Porcupine Hills of SW Alberta as an ideal location for Botany AB 2015. Is this a region that you'd like to visit with other plant geeks? Or do you have a natural area to suggest for Botany AB's 2015 weekend?

If you'd like to be involved in Botany AB at Porcupine Hills or have another great suggestion, please email info@anpc.ab.ca with BOTANY AB in the subject line. Ideally, the area will have a group campground and enough interesting vegetation to occupy two days of field activities.

ANPC Workshop 2015

The 2015 workshop will focus on non-vascular species and will be held on the weekend of April 11, 2015, in Sundre, AB.

Some volunteers are already hard at work organizing the workshop. Please join us with your ideas and enthusiasm. Email s.mcandrews@shaw.ca with ANPC WORKSHOP in the subject line.

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.

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Submission deadline for the next issue:
January 15, 2015

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

Rare Plant Study Groups

There are four rare plant ecology study groups associated with ANPC. Three meet throughout the year, indoors through the fall and winter and outdoors through the spring and summer. Beginning in October or November and running through until April, the following groups generally meet monthly. 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.**

Central Alberta Rare Plant Study Group (Edmonton)

Location: University of Alberta Herbarium, B-613 (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 Rare Plant Study Group (Calgary)

Location: University of Calgary Herbarium, Biological Sciences Basement. Date: First Saturday of the month; October to April inclusive. Time: noon to 4:00 p.m. Facilitator: Heide Blakely (enzian44@shaw.ca).

Medicine Hat Rare Plant Study Group

Location: Medicine Hat College Herbarium (L155). Date: Third Saturday of the month (except February) from noon to 3:00 p.m. 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. Contact Marsha Hayward for more information (wildloonart@telus.net).

