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



Cover photo: Patricia McIsaac
Hoar frost on willow branches,
northern Alberta.

Fascinating Ferns: Part 2

Marsha Hayward

Here we are, back to the forest and other unique spaces of the Alberta boreal, where visitors can discover members of the genera belonging to the Pteridophyta Ferns and Fern Allies. As we have already learned – ancient and amazing is the word!

And who doesn't love our beautiful wood ferns, such as *Athyrium filix-femina* (Linnaeus) Roth ex Mertens or common lady fern, a member of the Athyriaceae Lady Fern Family, which has telltale, drooping delicate tips, alternate pinnae, usually hook-shaped indusium, and sori along the veins that extend to the pinnule margin. This relatively uncommon and deceptively delicate-looking fern is an inhabitant of sheltered boreal streambeds and other moist places (Figure 1).

I have noted (thus far) that this gorgeous fern usually grows in lower to upper boreal uplands more so than at lower elevations. So named by Carolus Linnaeus, the *Athyrium filix-femina* (L.) is more feminine in appearance than the differently classified *Dryopteris filix-mas*. Apparently not a guy and a gal relationship after all!

Of course, I am NOT going into the world of taxonomic classification, but if I were to attempt to understand this baffling world, I would also mention that the Wood Fern Family

Dryopteridaceae (to which the lady ferns belong) was also once called Aspidaceae. But that's in another world.

The *Athyrium filix-femina*, also called subarctic lady fern, is likely to be endemic to northern and western Canada (this is exciting to me, as I was in the Yukon this summer learning about amphi-Beringian species). The *Athyrium filix-femina* var. *cyclosorum* (Ruprecht) T. Moore, or western lady fern, is a variety of this fern. A very rare variety of lady fern called *Athyrium distentifolium* var. *americanum* (Butters) Maxon, or alpine lady fern, grows in western Canada, and is considered a coastal and primarily alpine species in Alberta. It also grows in the Yukon and Alaska.



Figure 1. Common lady fern (*Athyrium filix-femina*)

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Fascinating Ferns, from page 1

The other is *Athyrium filix-femina* var. *angustum* (Willdenow) G. Lawson, commonly called northern lady fern, which is a more northeastern species.

One of my favourite groups of forested ferns, which although not as tall (up to 2 m) and conspicuous as the *Matteuccia struthiopteris* ostrich fern, are the medium-sized members of the Dryopteridaceae Shield Fern Family (20-100 cm), which bring a feeling of magic to forested clearings.

One of the more commonly found ferns of this family is the beautiful *Dryopteris carthusiana* narrow spinulose shield fern (Figure 2). *Dryopteris carthusiana* can easily be mistaken from a distance for *Dryopteris expansa*, *Athyrium filix-femina*, or *Dryopteris expansa* broad or spreading shield fern; all three have fronds [blades] that arise from a central base and fan outward with a similar-looking form. The key difference between *D. carthusiana* and *A. filix-femina* and *D. expansa* is that the *Dryopteris carthusiana* narrow spinulose shield fern has opposite pinna, similar-looking lowest pinnules (sub-leaflets), lance-shaped 2-3 times pinnately divided leaves, and – the coolest thing of all – it remains alive throughout the winter months. Even beneath the snow!

If you tend to feel winter weary, pay attention to moist, shady places (often green alder-filled areas), where the *D. carthusiana* may be found in summer. Once located, check back in the winter months, carefully push back the snow, and you will find a wonderful green surprise. Be sure to re-cover the fern fronds with snow afterward, and take heart, as spring is not long to follow.

And if you are still feeling confused, it is because most of the forested wood ferns are very similar in appearance. Take the rare *Dryopteris cristata* (L.) A. gray crested shield fern (currently ranked as S3), for example. It's also evergreen and looks very similar to the *Dryopteris carthusiana*, except that the lower leaf stalk is about one-third as long as the blade, and the leaflets vary in width and shape (Figure 3). This fern



Figure 2. *Dryopteris carthusiana* in the Birch Mountains, AB, area

has leathery leaves and is only 2 times pinnately divided, instead of the 2-3 times pinnately divided *D. carthusiana* narrow spinulose shield fern.



Figure 3. *Dryopteris cristata* (left) versus *Dryopteris carthusiana* (right)

And (yes of course, there is an *and!*), these two ferns can hybridize, so that they contain characteristics of both parents. I have lost track of the number of times that I have sat down puzzled, baffled and just-plain frustrated at my attempts to sort out which fern is hanging out with which other fern! Sigh.

And the whole thing about indusium and sori. That's something we need to reserve for a tabled write-up with detailed comparisons (upcoming).

Okay. Enough of the frustrating wood ferns! Let's have a look at a much smaller fern that inhabits the forest floor. And that family is the Cystopteridaceae Bladder Fern Family and namely the *Gymnocarpium* oak ferns.

The most common of these is *Gymnocarpium dryopteris* common oak fern. These beauties often grow in

colonies of interlaced fronds just above the forest floor, within moist shady places. A real beauty (Figure 4).



Figure 4. Common oak fern (*Gymnocarpium dryopteris*)

Of course, it is easy to confuse these ferns with *Gymnocarpium continentale* [*Gymnocarpium jessoense*] or the rare *Gymnocarpium disjunctum* [S3]. The *G. disjunctum* has longer leaf blades, with the lowest sub-leaflets being short stalked and *markedly* unequal in length, whereas the *G. dryopteris* has shorter leaf blades, with the two lower leaflets mostly stalkless (note: mostly), which are equal in length. The *G. continentale* [*G. jessoense*] has much stiffer leaves, which are glandular beneath.

Another amazing but rare fern, which grows primarily in boreal uplands habitat, is the *Phegopteris connectilis* northern beech fern. This beautiful fern likes secret, moist places within sheltered micro-habitat ecology. I simply love the way its two lower leaves bend downward and away from the rest of the frond. Look for this in higher elevations along creeks and steep wooded ravines of the uplands (Figures 5 and 6).



Figure 5. Beech fern found in the Marten Hills, AB

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Figure 6. Northern beech fern
(*Phegopteris connectilis*)

I would highly suggest heading outdoors for a closer look at this confusing but beautiful world of forested ferns. And watch for fairies within the groves!

There will be more to come in Part III.
All photos by Marsha Hayward.

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Puzzling Pairs Through the Years

Lorna Allen

Since 1988, the Alberta Native Plant Council newsletter *Iris* has brought to the ANPC membership articles on all things native plant-related. Periodically, a series called “Puzzling Pairs” (or the occasional “Tricky Trio”) has been published to help the plant observer to sort between similar species. So, if you are finding any of the following sets of species puzzling (or tricky), just head to the issue of *Iris* posted on the ANPC website for some help. Remember though that there have been ongoing taxonomic changes, so some of the names may have changed. The table below uses current taxonomy. Common names are from Kershaw 2019.*

Species Discussed	Issue of <i>Iris</i>	Author
Thinleaf snowberry (<i>Symphoricarpos albus</i>) Western snowberry (<i>Symphoricarpos occidentalis</i>)	No. 49 Summer 2005	Lorna Allen
Paper birch (<i>Betula papyrifera</i>) Alaska paper birch (<i>Betula neoalaskana</i>)	No. 50 Fall 2005	Lorna Allen
Field horsetail (<i>Equisetum arvense</i>) Meadow horsetail (<i>Equisetum pratense</i>)	No. 52 Summer 2006	Lorna Allen
Wild strawberry (<i>Fragaria virginiana</i>) Woodland strawberry (<i>Fragaria vesca</i>)	No. 56 January 2008	Lorna Allen
Fringed loosestrife (<i>Lysimachia ciliata</i>) Lowland yellow loosestrife (<i>Lysimachia hybrida</i>)	No. 57 March 2008	C. Dana Bush
Leafy northern green orchid (<i>Platanthera aquilonis</i>) Tall northern green orchid (<i>Platanthera huronensis</i>)	No. 58 November 2008	Lorna Allen
Golden saxifrage (<i>Chrysosplenium iowense</i>) Green saxifrage (<i>Chrysosplenium tetrandrum</i>)	No. 59 February 2009	C. Dana Bush
Cutleaf fleabane (<i>Erigeron compositus</i>) Threelobe fleabane (<i>Erigeron trifidus</i>)	No. 60 May 2009	C. Dana Bush
Blue columbine (<i>Aquilegia brevistyla</i>) Jones columbine (<i>Aquilegia jonesii</i>)	No. 66 December 2011	Lorna Allen
Yellow columbine (<i>Aquilegia flavescens</i>) Western columbine (<i>Aquilegia formosa</i>)	No. 66 December 2011	Lorna Allen
Mountain cranberry (<i>Vaccinium vitis-idaea</i>) Twinflower (<i>Linnaea borealis</i>) Common bearberry (<i>Arctostaphylos uva-ursi</i>)	No. 68 November 2012	Lorna Allen
Short-stalk chickweed (<i>Cerastium brachypodum</i>) Nodding chickweed (<i>Cerastium nutans</i>)	No. 70 March 2013	C. Dana Bush
Sandhills cinquefoil (<i>Potentilla lasiodonta</i> previously <i>P. finitima</i>) Pennsylvania cinquefoil (<i>Potentilla pennsylvanica</i>)	No. 78 January 2016	C. Dana Bush & Patsy Cotterill
Prickly rose (<i>Rosa acicularis</i>) Prairie rose (<i>Rosa arkansana</i>) Woods rose (<i>Rosa woodsii</i>)	No. 85 Spring/ Summer 2020	Lorna Allen
Three-leaved false-Solomon-seal (<i>Maianthemum trifolium</i>) Wild lily-of-the-valley (<i>Maianthemum canadense</i>)	Coming soon	Lorna Allen
Western false-Solomon-seal (<i>Maianthemum amplexicaule</i>) Starflower false-Solomon-seal (<i>Maianthemum stellatum</i>)	Coming soon	Lorna Allen

* Kershaw, L. 2019. Alberta Plant Names: A guide to their pronunciation, meaning and English alternatives. Self-published. Kindle Direct Publishing. ♦

Establishing Native Plant Communities: A Primer

Heather Sinton and David Walker

Re-establishing native plant communities in disturbed natural ecosystems can be challenging at the best of times. The importance of avoiding and minimizing disturbance cannot be overstated. The selection of appropriate plant materials for revegetating natural ecosystems is critical for the successful establishment of a native plant cover.

Revegetation goals need to be clearly understood before embarking on project planning. Some examples of questions to consider before finalizing goals and approaches include:

1. What regulations or policies should be considered during the planning phase?
2. Is the land publicly or privately owned?
3. What is the intended land use?
 - Is the goal restoration to the pre-existing or historical plant community?
 - Will the area be grazed?
 - Is there a need to establish tree cover?
 - Are there particular plants required for food or cover for wildlife?
 - Is the area used for recreation? If yes, what type?
4. Will the risk of wind or water erosion require mitigation?
5. What is the risk of invasion by undesirable species from the soil seedbank or encroachment from nearby sources (e.g., cultivated land)?
6. Are there species at risk, plant or animal, that require special treatment?
7. Are there any land use safety concerns?
8. Is aesthetics a concern?

Site Evaluation

A thorough assessment of land use on and adjacent to the site is necessary. It is important to talk to landowners, land

managers and users of the landscape at this stage to understand past and present values and uses as well as desired future plans for the area. An evaluation of biotic, site stability and hydrologic functions is necessary at an early stage of planning. On large-scale sites or areas where accelerated erosion risk is high, intensive phased approaches to revegetation may be required. It may be necessary to plant non-persistent, non-native species suitable for the specific site to ensure initial site stability and to enhance soil fertility.

A vegetation inventory (both onsite and offsite) is vital to assess biotic composition. If the site has a lot of weeds, it may be necessary to control them for several growing seasons prior to replanting the site with the desired native species. An inventory of offsite species will confirm whether there is an offsite source of native colonizers. It is also helpful to know if the restoration site is downwind from a potential source of problem species (e.g., an irrigation field). Analysis of a soil sample for weed seeds and nutrient status or potential chemical contamination may also be needed.

Where rare or sensitive plant species or communities are present, local native plant materials may need to be harvested prior to disturbance (e.g., sod in alpine areas) and stored for later re-application. Seed or plant parts may need to be collected and propagated. This requires appropriate lead time and preparation. Small disturbances and wetlands may not need to be revegetated if the soil seedbank was conserved. An exception to this may be situations where the seedbank is contaminated with the seeds of invasive species or where there is a strong likelihood of invasive seed blowing into or being brought onto the site (e.g., by traffic). In cases like this, it may be necessary to plant competitive

non-native, but non-persistent, plants for several years prior to adding native plant species. In extreme situations where the topsoil is seriously contaminated, it may be necessary to remove the topsoil and then plant into amended subsoil. This needs to be accounted for in the planning phase.

Selecting Plant Species

Plant species should be selected based on the goals of the project and compatibility with the Natural Sub-region where the project is located. The plants must also be able to grow in the altered conditions that may be present on the disturbed site. A soil analysis can help understand constraints and choice of plants for the current environment. Facilitation is a plant successional process by which one species assists establishment of another by ameliorating harsh site conditions. It may be necessary to plant species that are known to survive in the altered conditions and add other native species at a subsequent time when conditions become more favourable for their establishment and survival.

Availability of many native species may be limited, so early investigation of appropriate seed supplies is important. This can allow for collection and propagation of needed plant materials that are not offered commercially. Some species may take up to three years and longer to become available. Use of multiple native species, multiple varieties of native species, and different height or age classes can help to achieve the desired plant community diversity.

Wind and water erosion control are paramount to ensure minimal soil loss and the success of revegetation. Many native species are slow to establish. Annual cereal crops sown at a low seeding rate may be needed to control

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and stabilize soil in the interim. Native seed can be sowed into the stubble. When colonization from native plants from the soil seedbank or from offsite is desired, seeding rates of native species onsite should be lowered. When trees will be planted, it's important to limit the amount of native grass that is seeded, otherwise it will out-compete the tree seedlings.

When creation of wildlife habitat is a major objective, it is important to understand the requirements of the wildlife species throughout the year and through their life cycle. Palatability of vegetation varies throughout the year, and the presence of young plants may incur overgrazing by wildlife or cattle. It may be necessary to fence recovering revegetated areas until the plants are well established. This is also a necessary precaution in heavily used recreational areas.

Sourcing the Best Native Plant Materials

The success of a native revegetation project is dependent on the quality of the native plant materials that are used. Here are steps that can be taken to acquire the highest quality seed (also see Figure 1):

1. Develop a list of desirable native plant species for the site. Be prepared to replace or delete a species from the list if quality seed is not available.
2. If restoration is the goal and the site is small, wild harvesting (hand collection) by qualified botanists may be a good option. Otherwise, seed must be purchased from a commercial vendor or a reliable and trusted seed collector or producer.
3. If wild harvesting is chosen, refer to the ANPC policy on this subject. In addition, some agencies and organizations are against harvesting wild seed because of potential adverse environmental impacts to native plant communities. Sufficient seed should remain on the site to allow plants to propagate and provide food for wildlife.
4. If purchasing seed, consult several vendors for seed availability.
5. Buy source identified seed. Certified seed of a named variety provides the best assurance of quality and reliable performance. Reports on performance are usually available for named varieties. To verify the source of wild harvested seed, it may be necessary to inspect the harvesting site. If wild harvested seed has been field grown, inspect the production field just before harvest. Be aware that the scientific name without a variety name does not guarantee performance (see photos).
6. Before buying seed, ask for a Certificate of Seed Analysis for the seed lots. Typically, vendors have several seed lots of each species that they have purchased from different growers or different production fields. Each seed lot is tested separately, and some lots may be less contaminated with undesirable species or may be from a more recent harvest year. Ask the vendor what other seed lots are available.
7. The certificates should be reviewed to ensure that seed lots are free of undesirable species. The *Canada Seeds Act* defines which species are prohibited, primary and noxious. In Alberta, seed needs to be free of restricted and noxious species as designated by the *Alberta Weed Control Act* and by a local municipality.
8. Wild harvested seed may be contaminated with undesirable species that may be difficult or impossible to remove by post-harvest cleaning.
9. If the level of impurities in a seed lot does not meet regulatory standards or project goals, it should be removed from the revegetation mix.
10. While it may be convenient to purchase seed as a mixture, quality standards, as required under the *Canada Seeds Act*, are lower. A better choice is to purchase each species individually (possibly from more than one vendor) and then have the

seed blended. Pre-designed, off the shelf mixtures are sometimes made by blending seed lots of low quality with enough seed of higher quality grades to meet standards. There is also risk of seed substitution during blending (see example in table below).

11. Keep detailed records, including seed tags, seed analysis certificates and information about procedures. This is very helpful for monitoring and forensic analysis of problems such as weed infestations.

Evidence of Seed Substitution

Analysis of a Seed Mixture
As Specified (Tag) and As Delivered (Bag)

How Much Was	On Tag	In Bag
northern wheatgrass	20%	8.3%
hard fescue	20%	19.2%
streambank wheatgrass	15%	14.4%
Canada bluegrass	15%	0.8%
creeping red fescue	15%	23.9%
perennial ryegrass	15%	25.8%
Kentucky bluegrass	0%	7.1%

David Walker Unpublished. Used with permission.

Seeding and Planting

It is important to prepare a firm seedbed to ensure good soil to seed contact. Creating microsites (ridges and hollows) can also enhance survival of native plants, particularly in dry environments and on slopes. If amendments are necessary, the use of clean materials is very important. Sources should be inspected for problem plant species prior to purchase. Inspection is best done prior to harvest. Using straw from seed growers is a good practice. It is also possible to have seed inspection labs test samples of the materials that will be used.

Seeding or planting rates need to match revegetation goals and plant characteristics. For example, higher

See **Establishing Plant Communities**, page 6

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seeding rates may be used in situations where competition with weedy species is expected. Lower seeding rates are more appropriate where the site is not contaminated with problem plant species and establishment of native species from around the site or from the soil seedbank is desired.

Seed placement is dependent on species requirements. Seeding too deep can be a common cause of seeding failure. Timing of seeding or planting should consider species requirements. Some species may require special pre-treatment (e.g., stratification, scarification) to enhance germination. Some species may require rhizobia bacteria to thrive. Mycorrhizal fungi are usually present in salvaged topsoil. Getting advice from an experienced practitioner is recommended.

Management of Revegetated Areas and Assessing Success

There is a misconception that areas revegetated with native species do not require management. Project sites may become contaminated with unwanted plant species that are brought in by wind, wildlife, or human traffic. Control of restricted or noxious weeds as defined in the *Alberta Weed Control Act* and municipal bylaws is necessary.

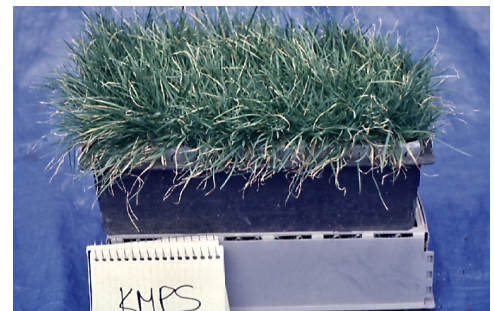
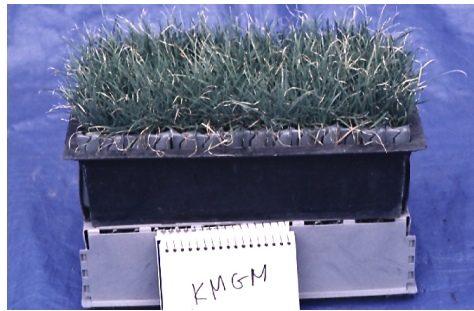
Non-persistent non-native annual weeds should only be controlled when they are negatively affecting native plant establishment and survival or the land use. Annual weeds can catch snow and can protect emerging native plants from grazing. Their presence will decline once the native stand is established.

An initial watering may be needed for establishment of native forbs, shrubs and trees that were planted out from containers. Grazing, mowing or prescribed burning of the revegetated area will be necessary at some point to retain plant vigour and diversity over time. Fertilization may be required

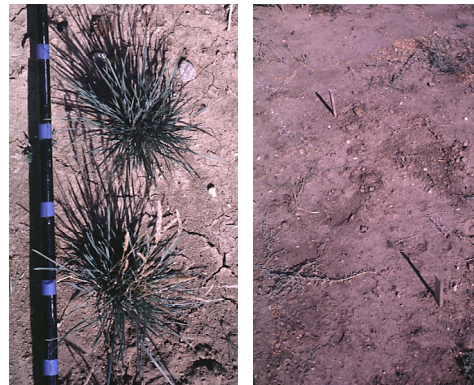
Importance of Source Identified Seed



Alpine bluegrass (*Poa alpina*) performance trials near Mountain Park, AB (photos above). Left: Variety AEC Glacier, developed at the Alberta Environment Centre, is more robust than plants from common seed (no name) imported from Iceland. Right: Common seed plants susceptible to mildew.



Junegrass (*Koeleria macrantha*) performance trials near Suffield, AB (photos above and below). Above: Plants before out-planting. Plants from locally harvested wild seeds (left) were slower growing than plants from seed of variety Barkeol imported from the Netherlands (right).



Plant survival after 14 months.

Far left: Local wild harvested seed, all survived.

Near left: Variety Barkeol seed imported from the Netherlands, no survival.

All photos by David Walker

during or after establishment to achieve specific project goals, such as increasing ground cover to prevent erosion.

Ongoing monitoring of the site is extremely important for determining management needs, to evaluate success relative to the project goals, and to adjust procedures for future projects. Assessing site stability, biotic integrity, and hydrologic and land use functions at the end of the planting

season, and in years two, three, five and ten is recommended. This should be conducted by an experienced practitioner and detailed records kept for future use.

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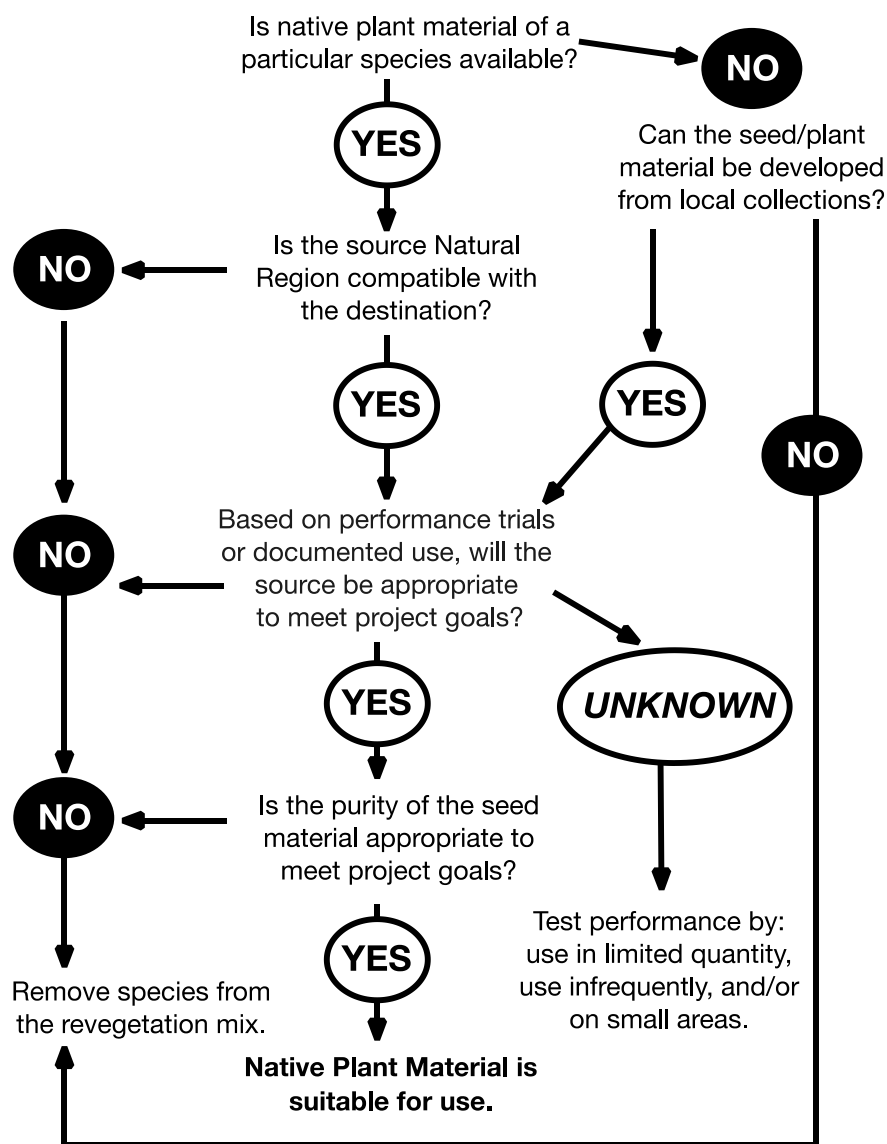
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See **Establishing Plant Communities**, page 7

Establishing Plant Communities, from page 7

Figure 1

Decision-Making Chart: Sourcing Native Plant Material



Canadian Food Inspection Agency. Canada's Seed System – A Summary Description 2017. Accessed 2021-09-30 at <https://inspection.canada.ca/plant-health/seeds/seed-regulatory-modernization/eng/1610723659167/1610723659636>

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A new interactive map resource has been created on behalf of the Stewards of Alberta's Protected Areas Association (SAPAA). The map shows all parks and protected areas in Alberta and allows users to pan or zoom into each site to view the boundaries, driving directions, natural features (aerial imagery) and more. The information was released as part of a Storymap: <https://arcgis.com/arcgis/storymapjs/index.html?appid=19r1q8>. This informational resource guides users through the various parks and protected area designations in Alberta, from sites protected under legislation (*Provincial Parks Act*, *Wilderness Areas*, *Ecological Reserves*, *Natural Areas and Heritage Rangelands Act* or the *Willmore Wilderness Parks Act*), to other Crown land natural areas that may only be granted a Protective Notation (PNT) at this time.

All sites can be identified using the maps within this interactive resource; however, key sites that are under the stewardship of SAPAA stewards are highlighted, including Clyde Fen Natural Area and Whitehorse Wildland Provincial Park, two sites that are stewarded by dedicated ANPC volunteers.

It is the hope of SAPAA to continue to offer this interactive resource as part of a redeveloped website and to encourage more citizen stewards to undertake monitoring and reporting for Alberta's protected areas. If there are future changes to the structure or management of these sites, this Storymap can serve as a public record of their current status to use as future reference or baseline for comparison.

If you have any suggestions or amendments for the Storymaps, please do not hesitate to reach out to Kristyn Mayner at kristynmayner@gmail.com. For example, I will note that municipal reserves such as Nisku Prairie are not currently included but can be incorporated in the future. ♦



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.

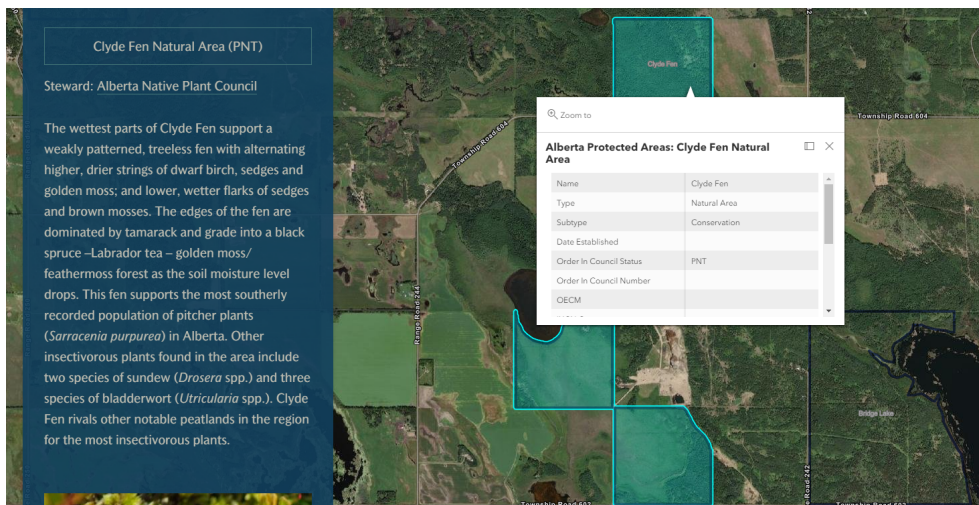
If you have an announcement, article or other item, you are invited to submit it to the editor for publication. Items concerning native plants will be given highest priority.

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:
April 30, 2022

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Clyde Fen Natural Area is one of the protected areas stewarded by ANPC volunteers.