WAGNER NATURAL AREA NEWSLETTER
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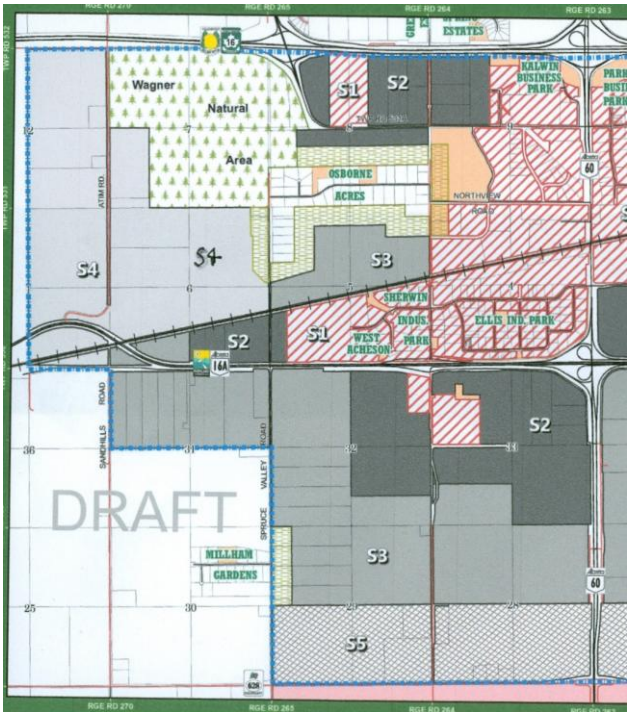
Newsletter of the Wagner Natural Area Society, and Volunteer Stewards of Wagner Natural Area, Parkland County, Alberta

Wagner Natural Area Facing Conservation Challenge



Once again Wagner Natural Area (WNA) is threatened by impending development in the lands surrounding it. The draft Acheson Industrial Area Structure Plan currently being circulated proposes to rezone the land immediately south of WNA from agricultural uses to future industrial uses.

In the illustration, areas S1 to S4 indicate the stages in which industrial development will take place, with S1 having the highest priority for development. The area south of Wagner as far as the rail line (currently zoned Agriculture General) and a strip west of Atim Road (currently Agriculture Restricted District) are zoned S4, or Industrial Reserve, with lowest priority for development. Nevertheless, Parkland County plans that they will be developed some time in the future.

Wagner Natural Area Society (WNAS), stewards of the area under a provincial program since 1987, and with a lease to the site, takes the view that this future development poses a real threat to the water supply. The fens, which are the most interesting feature of the site and the reason why it has been protected thus far, rely for their existence upon groundwater carried in an aquifer discharging to the surface as springs. Industrial development, no matter how carefully done, is likely to reduce the recharge area, the area of ground over which precipitation penetrates to replenish the aquifer.

WNAS is opposing the Area Structure Plan as proposed and has asked Parkland County to keep the current zoning for agricultural uses in place.

The proposed Industrial Reserve zoning not only threatens the water supply but also the connection of WNA to upland habitats, including agricultural lands. Connectivity is essential for the movement and long-term health of wildlife populations in WNA.

Another setback has been the recent rejection of WNAS's appeal of a successful application to strip topsoil from the land immediately south of Wagner. This reduces the agricultural value of the land and anticipates its zoning as Industrial Reserve. Osborne Acres residents' association similarly objected to the stripping, but their concerns of noise, traffic, erosion and siltation have been somewhat allayed by the conditions imposed on the soil removal company.

Wagner Society is currently negotiating with Parkland County planners to achieve a zoning and land use plan that will provide more assurance that WNA can be sustained into the indefinite future. If we deem the outcome to be unsatisfactory, WNAS will once again be appealing for public support in its conservation efforts.

WNA is a classic example of a natural area that cannot be protected merely by putting a fence around it. It is a priceless amenity and resource for scientific, educational and recreational purposes, as well as its intrinsic wild values. Shouldn't these trump the needs of a municipality to gain more tax revenue to service an ever-expanding population, given that quality of life for everyone will eventually be diminished?

Please check our website and on-site posted notices for updates: http://www.wagnerfen.ca/

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The Wagner Grapevine

President's Year-end Report
Given at Open House, November 20th, 2011

he following are notes taken from President's Pat Clayton's Treport to the assembly at the Open House last November.

Unfortunately the keynote speaker, Peter Lee, was not able to deliver his lecture owing to a death in the family. Derek Johnson gamely stepped into the breach, giving a presentation on work he had done re-measuring 15 of the 28 Permanent Sample Plots we have in our biophysical inventory of Wagner Natural Area. His presentation included a good deal of ecological information that was well received by attending students of Dr. Anne Naeth's U of A reclamation class. These students are currently working on a restoration plan for Wagner's south fields.

The following are highlights of the year's activities:

- board members attended or called seven major meetings with outside parties during the year, regarding the Heartland Transmission route, the Acheson Drainage Plan and the draft Acheson Area Structure Plan. These meetings involved liaising with personnel from Parkland County, Alberta Environment, and the Town of Spruce Grove.
- WNAS members held talks with the Dr. Naeth and her reclamation students and gave a presentation on Wagner by way of background information.
- As outreach we took our portable display to three venues.
- We were successful in obtaining a grant for summer students but unfortunately were notified so late that we were unable to find two students who were qualified to do the job in question, monitoring of permanent biophysical plots. Nevertheless, an interested volunteer, Kim McKinnon, provided much-appreciated help with monitoring of some of the plots.
- WNAS and no doubt all our visitors enjoyed the new boardwalk, courtesy of Alberta Parks, this year. We celebrated it with an event in the picnic shelter for donors and boardwalk construction staff, including speeches and cake.
- Speaking of eating, we enjoyed barbecues provided by Knights of Columbus volunteers after they had helped us with both spring and fall clean-ups. A big thank-you to them for their assistance, as well as their outdoor culinary skills!
- Thanks to all our site monitors and maintainers. Again we have been greatly assisted in this by Heike Kohl and Holly Duval who took on a month each during the busy summer season when our monitor numbers were low and visitors were many. In total we have recorded 1,166 volunteer hours for the past year to bring our grand total up to 28,754 from the time we first started keeping these records.
- As noted in our November newsletter, we lost Eddie Jones in November. He was a founding member of WNAS, and Wagner would never have been declared a Natural Area but for his work and commitment. We already have a body of water on site named for him (Jones's Pond) but we may use his memorial donations to honour him again
- Pat Clayton thanked the following volunteers: Pat Webb, Carole Dodd, Vid Bijelc for website creation and maintenance; Derek Johnson, Patsy Cotterill, Loney Dickson, Kim McKinnon and Irl Miller for work on the restoration fields and plots; Heike and Holly for monitoring; Leslie Treseder and Beth Jenkins for visioning; Dick Clayton for his unfailing support and physical presence on Pat's visits to the site and also for years of Tree Swallow nest box monitoring; Jasper Kaiser for taking on the Tree Swallows and continuing to be Fire Marshall; Cathy Mowat for stepping forward and getting the meetings and visionings under way and for coordinating the Clean-up Days.

Patsy Cotterill was this year's recipient of a Wagner Appreciation Award for services to Wagner Society. The award was a water colour painting of a round-leaved orchid by local artist Cindy Barratt. Alice Hendry and Pat Clayton researched and presented the award.

Join us for our Annual Orchid Walk, June 17th, 2012. Guided tours will leave from the Wagner parking lot at 11 a.m. and 1 p.m.

Contents of this Issue

Meet Our New Summer Student, Ashley Thorsen!

Ashley with a Long-eared Owl

Ashley is in her 4th year of an Environmental and Conservation Sciences degree at the University of Alberta, and she has a Renewable Resources diploma from NAIT. She enjoys birdwatching, bird banding, and plant identification. She is not entirely certain what her future career path holds, but she hopes that wetland conservation will be part of it!

Ashley is funded by the Canada Summer Jobs Program with additional funds provided by Wagner Society.

May Count of Plants in Flower, 2012

It became clear some days before the Count in Wagner on May 27 and May 28th that this was not going to be a record-breaking year for numbers of species in flower. A total of 55 species were recorded in flower (i.e., anything from a plant with a few opened flowers showing anthers ready to shed pollen and /or stigmas ready to receive it, to species in which the majority of individuals had fading blooms). The tally was less than last year's 63 species but equal to 2008's 55 and comparable to 2009's 51 species. In many cases, comparing this year's results to last's, although the flowering stage was lower (e.g., 50% of a species populations was in bloom compared to 100%), this made no difference to the actual number of species counted in flower (i.e., both 50% and 100% count as being in flower). There were 13 "losses" (i.e. species that did not qualify as flowering this year compared to last or that couldn't be found), and six gains (plants that squeaked into flowering this year but not last) and the addition of one previously unrecorded species in flower on the May Count, bittercress (*Cardamine pensylvanica*).

A useful by-product of wandering the property while counting during the weekend (always the last full weekend in May) is the opportunity to keep tabs on rare or unique populations of a given species. The good news is that several plants of Northern Valerian (*Valeriana dioica*) were observed near the end of the Marl Pond Trail, indicating that it has spread; the bad news is that it was only in bud and so could not be counted. The two streams traversing the "east-west road allowance" and feeding the beaver pond and Morgan Creek proved to be a productive habitat. On their muddy shores grew patches of common mare's-tail (*Hippuris vulgaris*) which on careful examination revealed tiny flowers within their upper whorls of leaves. The thin white female stigma of each flower protruded between two red anther lobes that were as yet unopened – an early flowering stage. About 50% of the stems examined showing emergent stigmas but none had ripe stamens. Here also I found one marsh ragwort (*Senecio congestus*) in flower and the new species for the count, two plants of bittercress with flowers.

To summarize, flowering was somewhat retarded compared with last year (as judged more from percentage flowering rather than absolute numbers counted, which can depend more on the route taken and the absolute thoroughness with which the count is conducted), but on the whole most species were quite faithful to their flowering time and sequence.

Taking part in the Count were Pat Clayton, Ed and Doreen Letain, Susan Moore, Gail Fennell and Ashley Thorsen, with contributions from Alice Hendry and Carolyn Vanderveen. Patsy Cotterill coordinated.

Photo: P. Cotterill

Ashley Thorsen and Gail Fennell participating in the May Count at Jones's Pond, May 27th.

Wagner Natural Area Biophysical Survey Revisited (2011): Summary

by Derek Johnson

"Twenty-nine permanent sample plots have been established in the Wagner Natural Area as a result of two biophysical surveys conducted in 1999 and 2006. During the summer of 2011, 15 of these plots were visited by members of the Wagner Natural Area Society. Emphasis was placed on those plots found in the extension lands.

A complete re-measurement of plant covers was done in 11 of these plots; in the other four, only tree diameters were measured. Six of these plots are located in so-called hay meadows, four of them being cut annually and two which have not been cut for several decades. Measurements over the past 12 years indicate that grass cover in the active plots has increased, whereas the cover of forbs has decreased. Most of the increased grass cover is due to smooth brome (*Bromus inermis*) and it has increased at the expense of introduced clover species (*Trifolium*). The cover of alfalfa (*Medicago sativa*) has remained relatively constant in the active fields over the past 12 years. Fifteen native vascular plant species and 16 introduced species have been found in these plots. The most frequently encountered native species are American vetch (*Vicia americana*) and common horsetail (*Equisetum arvense*). The average number of native species found in the active plots (two) differs significantly from the number found in the inactive plots (six). The cover of noxious weeds in these plots, particularly common dandelion (*Taraxacum officinale*), Canada thistle (*Cirsium arvense*), and perennial sow thistle (*Sonchus arvensis*), has been highly variable over the years, but these species have persisted. Shrub expansion, particularly of prickly rose (*Rosa acicularis*), is occurring in the inactive plots.

Little change, in terms of species composition or cover, has occurred in two plots established in marl ponds, with the exception of a marked increase in the cover of great bulrush (*Schoenoplectus acutus*) in one of them. The trees in the seven plots with some form of tree cover on them appear healthy. Tree mortality was observed in only one of these plots. The majority of the trees measured, both coniferous and deciduous, are growing at a rate of between 2 and 4 mm/yr. Some of the largest and oldest trees of white spruce (*Picea glauca*), Alaska birch (*Betula neoalaskana*) and balsam poplar (*Populus balsamifera*) in the Natural Area are found to the west of the Cabin Trail. Exceptionally large specimens of river alder (*Alnus incana* ssp. *tenuifolia*) and false mountain willow (*Salix pseudomonticola*) were found in one plot in the southeastern part of the Natural Area."

Derek's full report contains a detailed analysis of the individual plots re-surveyed in 2011, with information on individual tree growth and vegetation trends. The full report will be posted on the Society's website.

This season Rangeland Conservation Service Ltd. (RCS) has been contracted to re-sample vegetation in 14 permanent sample plots established in WNA by Geowest Environmental Consultants Ltd. in 1999, and four plots established by RCS in the extension lands in 2006. Sampling will follow the nation-wide Ecological and Monitoring Assessment Network Terrestrial Vegetation Monitoring Protocols.

(Photos: below left, infill of marl pond with great bulrush *(Schoenoplectus acutus);* below right: determining vegetation cover in a fen plot.)

Photo: P. Cotterill (2011)

Photo: Rangeland Conservation Service Ltd (2006)

Tragedy in our National Parks?

by W.A. Fuller (1924-2009)

Editor's note: The ideological and practical tug of war between "parks for conservation" and "parks for people and tourism" has likely been going on ever since the first national parks were created in North America. Now, with the laying-off of 1600 Parks Canada workers proposed for this spring by the federal government it seems that both ideologies will suffer.

When I came across a reprint of a Distinguished Lecture given by Dr. William (Bill) Fuller to the National and Provincial Parks Association of Canada (now CPAWS) in 1977, I wondered what attitudes prevailing towards parks were back then. Consequently, I thought it might be worthwhile re-publishing it, with the permission of CPAWS, as a permanent record in our newsletter. Bill Fuller was a long-time supporter of Wagner Natural Area Society until his death in 2009. At the time he gave this lecture he was a zoology professor at the University of Alberta with research experience in Wood Buffalo National Park and elsewhere in the north. (He was responsible for discovering the nesting grounds of whooping cranes on the Alberta/Northwest Territories border in 1954.) He was also ex-Chairman of the Conservation of Terrestrial Communities sub-Committee of the International Biological Program and Chairman of the National Research Council of Canada's Associate Committee on Ecological Reserves. Dr. Fuller was also one of the founders of the Boreal Institute for Northern Studies which eventually became the Canadian Circumpolar Institute. Since the lecture is quite long, I propose to re-publish it in the Wagner newsletter in four parts. The title and some of the subject-matter of the lecture derive from ecologist Garrett Hardin's model of "the tragedy of the commons" in which he predicts that shared resources will be overexploited until they are ruined because, even though it is in everyone's long-term interest, no-one has short-term incentive to protect them.

"Foreword

"The National Parks of Canada belong to all Canadians for all time. In a world of constant change, Parks Canada exists to preserve the natural heritage of this country; to help Canadians everywhere enjoy the vast beauty of our land and the great achievements of its founders."

Judd Buchanan, Minister responsible for Parks Canada (Aug. 1974-Sept. 1976)

The Distinguished Lecture Series was organized by the National and Provincial Parks Association of Canada, with funding assistance from Parks Canada, as a public education program. The series was introduced to encourage general public interest and understanding of parks and related issues. Co-sponsorship has been possible as both the National and Provincial Parks Association of Canada and Parks Canada recognize that a good parks system is vitally important to this and future generations of Canadians.

Dr. Fuller's lecture, "Tragedy in our National Parks?" was presented during the spring of 1975 to enthusiastic audiences in Ottawa, Vancouver, and Winnipeg. The analogy between the pressures placed on the English commons described by Garrett Hardin provides the basis for Dr. Fuller's paper. He then challenges both citizens and government with the responsibility of averting "tragedy" in our National Parks. His provocative paper is indeed an appropriate beginning for the Distinguished Lecture Series."

Terry L. Green, Executive Director, National and Provincial Parks Association of Canada

"This talk, like Caesar's Gaul, is divided into three parts. The first part examines the question: What kind of problems face National Parks and which of them are most serious? The second part attempts to relate what I consider the chief problems of National Parks to the System of the Commons set out by Garrett Hardin in his famous essay "The Tragedy of the Commons." Those of you who know the essay will have recognized the source of my title. In the third part I look for solutions to the problems raised and try to suggest what form solutions are likely to take.

First, the problems that beset National Parks clearly fall into two broad categories – threats from without and threats from within. Extrinsic threats are directed at parks by people who are not sympathetic to the concept of National Parks and by those who see a higher purpose in extraction of minerals, exploitation of forests, hunting of game, or any other consumptive use – in short, economic determinists. Traditionally, they have been the enemy, and only vigilance on the part of groups such as the National and Provincial Parks Association of Canada and its forerunners, and perhaps some happy choices of Federal ministers, has held them at bay in the past. The conservation movement has reacted with increasing vigour to external challenges and is now so effective, in my view, that extrinsic threats are no longer the major concern that they were a decade ago. Recently, also, American authorities, such as Marion Clawson, have been able to show that recreational uses of parks can yield a greater economic return than exploitative uses. Thus, paradoxically, economic determinism has, in the end, come to the aid of the parks.

The new-found economic clout of the parks, of course, came from dramatic increases in park visitation, and those increases introduce problems of another kind – those that I call intrinsic. So, while I do not wish to imply that vigilance is no longer necessary against extrinsic threats, or that extrinsic threats cannot delay or prevent declaration of new parks – because this is clearly not the case – I do want to discuss in more detail what I consider to be the greater and more difficult long-term threat: namely to protect parks against their own users.

Fundamentally, more people, with more money, more leisure, and better transportation have streamed into National Parks at an exponentially increasing rate since the end of World War II. Each increase in this flood of visitors has stimulated Park Managers to construct, or permit the construction of, more facilities, which has in turn brought more visitors. This is a classic case of a vicious circle or, in more modern terms, positive feedback. Most systems in the grip of positive

Continued on page 6

Continued from page 5
feedback are programmed for self-destruction and *will* self-destruct unless effective external controls are instituted.

Let me give you a simple example to make clear what I mean by positive feedback. Imagine a room with a thermostat that reacts to a rise in temperature by instructing the furnace to put out more heat, which raises the temperature still further, provoking the thermostat to instruct the furnace to work still harder to produce a further increase in temperature. Obviously, the room would soon be unbearably hot, and there would be real danger that the furnace would burn itself out or even set the whole building on fire – in short, that the system would destroy itself. This is positive feedback – every deviation from a normal or average situation, or a set-point of some kind, provokes further deviation *in the same direction*. Such a system can only be saved from self-destruction by imposition of control through an *external* agency. In the example that I have given, for instance, someone could limit the rate at which fuel is fed to the furnace by operating an external valve.

On the other hand, we all know that proper thermostats react to an increased temperature by instructing the furnace to take it easy, and to a decrease in temperature by instructing it to get busy again. In more general terms, deviations from a norm or a set-point provoke responses that work in the opposite direction and thus tend to restore the system to its original state without intervention by an agent external to the system. This is the essence of negative feedback. Engineers have developed a vast array of sophisticated devices to regulate machinery and industrial processes by negative feedback. Evolution has also developed an array of negative feedbacks that act, for example, to keep the composition of our blood remarkably uniform even though nutrients and gases and waster products are continually being added or deleted as it circulates. In ecology too, negative feedback plays an important role in regulating numbers of individuals in populations and in maintaining some sort of recognizable structure in communities.

As a bold generalization, we can go so far as to say that no resource, renewable or non-renewable, can long survive if its rate of exploitation is constantly increasing under the influence of positive feedback. On the other hand, renewable resources ought to last in perpetuity if their rate of exploitation is regulated by negative feedback. Thus, it behooves us to examine what is going on in parks where positive feedback seems to be in control. We want to see whether there are any negative feedback loops, and if we are unable to discover any, to consider ways of saving the system by means of externally imposed controls."

Photo: Lu Carbyn

Bison in Wood Buffalo National Park

To be continued in subsequent newsletters…

Looking towards the future – our vision for Wagner Natural Area and its stewards, and how to realize it

Wagner Natural Area Society has held five special "visioning" and planning sessions over the last three years: in May and December of 2010, April and October of 2011, and in March, 2012. As a result of these sessions we have developed the following vision statements:
For the Society: "The Wagner Natural Area Society is an independent volunteer organization, passionately committed to the protection and ecological integrity of the Wagner Natural Area. The Society is a sustainable, respected organization focusing on partnerships, advocacy, outreach and knowledge-based management."

For the Wagner Natural Area: "In 2018 the Wagner Natural Area will be: an ecologically vibrant and healthy natural area, physically connected to a network of other protected areas, widely recognized for its fen habitats and diversity of species, buffered from conflicting land uses, a place of significant natural beauty for peace and contemplation, and a location for learning about our environment and conservation."
To achieve these goals we identified a number of strategies or actions, the personnel who would likely be responsible for carrying them out, and time frames for completion. Several of our goals are extremely challenging, not least that of finding replacements for our aging Society board members. It seems that a healthy and active stewards group is vital because, as can be seen from the article on page one, conservation of the Natural Area requires active conservation through continual human effort.

Willow Leaf Miner Outbreaks in Northern and Central Alberta

by Patsy Cotterill

When I was travelling to Lesser Slave Lake early in August last year I was struck by how brown and dead-looking were large numbers of willows growing along the roadside ditches, especially north of Westlock. When I returned to Edmonton I enquired of City of Edmonton entomologists Chris Saunders and Bill Barr whether the disease or infestation was present in local willows. The answer came back positive. Bill Barr of the Environmental Services Lab, City of Edmonton, did some research, including hatching a moth from a pupa he had collected to assist in identification, and kindly supplied me with information and a number of online references. I summarize this information below.

The brown, curled leaves of the willows are caused by an infestation of the larva of a moth, *Micrurapteryx salicifoliella*, in the family Gracillariidae. This insect, variously known as the willow leaf miner or the willow blotch miner, is native and endemic to North America, but normally present in populations low enough to be unobtrusive. It becomes very noticeable, however, even observable from the air, when present in epidemic proportions, because of the damage it causes. Interestingly, according to an article in the *Bonnyville Nouvelle* (newspaper) dated August 10, 2010, populations of the leaf miner have been apparent in northeast Alberta for several years, but in 2010 the population exploded dramatically. This would explain the very obvious browning of the willows I saw in 2011 as I drove north.

Severe willow defoliation caused by this species has been observed in Alaska for at least 15 years, and in the Yukon since 2007. Here is some basic information on the biology of the species, taken from "Willow Blotch Miner: Yukon Forest Health – Forest insect and disease No. 25," Forest Health Program, Forest Management Branch, Energy, Mines and Resources, Government of Yukon, Whitehorse (?2009).
The adults are small, grey mottled moths with a wingspan of 10-11 mm. They emerge from sheltered places after overwintering and mate, with egg-laying occurring in late May. The eggs are pale green and satiny and laid singly on the undersides of the leaves. They are cemented in place by an excretion from the female. The larvae hatch about two weeks later and begin to eat the leaf tissue towards the upper surface, causing reddish-brown necroses of dead tissue, or blotches, to form. The larvae go through five instars before emerging about mid-July from slits or tears in the undersides of the leaves. If the attack occurs earlier in the spring, galls, small conspicuous bumps on the leaf surface, may develop. The young larvae (first and second instars) are 0.5-1.6 mm long, with yellowish bodies that taper towards the rear, and brown heads. Larvae in the third to fifth instars are larger (1.3-6.5 mm), translucent yellow and equipped with legs. After emergence the larvae develop into dark brown, slender pupae 4.8-5.5 mm long, and cocoon under a cellophane-like dome on the leaf surface.

Other insects may cause similar damage to the leaves, but that caused by leaf beetle larvae of *Phratora* species can be distinguished easily because the leaf is skeletonized.

The effect of short-term infestations on willow mortality is not clear; if low, it would have little negative impact on hydrology and fire hazard. However, defoliation can reduce food supply for moose and willow ptarmigan, which in turn may reduce traditional hunting opportunities.

What causes outbreaks? The breeding success of the moth is enhanced by warm, dry weather, and when the resistance of the willow hosts is reduced (e.g., by stress due to drought). Climate change factors may thus well be implicated. Northern Canada is warmer now both in the winter (by up to 10^{o}C), and in the summer (by 3-5^{o}C), and higher temperatures result in lower levels of soil moisture unless precipitation also increases. Defoliator species may benefit from warmer temperatures because of higher rates of winter survival, fewer frosts at critical times, a longer summer season for growth and reproduction, and climate-caused stress in the hosts. Most willow species are susceptible, the exceptions being those having a dense covering of hairs on the leaf undersides, which precludes egg laying, and arctic/alpine species.
Entomologist Greg Pohl says that the willow blotch miner has been present in Edmonton for years. A quick check in Wagner Natural Area later this August indicated that it certainly isn't immune from the infestation, although very large numbers of willows are not yet affected. It would be of interest to tag and GPS a number of willows – say a dozen – that show the infestation and follow them through the years to see if they die sooner than a control group of uninfected willows. We should also of course monitor for signs of spread of the outbreak.
For pictures of the moth and typical leaf damage, go to http://www.microleps.org/Guide/Gracillariidae/Gracillariinae/Micrurapteryx/index.html.

As a footnote, several of us observed extensive aspen leaf miner damage as we drove west over the mountains this year: the aspens appeared uniformly whitish-grey over large distances. Again, could this be related to climate change?
Reference:
http://www.emr.gov.yk.ca/forestry/pdf/forest_health25.pdf

Photo: P. Cotterill

Willow in Wagner affected by leaf miner.

Wildflowers of Wagner No. 36

Calamagrostis spp.
Family Poaceae

Reed Grasses
Grass Family

The genus *Calamagrostis* consists of the reed grasses, tall perennial grasses of the cool temperate climates of North America and northern Europe and Asia. Many *Calamagrostis* species occur in moist environments, including our two common local species, marsh reed grass (*Calamagrostis canadensis*) and northern reed grass (*C. stricta*).

The reed grasses have a number of features in common. The flower heads (panicles) bear numerous units called spikelets on short branches, each of which consists of only a single flower (floret). Each spikelet has two glumes, usually more or less equal in size, suffused with purple and pointed, with a mid-line ridge or keel which may be smooth or rough due to the presence of tiny hairs. The floret consists of a smaller, often more or less membranous lemma and palea, which in turn enclose the reproductive parts of the flower, the anthers carrying the pollen, and the style and ovary from which develops the grain. A characteristic appendage of the lemma in this genus is the bristle or awn that arises from the back of the lemma and is either straight or bent. It can be seen as distinct from the tuft of bright white hairs that arises from the base of the lemma (callus).

Marsh reed grass, also known as bluejoint, can be fairly readily distinguished from northern reed grass in the field. Its panicles tend to be more open, with longer branches and spikelets that do not extend to the very base, and it is often curved or somewhat drooping, and purplish. The long rhizomes (creeping horizontal stems) of this grass allow it to form extensive patches around lakeshores and in wetlands. It is often a major understory herb of moist northern forests. In Wagner Natural Area it occurs around creeks and in wet, non-peat-forming areas of forest stands.

Calamagrostis stricta ssp. *stricta* in Wagner fen in fall; above, whole plant; below, showing panicle

Northern reed grass consists of two subspecies that are difficult to tell apart, and which were once recognized as two separate species, *Calamagrostis inexpansa*, the more robust form, and *C. stricta*. Now they have subspecies status under the single species *C. stricta*. Both occur in open meadows and both appear to favour the wet alkaline soil conditions of Wagner's fens. More sample studies are needed, but it appears that *C. stricta* ssp. *stricta* is the more common variety in the fens. It is particularly abundant and easily seen in the "roadside fen" east of the parking lot, where it forms large conspicuous tufts in the marl. When it is in flower and both the panicle branches and the purple-and-green spikelets have opened to facilitate pollen shedding, it is strikingly attractive.

The tall (up to 90-cm), straight stems are smooth throughout or sometimes rough just below the panicle. The leaf blades are narrow, 1.5-2.5 mm wide, and often folded, bearing membranous ligules 1-4 mm long at the junction of leaf blade and leaf sheath. On the short panicle branches the spikelets are crowded almost to the base, giving the flower head a congested look. (In late summer and fall the whole plant becomes straw-coloured, and the golden panicles close up to become almost cylindrical.) The spikelets are 2-3 mm long, slightly shorter than in subspecies *inexpansa* (3-4 mm long), and the lemmas somewhat shorter. The straight awn is 1.5-2.5 mm long and can be seen clearly when the spikelet is pulled apart. The white callus hairs vary in size but are shorter than the lemma.

Subspecies *stricta* usually produces good pollen in its anthers, whereas in subspecies *inexpansa* the anthers are often poorly developed and do not shed pollen. This subspecies may then produce seed without sexual recombination of genes.