

WAGNER NATURAL AREA NEWSLETTER

Volume 26 Number 2 November 2012

Newsletter of the Wagner Natural Area Society, and Volunteer Stewards
of Wagner Natural Area, Parkland County, Alberta



Wagner Open House, 2012

**Please join us for Wagner Society's annual outreach event!
at St. Paul's Church United Church, 11526-76 Ave., Edmonton
on Saturday, November 24th, 2012, 2:30 p.m.**

Our featured speaker will be **Shannyn Ellett**, a Planner with Planning and Development Services, Strathcona County. Her topic is: Tools for Conservation Planning: Rural Cluster Development.

"There are many new tools and approaches that can be used to increase the conservation of natural and agricultural areas along with profitable development. With all of the increased development in the Edmonton region this is a timely issue! The theme of the presentation will be the different tools and approaches Strathcona County has used to achieve conservation design in rural development. Come and hear about these successful innovations - with an eye to considering how they could be used in your own community to conserve what you value and enjoy."

There will be an open opportunity to ask questions of the speaker. Our Open House includes a report of Wagner Society activities and displays. Admission is free, and open to all interested parties.

The Zoning Issue again...

Approval of the draft Acheson Area Structure Plan is expected at a public hearing in the County Hall in Stony Plain on November 6th. In a previous iteration of the Plan the lands south of Wagner Natural Area as far as the rail line and in a half-mile strip to the west of it were zoned low-priority industrial, or Industrial Reserve. In consequence of Wagner Society's opposition, this area has been zoned a Special Study Area in the current draft. The Society understands that this means that environmental studies can be undertaken in advance of industrial development that has the potential to affect the Natural Area. The Society would like the Special Study Area designation to be extended south of Highway 16A. The Society argues that this will enhance protection of the groundwater recharge area and also provide access to open agricultural land to the south, which is important for the movement of wildlife. Isolation of Wagner Natural Area in a sea of development presents a real threat to its long-term viability.

Downstream Effects of a Wet Summer...

This spring Wagner Society opposed an application for soil stripping on farmland south of Wagner Natural Area and was disappointed when Parkland County approved it, albeit with conditions. The Society's main concern was that this would devalue the land for agricultural purposes and strengthen the rationale for industrial zoning. Osborne Acres residents also expressed various concerns,

including noise, pollution, flooding and erosion. One of the conditions involved creation of buffer strips in the fields abutting other properties. Unfortunately the buffer strip adjoining Wagner's south boundary did not get sown in advance of this summer's heavy rains. In consequence bare soil and plant debris washed into a low-lying area of Wagner land. The Natural Area, as well as a tide-mark of flotsam in the trees, now has its own mini-crop of canola in a newly established "field"!



South boundary of the Natural Area showing erosion.
Photo: P. Cotterill

Ecological Planning

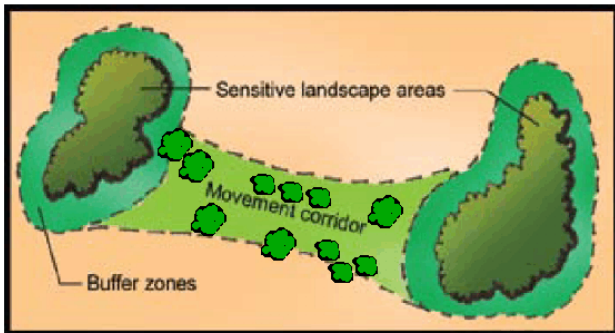
Wagner Natural Area Society is concerned that Parkland County's draft Acheson Area Structure Plan shows no evidence of planning for ecological connectivity – a network of corridors with natural vegetation linking larger natural areas. This summer it hired **Catherine Mowat**, an ecological planner, to provide the County with planning options that, if implemented, could allow movement of wildlife and plants into and out of Wagner Natural Area. Here is an excerpt from her report.

Common Ground – The Mechanics of Ecology

For many municipalities, in many jurisdictions, the challenges becomes “how to implement” the environment goals set by the municipality. There is, fortunately, an established body of evidence that can provide some ecological guidelines for land use planning. This section highlights two critical factors that, with increasing development pressure, should be addressed in the area surrounding Wagner Natural Area.

The Need for Effective Buffers (Edge Effects)

Buffer zones are “designated areas used to protect sensitive landscape patches (e.g., wetlands, wildlife reserves) from negative external pressures.” Although the term ‘buffer’ is most frequently associated with the protection of riparian areas, evidence suggests that buffers have a broader application and that there is a need for separation between development and wildlife habitat to mitigate the effects of disturbance.



Modified from Bentrup, 2008

Edge Effects

It is important to be aware of the effects that occur at the edge of vegetation communities (‘edge effects’). Edge effects occur in nature, but are sharply increased when a landscape is fragmented by development. They can include: changes in the nature of the growing environment with altered levels of wind, sun exposure, heat, water and nutrients; changes in soil fertility; the increased risk of exotic and unwanted species; increased predation and mortality among resident wildlife; increased disturbance (including noise); and stress in wildlife populations

(measured by startle and escape responses). These effects are ‘costs’ to local established ecosystems when they are artificially imposed, and over time include decreased biodiversity, as well as the ultimate loss of local plant and animal populations that depend on more sheltered, interior, and/or more uniform habitats. (U.S. ELI, 2003, U.S. NRCS, 2004).

Land use planning – Research suggests buffers may need to be wider than commonly assumed to mitigate edge effects and maintain ecological functions. **A recent meta-survey indicated a majority of surveyed studies (75%) determined edge influences can extend to a distance of 230 metres (U.S. ELI, 2003).**

The Need for Functional Wildlife Corridors

For species to survive, they must have access to all of the habitat resources they need in order to maintain a viable population. Corridors provide additional food, shelter, safe cover for daily/seasonal movement to needed resources, and allow migration, the location of new resources by stressed populations, and the dispersal of young. Buffers and corridors can be joined, as a conservation strategy, to conserve ecological functions and environmentally sensitive areas.



Figure 1 -- Conservation buffers in an agricultural landscape.

Land use planning – Research suggests corridors between larger habitat patches (core areas) should be designed as ‘broad connectivity zones’ including a variety of protected landscape features (e.g., open and riparian areas, fencerows, stepping-stone patches of natural vegetation, shelter belts, etc.)

Bentrup (2008) summarizes research on species movement through corridors: **existing guidelines suggest minimum buffer widths ranging from 100 ft (30 m) for plant dispersal, amphibians and reptiles to 330 ft (100 m) for large mammals such as deer and moose. Wagner Natural Area is known to provide important winter habitat for local deer/moose and “supports several rare plant species” (Westworth, 2004).**

Junior Forest Wardens' Tree Seedlings Revisited – 2012

By J. Derek Johnson

It's been seven years since the Spruce Grove Junior Forest Wardens planted the first white spruce seedlings in Wagner Natural Area. I tagged a total of 190 seedlings from their plantings in 2005 (150 tagged), 2006 (26) and 2009 (14). I went out on July 5th and August 22nd this year to re-measure the surviving tagged seedlings from these three years of plantings. (The number of seedlings may seem a bit strange, but that's all the "pigtailed" (metal markers) I had available at the time to mark the seedlings.) The middle of summer is not the best time to measure the seedlings as most of them are invisible in the thick green grass. It is better to do it in late April or early May, after the snow is gone, but before things start growing, when the grass is brown and has been pushed down by the winter snow, making the seedlings more visible. However, this year there were actually a few seedlings big enough to poke up above the grass.



Photo: J. Derek Johnson. Junior Forest Wardens planting white spruce in Wagner, May 2005.

Overall survival of the 150 seedlings tagged in 2005 is 85% (this total considers missing seedlings as dead), quite exceptional when you consider they weren't planted by professional tree planters. Only two confirmed fatalities were observed this year, along with three missing seedlings (I'll try and go back in the spring to find these). It takes three to five years for the seedlings to establish a good root system before any substantial growth in height occurs. Once the root system is established, any seedling that can put on 15 cm or more of growth in a year is doing well. Any seedling growing 5 cm or less per year is not doing so well. Thirty-six seedlings have put on 30 cm or more of growth over the past two years. There are now six seedlings over 1 m tall (the tallest at 123 cm) and

another 11 over 90 cm tall. On the negative side, 40 seedlings have put on 10 cm or less of growth in the same time period.

After seven years there does seem to be a bit of a pattern emerging in how the seedlings are growing. As has been stated many times in the past, the key to successful seedling establishment is location, location and location, but planting technique and the quality of the seedling stock cannot be totally discounted in affecting survival and growth. As a group, the seedlings that appear to be doing best are the ones planted in the young poplar in the northwest corner of the Villeneuve field in 2006 (including "Spikey II"). The grass here is not as thick and the seedlings have some protection from the elements by the young poplar. All 10 of the seedlings I tagged have survived and, as a group, they have put on an average of 30 cm of height growth over the past two years. Seven of the 10 have put on 30 cm or more of growth, with only two having a growth of 10 cm or less in the same time period. ("Spikey II" is fair with 18 cm of growth over the past two years.) One seedling has put on 52 cm of growth over the past two years and is now 107 cm tall, with another having 43 cm of growth and a height now of 99 cm. (Average original planting height was about 24 cm.)

The group doing the next best are the 15 seedlings tagged on the "hill" near the permanent water level recorder west of the Marl Pond Trail. All 15 have survived and, with one exception, are healthy and doing well. Average height growth for the group over the past two years is 28 cm. Seven of the 15 seedlings have put on 30 cm or more of growth with only one at the 10 cm mark. One seedling has grown 47 cm and is now 105 cm tall and another has grown 46 cm and is now 98 cm tall. (Average original planting height was about 27 cm.) The 35 tagged seedlings planted close to the willows on the east side of the Marl Pond Trail aren't doing quite as well as the ones up the hill. Six of the 35 tagged seedlings have expired and a few are struggling for survival in what has turned into a rather thick patch of Canada goldenrod. Ironically, the seedlings more in the open in the rose bushes to the west of the willows are doing the best. Average height growth for the group over the past two years is 25 cm. Eight of the 29 surviving seedlings have put on 30 cm or more of growth in the past two years; only three have grown 10 cm or less. (Average original planting height was about 24 cm.) Of the seedlings planted in 2005, those clearly doing the poorest are the 25 or so located near the middle at the

(continued on page 4)

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south end of the Villeneuve field, roughly in line with the entrance to the Cabin Trail. When these seedlings were initially planted, several of the holes immediately filled up with water. (Several seedlings were actually moved because of this problem.) Whether it's the wetness, or the very thick brome grass, or both, that's primarily inhibiting the seedlings, I don't know, but based on the seedlings elsewhere, I'm pretty sure the grass is the problem. Planting technique shouldn't be a factor as it was pretty well consistent for all the 2005 plantings. The three newly missing seedlings are in this area. With a touch of irony, the two tallest seedlings in the entire field are in this area, poking up over the brome grass. One seedling has put on 50 cm of growth over the past two years and is now 121 cm tall and another has grown 43 cm and is 123 cm tall. These two seedlings had a bit of a head start in that they were 35 and 34 cm tall when planted. Only six seedlings in this area have grown 30 cm or more in the past two years, whereas 14 have grown 10 cm or less.

Another area where the seedlings are not doing well is the east side at the south end of the Villeneuve field. There are about 15 seedlings in this area; none have grown 30 or more cm in the past two years (the best growth being 23 cm); and nine have grown 10 cm or less. The problem here I think is one of exposure. The grass in this area is primarily Kentucky blue grass rather than smooth brome. It's shorter and less dense than the smooth brome and I think the seedlings are getting fried in the sun. Browned needles are widely in evidence. This reinforces the notion of the importance of location when

planting. Seedlings planted some distance from the trees are having a tough time, either getting smothered by the grass or dried out by the sun. One of the confirmed fatalities this year was in this area. It looked like a gigantic bull moose had lain down on the seedling. The poor thing didn't stand a chance! The pin didn't look very good either!

Another factor which seems to be retarding the growth of some of the seedlings is the presence of what I've chosen to call "ant runs" along the stems of many seedlings at the south end of the Villeneuve field. These consist of a channel of cemented soil that runs the length of the stem from the ground to near the tip. Whether the ants are using these "runs" to get to the buds to feed on the sap themselves, or milk the aphids which occasionally infest the seedlings, I don't really know, but the ants are there on the seedlings nonetheless. Except for the occasional spruce gall aphid, the seedlings seem to be little affected by disease.

The condition of the seedlings at the south end of the Villeneuve field looks great in comparison to the condition of the seedlings "parachute planted" in the southwest corner of the Villeneuve field in 2009. Granted, these seedlings are still in their root development stage, but of the 14 seedlings tagged, only one has put on more than 10 cm of growth over the past two years, one has died, and I think maybe only four of the 14 seedlings will survive at all. Planting technique does make a difference! *****

Woolly Bears and Tussock Moths



David Fielder took this photo of a Spotted Tussock Moth (*Lophocampa maculata*) caterpillar in Wagner on August 4th. It belongs to the Arctiidae family (some authorities say Erebidae) or the tiger moths. The caterpillars (larvae) feed on the leaves of poplar, willow and other deciduous trees. The adult

tussock moth (named for the tufts of long hairs on the larva) has a wingspan of 35 to 45 mm and flies from May to July. (Check the Internet for pictures of these

attractive moths.) It is easy to see how the common name of "woolly bear" is applied to the larva. Woolly bear caterpillars are particularly noticeable in the late summer or early fall, as they move about purposefully on vegetation or cross paths. They will overwinter in this development phase, freezing completely solid during the cold weather with the aid of a cryoprotectant.

Note: The second instalment of Bill Fuller's "Tragedy in our National Parks" has been postponed to the next issue of the newsletter due to lack of space.



The Wagner Grapevine



Survey of Permanent Sample Plots

Rangeland Conservation Service Ltd based in Airdrie was contracted this summer to re-survey 18 of the 29 permanent sample plots (PSPs) that are established in Wagner Natural Area, including 14 established in 1999 by GeoWest Environmental Consultants Ltd and four (of 10) established by Rangeland in the Extension lands (former Kichton and Porter properties) in 2006. (In fact, Rangeland surveyed 17 PSPs; Derek Johnson re-surveyed plot no. 14 this year. The remaining plots were surveyed by Wagner volunteers in 2011.) This re-surveying was to meet the requirements of our monitoring protocols. The field work was done by two Rangeland staff members between July 23 and July 28 in typically hot, humid or wet and mosquito-promoting weather!

Vegetation cover was assessed and tree mensuration (age, height and diameter at breast height of the individual tree) was carried out in the plots. Summer student Ashley Thorsen assisted with surveying of a number of the plots and the whole project was organized by Derek Johnson. Derek also identified the bryophyte and fungus collections from the plots. Ashley has spent some of her work hours putting the data into digital form, including those from the original Geowest survey done in 1999. Derek notes that all permanent sample plots in the Natural Area are now marked in an identical manner according to EMAN (Ecological Monitoring and Assessment Network) and Alberta Sustainable Resource Development survey protocols. The Rangeland report is expected by December 20th.

For the record, as Derek established an additional plot this year, plot no. 30 (see the report on page 6), we now have data for 30 permanent sample plots and 106 reconnaissance plots for a total of 136 plots.

Marl Pond Trail – New Guide

Good progress has been made with a new edition of the Marl Pond Trail guide, reflecting changes that have occurred along the trail in the past 25 years. The new field-friendly text should be ready by next spring, to be supplemented with additional information on the website.

Bouquets:

To **Dr. Anne Naeth and her graduating students** at the University of Alberta who provided a comprehensive guide to our restoration project this spring. The implementation schedule will depend upon our ability to obtain grants. Our first priority is to undertake an extensive program of weed control in the Natural Area.

To the **Knights of Columbus and their crew** of volunteers, as well as several other volunteers, for taking part in the fall clean-up on September 29th. The annual K of C barbecue was well received after a morning of hard work.

To: **Cathy Mowat**, who wrote a report on ecological planning options for the County of Parkland.

To: **Irl Miller**, for masterminding another 200 m of fencing in Wagner, installed by Prairie Fencing.

To: **Derek Johnson** for dedication to scientific rigour in vegetation monitoring.

To: our long-suffering “ex-President” **Pat Clayton**, for continuing to preside and have the best interests of Wagner at heart!

And finally, Welcome: To three new voting members this year: **Carolyn Vanderveen, David Fielder, and Tony Sneep**. All have put in many hours of volunteer work on behalf of the Natural Area and the Society. Welcome, and a big thank you!

Wagner Natural Area Society Board 2010-2011

26519 Highway16, Spruce Grove, AB T7X 3L4

Visit our website at <http://www.wagnerfen.ca>

Executive:

President	Vacant
Past President	Pat Clayton (456-9046)
Vice-President	Ben Rostron (434-3839)
Treasurer	Beth Jenkins (458-1794),
Secretary/Editor	Patsy Cotterill (481-1525)
Webmaster/Membership	Pat Webb (478-1630)

Other Responsibilities: Pat Clayton (Archivist); Jasper Keizer (Fire Warden) (962-2745);

Derek Johnson (Science Advisor) (436-8231); Carole Dodd (Assistant Webmaster) All telephone numbers are preceded by 780-

Directors: Alice Hendry (962-4836); Irl Miller (455-3866); Mike Jenkins (887-2032)

Updates to Wagner’s Flora...

And yet more plot monitoring ...

Derek Johnson is curiouser than the proverbial cat when it comes to monitoring – he takes evident personal delight in checking up on how vegetation is faring over the years. Wagner Society is the grateful recipient of his curiosity and vigilance.

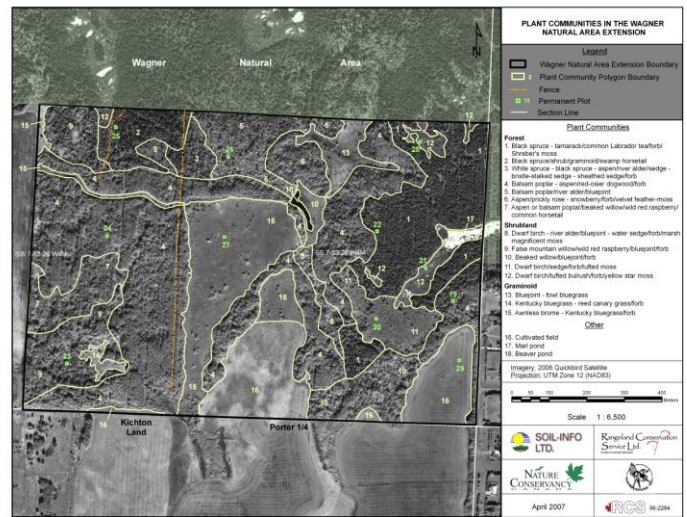
As well as organizing and liaising with Rangeland Conservation Service Ltd (in the persons of Alan Dodd and Joan Williams), who re-surveyed 17 of our permanent sample plots (PSPs) this summer, Derek did some monitoring of his own, often engaging summer student Ashley Thorsen to help him.

When Derek and Ashley pinned the corner posts of permanent sample plot numbers 5 and 6 in the vicinity of Jones’ Pond they noted a rare bog adder’s-mouth orchid (*Malaxis paludosa*) in flower and close by its less rare congener white adder’s-mouth (*Malaxis monophyllos*). Derek records that Plot 22 west of the northwest corner of the “Hourglass Fen” in the southeast sector of the property held the most orchid species (five) of any of the plots: round-leaved orchid (*Orchis rotundifolia*), pale coral-root, northern green bog orchid, heart-leaved twayblade and white adder’s-mouth, with heart-leaved twayblade and round-leaved orchid being particularly abundant. Derek says: “Rangeland estimated about 0.5% cover for both the round-leaved orchid and heart-leaved twayblade. 1% cover doesn’t seem like much, but if you equate it to the entire 400 m² plot, that means a square with sides of 2 metres would be completely covered with orchids!” It is too bad (from one point of view) that the public rarely gets to see such abundance!

Regarding Plot 14, which Derek re-measured this year, he had the following to say. “Anecdotally, we all know that great bulrush (*Schoenoplectus acutus*) is taking over the marl ponds, but I wanted to know if data from the PSPs would “scientifically” support this conclusion, so I was anxious to remeasure Plot 14. Since Plot 14 is the oldest plot established in a marl pond (1999), I thought it might provide the best results to answer my question. I think it did. Cover of great bulrush in this plot was estimated at 1% in 1999, 5% in 2005, and 15% in 2012.” With respect to occurrence of great bulrush in other plots Derek notes that Rangeland did not record its occurrence in Plot no. 21 in 2006, but he found 20% cover in this plot in 2011. Derek established a new plot (no. 30) off the southeast end of the large marl pond along the Marl Pond Trail and recorded a starting cover of 10%. He concludes that our assumptions about a marked increase in great bulrush cover are correct.

Derek also wondered if a similar increase had occurred with another large bulrush, three-square bulrush (*Schoenoplectus pungens*). The results vary. In Plot 28, established by Rangeland in 2006, cover was estimated

at 10%, but Derek estimated it at only 5% in 2011. In Plot 14 it went from 2% in 1999 to 5% in 2012, which he considers a modest increase in a time span of 13 years. It does not occur in plots 21 or 30. Derek concluded that three-square bulrush is holding its own; however, it is clearly not nearly as invasive as great bulrush. He also looked at changes in percentage cover of other species and concluded that there is no clear evidence from the PSPs that any plant species in particular is declining as a result of the increase in great bulrush cover. Rather, the increase appears to be taking place at the expense of open water.



Rangeland’s 18 permanent sample plots in the “extension lands” of Wagner. (RCS Ltd map)

David Fielder’s plant observations...

David Fielder, a relative newcomer to our voting membership, enjoys keeping tabs (including GPS tags) on our orchids and sundry other flora, especially in the more southern, less travelled parts of the Natural Area. He also enjoys photography. On August 1st he reported seeing 20-25 Rattlesnake Plantain orchids (*Goodyera repens* var. *repens*), of which one was in bloom and according to his estimates, another 5% had finished blooming.

David was also instrumental (with some help from Patsy Cotterill) in removing a sizable population of Yellow Iris (*Iris pseudacorus*) from Morgan Creek in the vicinity of the east-west road allowance this summer. This highly attractive plant is unfortunately an invasive aquatic weed, native to Eurasia, and is on the Province’s prohibited noxious weed list. All material from the plant has to be burnt.

From this same creekside area Patsy reported a few specimens of wool-grass, *Scirpus cyperinus*, apparently a first for Wagner Natural Area, although it is to be expected because it does occur locally, and seems to favour calcareous wetland sites.

Creeping Meadow Foxtail: A Case of Mistaken Identity

From information supplied by J. Derek Johnson

Our science director and plant sleuth Derek Johnson made the astounding announcement this past summer that a plant he'd been seeing for the past 25 years was not *Alopecurus pratensis* (meadow foxtail) but *Alopecurus arundinaceus* (creeping meadow foxtail). Indeed, we had all just assumed that the tall, alien grass with the single spike atop its stem growing along the ditch of the access road to Wagner's parking lot, and especially abundant at the corner of Atim Road, was meadow foxtail (*A. pratensis*). Derek came to his conclusion after carefully examining specimens using a key to the genus and comparing descriptions.

Derek notes that this species showed up in abundance along Highway 16 around the Wagner Natural Area in the early 1990s after construction of the Villeneuve interchange. This apparently prompted Wagner Natural Area Society (likely Derek himself) to contact the then provincial Department of Transportation and Utilities to ask if "meadow foxtail" had been used in revegetation seed mixtures for highway projects. They replied that it had not.



Photo: P. Cotterill (1996)



Photo: P. Cotterill. Wagner Natural Area, 14 June 2009

Since then, Derek has noted it in many places, as far east as Lloydminster, as far west as Hinton, around Fort McMurray to the northeast, Manning and Peace River in the northwest and Red Deer in the south. It occurs in the United States, for example, in Montana. According to American literature it can outperform smooth brome (*Bromus inermis*) on moist sites and may even outcompete that aggressive spreader in moist areas, reed canary grass (*Phalaris arundinacea*). Derek notes that in fact it seems to be doing this along the ditch beside the access road to Wagner's parking lot. Its seeds are small and light, easily spread by wind and water.

Derek thinks that the species is often overlooked because of its resemblance to timothy grass. (None of the major herbaria in Alberta have specimens; we need to rectify this with some collections from Wagner!) It flowers much earlier than timothy, often getting recorded on the May Count at the end of May, whereas timothy doesn't start to flower until mid to late June. The flower spikes of creeping meadow foxtail are also much softer to the touch than those of timothy.

Creeping meadow foxtail is much more strongly rhizomatous than its congener; however, the two species (*A. arundinaceus* vs. *A. pratensis*) are better distinguished by a careful contrasting of floral characters.

Derek attributes the rapid and wide spread of creeping meadow foxtail in central Alberta to extensive highway construction and disturbance, and predicts that only a prolonged drought will slow it in its tracks. The question that surely arises, however, is: do we control it aggressively on and near Wagner?

Editor's note: "Meadow foxtail" has spread noticeably in Nisku Prairie over the last decade. I too assumed it was *Alopecurus pratensis*, but will be checking it carefully next season to see if it is *A. arundinaceus*. Here it is particularly prolific in the moist bottomlands adjacent to Blackmud Creek, but it also occurs in the upland prairie where it has a more tufted growth habit. Like the smooth brome which also invades this moist, plains rough fescue prairie, along with small amounts of reed canary grass, it is already the target of spot-spraying with Roundup. However, I plan to pay it more attention in the future.

Many thanks to Derek for giving us a heads-up on this case of mistaken identity. *****

Wildflowers of Wagner No. 37

Geum aleppicum Jacq. Family Rosaceae

The basal leaf rosettes of this extremely common plant of moist meadows, woodland openings and edges are evident early in the season. It is only in mid to late summer that the plant sends up its flower stem, anything from 30 to 100 cm tall. It branches at the top, each fine branch bearing a yellow, rose-like flower at its tip.

The leaves help distinguish this plant from its close cousins, *Geum macrophyllum* (also called Yellow Avens) and Purple or Water Avens (*Geum rivale*), although when in flower the latter is distinctive because of its purple-and-yellow flowers in which the sepals and petals are erect. A fourth member of the genus *Geum* in Alberta, Prairie Smoke or *Geum triflorum*, is not likely to be confused with the other three because of its prairie habitat, and when in flower, its nodding pink flowers that usually come in multiples of three. Both species of Yellow Avens, and Water Avens, occur in Wagner Natural Area. Indeed, *Geum aleppicum* and *G. rivale* grow close together along the Marl Pond Trail.

The basal leaves reach about 30 cm in length and are rough hairy, with 3-4 pairs of lobed and toothed leaflets that increase in size towards the leaf tip. The terminal leaflet is largest, reaching about 7 cm, and clearly divided into three somewhat wedge-shaped to rounded lobes. Characteristic of this genus, as well as others in the rose family, is the presence of much smaller leaflets (up to 2 cm long) between the larger ones.

The five, veined petals of the flower are about 7 mm long; they are enclosed by triangular, fine-pointed green sepals of about the same size, which turn downwards against the stem. Smaller sepal-like structures, or bractlets, alternate with them. Numerous yellow stamens surround a cluster of ovaries (carpels) attached to a domed receptacle. Each carpel produces a fruit (achene).

When well developed, the globular head of achenes is as much likely to be noticed as the flowers. The head forms a bur, about 1-2 cm wide. The ripe, brown achenes, attached to the now columnar, densely hairy receptacle, are about 5 mm long and white-hairy all over. Atop each achene is a curved style which is slightly glandular towards the hooked tip. This tip articulates with another portion of the style, which is slender, hairy and oriented diagonally towards it. This upper style quickly becomes detached, leaving the exposed hook-like tip of the lower style free to hook onto passing animals. This is an extremely efficient fruit-dispersal mechanism and may account for the species' abundance and wide distribution (it is more or less circumpolar).

Yellow Avens Rose Family

Geum macrophyllum seems to prefer more moist and shaded habitats, has some slight differences in the achene and style, and the terminal leaflet of its basal leaves has more rounded lobes. However, it is often quite difficult to distinguish from *G. aleppicum*.



Basal leaf of *G. aleppicum*, showing leaflets

Flower and head of fruits showing hooked styles



Geum aleppicum – whole plant

Photos by P. Cotterill

Water Avens, *Geum rivale*

