Industrial Activity in the Central Parkland and Northern Fescue Native Grasslands

Strategies for Minimizing Surface Disturbance

September 1, 2016

Alberta Government

Acknowledgements

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Purpose

This document, *Industrial Activity in the Central Parkland and Northern Fescue Native Grasslands – Strategies for Minimizing Surface Disturbance*, was created to provide specific guidance on minimizing surface disturbances for Central Parkland and Northern Fescue Natural Subregions (NSRs). It describes the important grasslands in these NSRs and best practices for conservation and reclamation. The intent is to also to educate and alert all industries to the environmental and economic risks of disturbing the remaining grasslands in the Central Parkland and Northern Fescue NSRs.

These remaining native grasslands in the Central Parkland and Northern Fescue NSRs are highly fragmented. Preservation of existing tracts is very important to protecting the native plant community ecological integrity and resulting biodiversity. The overall purpose of this document is to emphasize the importance of utilizing the proven threefold strategy below, while providing conservation and reclamation strategies specific to native grasslands in the Central Parkland and Northern Fescue NSRs.

1. Avoidance of native grasslands if possible, especially in critical ecological sites that are identified as extremely difficult to reclaim.
2. Reducing industrial disturbance to the extent possible, and
3. Developing practical methods that will allow eventual restoration of impacted areas.

How to Use This Document

This document was released concurrently with AEP's 2016 update to the *Principles for Minimizing Surface Disturbance in Native Grassland - Principles, Guidelines and Tools for all Industrial Activity in Native Grasslands in the Prairie and Parkland Landscapes of Alberta* as a complementary policy document, it is referred to as AEP 2016 throughout this document.

As well, this document has similar objectives as the document *Industrial Activity in the Foothills Fescue Grasslands–Guidelines for Minimizing Surface Disturbance*, specifically targeted to Central Parkland and Northern Fescue grasslands. It describes conservation and reclamation practices to avoid or minimize disturbances. Central Parkland and Northern Fescue NSRs have a variety of soils with accompanying varied grasslands with greater or lesser likelihood of reclamation success. For example, minimum disturbance may be effective in sandy soils but it is less so in loamy areas where avoidance is the best strategy. In addition, the extent of cultivated and disturbed land in the Central Parkland and Northern Fescue NSRs provide the ability to avoid disturbing native grassland and to relocate proposed projects on previous disturbances.

This document begins with a description of the geography and biophysical characteristics of native grasslands found in the Northern Fescue and Central Parkland NSRs, with particular detail on plains rough fescue (*Festuca hallii*), the once dominant grass. The importance of these grasslands is then discussed along with factors that constrain their conservation and restoration success. Strategies for development in the grasslands found in the Central Parkland and Northern Fescue NSRs follow, with specifics about appropriate minimal disturbance construction practices and conservation and reclamation practices. There were a number of important studies completed specific to reclamation in the CP and NF utilized in this document. References to these practices

can be found in a literature review completed to develop these strategies with a specific focus on restoration in these NSRs' - Reclamation practices in the Central Parkland and Northern Fescue Natural Subregions (Desserud 2016). Information and links are provided for regulations and further information can be found at the end of this document.

Strategies described in this document are designed to be utilized by all industries and land use activities that have the potential to be located within native grasslands found within the Central Parkland and Northern Fescue NSRs. These strategies apply to lands where the native plant communities remain intact and functioning. Essential areas would include grasslands with 30 per cent or greater native communities in place (less than 70 per cent disturbance). Application of these principles is currently required on public land primarily through the standards and conditions of the formal disposition approval and may apply on private land through landowner consultation and agreements.

This document is intended to be utilized when conducting any activity that may result in disturbance to native grasslands. Some examples include:

- mineral exploration and development, such as wellsites, mines, aggregate, quarry pits and associated facilities and infrastructure;
- forest industry timber extraction infrastructure;
- transportation infrastructure and borrow pits;
- electric energy transmission lines and associated infrastructure;
- renewable energy development, such as wind and solar power and associated infrastructure;
- communications related development and infrastructure;
- municipal developments and road access through public land for country residential development;
- recreational facilities and associated infrastructure; and
- rangeland improvement infrastructure required for livestock production.

Qualities of the Central Parkland/Northern Fescue Subregions

A variety of soils occur in the Central Parkland and Northern Fescue NSRs with an accompanying variety of grassland plant communities. Rough fescue grasslands occur mainly on loamy black soils in the Central Parkland grasslands and loamy dark brown soils in the Northern Fescue NSR. These grasslands are comprised of a combination of plains rough fescue and western porcupine grass (*Stipa curtiseta*) in the Central Parkland, and plains rough fescue with blue grama (*Bouteloua gracilis*) and needle and thread grass (*Stipa comata*) in the Northern fescue NSR. Plains rough fescue dominates mesic to sub-mesic grasslands such as plateaus and north or east-facing slopes. South facing slopes and drier sites are more typically dominated by western porcupine grass in Central Parkland. In the Northern Fescue NSR, blue grama and needle and thread grass occur in drier areas. In the eastern portion of the Central Parkland, sandy soils (such as south east of the Wainwright area), shift grassland species dominance to sandgrass (*Calamovilfa longifolia*), needle and thread (*Stipa comata*), and sand dropseed (*Sporobolus cryptandrus*).

“Prairie wool” plains rough fescue grassland next to an aspen grove (Desserud 2008)

Plains rough fescue is commonly known as “prairie wool”, because its hummocky clumps and curly thatch resembles balls of wool, especially when it dominates grassland to the exclusion of many other species. Plains rough fescue and foothills rough fescue (*Festuca campestris*) were once considered a single species; however, they are now distinguished as occurring at different elevations.

Plains rough fescue is found at elevations below 800 m and foothills rough fescue at higher elevations. Both species once dominated grasslands on loamy soils in their respective areas. Once established they both produce large amounts of litter. They flower sporadically and are long lived. Plains rough fescue is shorter, occasionally has short rhizomes, and forms smaller clumps. Like foothills rough fescue, plains rough fescue is resistant to drought and fire, and tolerates moderate grazing, especially in fall and winter when it provides valuable forage for livestock and wildlife. It begins growth in early spring and completes its growth cycle by early summer. Well managed rough fescue

Plains rough fescue flowering (Desserud 2008)

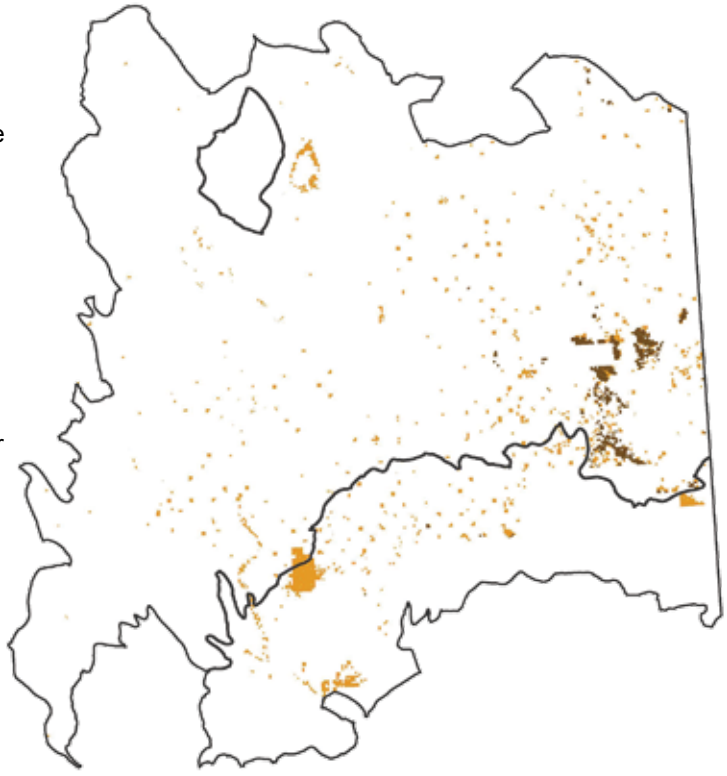
grasslands are a valuable, highly productive, and sustainable resource that supports livestock production and provisions goods and services.

Other common grassland species found in plains rough fescue dominated grasslands include the aforementioned western porcupine grass, blue grama and needle and thread grass, as well as western wheat grass (*Pascopyron smithii*), slender wheat grass (*Elymus trachycaulus*), june grass (*Koeleria macrantha*) and rocky mountain fescue (*Festuca saximontana*).

For more information on plains rough fescue and other plant communities consult the Range Plant Community Guides for the Central Parkland http://aep.alberta.ca/lands-forests/grazing-range-management/documents/CentralParklandRangePlantGuide.pdf and Northern Fescue Natural Subregion http://aep.alberta.ca/lands-forests/grazing-range-management/documents/NorthernFescue-NaturalSubregionGuide.pdf and the Range Health Assessment Field Workbook http://aep.alberta.ca/lands-forests/grazing-range-management/documents/RangelandHealthAssessment-Revised-2009.pdf prepared by AEP Rangeland Management Branch.

The spatial distribution of native grasslands in the Central Parkland and Northern Fescue Subregions has not been well mapped mainly due to the fragmented nature of the grasslands as they are interspersed with aspen in a mosaic landscape, and have been greatly fragmented by conversion to other land types. In a mapping project, identifying land uses from satellite images, air photos and provincial inventories, Bjorge et al. (2004) concluded less than 12 per cent of original native grassland remains in the Central Parkland and similar degradation has occurred in the Northern Fescue NSR (Desserud, 2016).

To provide an indication of this fragmentation, the following map highlights the public land in these NSR's where the land surface is largely undisturbed and managed as native rangeland with a high likelihood of the presence of intact native grasslands. The map also indicates a rough extent of the sandy and loamy soils in these areas.



Central Parkland and Northern Fescue Natural Subregions

Soil Texture Categories

Loamy Dominated

Sandy Dominated

Note: The areas mapped as having a high likelihood of intact native grasslands correlate to grazing leases and permits. However, this map is not inclusive and other areas of intact grasslands in these natural subregion will exist

Produced by Land Policy Branch, Range Resource Stewardship
Base Map Data provided by the Government of Alberta under the Alberta Open Government Licence November 2014.
Cadastral - Dispositions Data provided by Alberta Data Partnerships

Map Date July 2016
Information as depicted is subject to change therefore the Government of Alberta assumes no responsibility for the discrepancies at time of use.

Why Conservation of Native Grassland in Central Parkland/Northern Fescue is Important

In Alberta's Central Parkland and Northern Fescue NSRs, rich black and brown soils have attracted farming and settlement since the late 1800's. Thus, agricultural expansion, oil and gas development, transportation infrastructure, and rural and urban growth have contributed to habitat degradation and conversion. Only native grassland remnants remain in these subregions and native plant communities and biodiversity is at continued risk from incremental losses due to these activities. In addition, when large tracts of native grasslands in the Central Parkland or Northern Fescue NSRs are disturbed, carbon dioxide (CO_2) and nitrous oxide (N_2O), greenhouse gases are released. Consequently, native grasslands in these natural subregions require protection and surface disturbances minimized.

Extensive tracts of Central Parkland and Northern Fescue grasslands have been permanently converted to non-native cover types, which are long term and are difficult to remove. Habitat loss, alteration and fragmentation can result in reduced quality of wildlife habitat due to increased mortality, reduced reproductive success, displacement to other habitat, and loss of habitat connectivity. Disturbed Central Parkland and Northern Fescue grasslands also experience reduced ecological services: reduced watershed protection, carbon storage and soil moisture retention.

Factors limiting Conservation and Restoration of Grasslands in the Central Parkland and Northern Fescue

Cumulative effects are the combined effects of past, present and reasonably foreseeable future land-use activities on the environment. Surface disturbance in grasslands can be categorized in a number of measurable categories that help in the understanding and management of cumulative impacts of land use practices to Alberta's native grasslands. These factors include:

1. **Plains rough fescue recovers poorly when grassland is disturbed**

   It germinates easily from seed; however, plains rough fescue requires at least three years to become established. During that time, it is susceptible to competition from more aggressive species and weeds. In fact, researchers have found it does best when seeded as a monoculture, which unfortunately is usually not practical. It is particularly affected negatively by wheatgrass cultivars, but tolerates less aggressive species such as June grass and blue grama. Unfortunately, seed is often not readily available. Wild harvesting is hampered by its sporadic seeding, and few growers cultivate plains rough fescue.

   Most other species found in rough fescue grasslands such as blue grama, needle and thread grass, june grass and rocky mountain fescue are readily available as seed and establish quickly when seeded. Western porcupine grass seed is an important species for these grasslands, and is not as easily found, and requires either several seasons to germinate or a period of stratification before it will establish. In fact, it has been noted that it takes 8-10 years following successful reseeding for seed mixed to begin to resemble similar patterning to surrounding native rangelands in these areas.

2. Anthropogenic Edge Density and Fragmentation

The progressive additions of linear developments like roads, pipelines and transmission rights-of-way in a unit of native grassland can be expressed as anthropogenic edge density and measured in km/square kilometer of linear feature. Research shows that grassland intactness declines as anthropogenic edge increases. Left unmanaged it results in the progressive fragmentation of native grasslands, reducing their health and function.

3. Shadow Effect and Invasive Species

Restoration of older disturbances is affected by past reclamation practices. A number of invasive introduced species were historically used to reclaim industrial disturbances, including smooth brome (*Bromus inermis*), kentucky bluegrass (*Poa pratensis*) and to a lesser extent crested wheatgrass (*Agropyron cristatum*). Sweet clover (*Melilotus officinalis*) was also commonly used as a cover crop. These species persist and thrive over time, preventing native species from establishing. Unfortunately, they are also prolific seed producers and their seed is readily dispersed by the wind, spring runoff, and overland flow. Invasive species seed is also transported by the tires, tracks and undercarriages of vehicles and heavy equipment as well as livestock and wildlife. These species are opportunistic, germinating where soil disturbance has occurred. Kentucky bluegrass and smooth brome also reproduce from extensive creeping rhizomes, often forming thick mats, aggressively competing with native plants for light, moisture and soil nutrients.

The spread of invasive, non-native species and weeds dramatically reduces the health and function of fescue grasslands. Winter forage, which is critical for sustaining important wildlife species, such as elk, is reduced. Forage production for livestock is less stable (e.g., more variability in production year to year) and forage quality is diminished. Biodiversity, critical to ecological health and function, is diminished. Industry should also be aware that prohibited noxious weeds, the control of which is legislated under the Alberta *Weed Control Act*, also presents a serious economic and ecological risk for development activity in plains fescue grasslands. Municipal authorities and vested stakeholders are well aware of the increasing number of weed species that can invade following soil disturbances, posing serious threats to the sustainability of native grasslands. Municipalities have the authority to upgrade the status of weed species under the Alberta *Weed Control Act*. Industry and landholders are expected to consult with municipal authorities regarding local weed concerns and their status within the municipality. Weed control is a requirement under the *Public Lands Act* for all dispositions and is considered a serious issue that affects all stakeholders in a multiple use landscape. The Alberta Agriculture and Forestry Alberta Weed Monitoring Network (www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/prm13875) has valuable information about weed classification and descriptions. Not all listed weeds occur in the Central Parkland and Northern Fescue NSRs. Table 1 lists those commonly found in the area; note that this list is not exhaustive.

Table 1. Noxious and Common Weeds commonly found in the Central Parkland and Northern Fescue NSRs

Common Name	Scientific Name	Type
Absinthe	*Artemisia absinthium*	Common
Bluebur	*Lappula squarrosa*	Common
Canada thistle	*Cirsium arvense (noxious)*	Noxious
Common burdock	*Arctium minus*	Noxious
Common tansy	*Tanacetum vulgare*	Noxious
Dalmation toadflax	*Linaria dalmatica*	Noxious
Dandelion	*Taraxacum officinale*	Common
Field bindweed	*Convolvulus arvensis*	Noxious
Flixweed	*Descurania sophia*	Common
Chickweed, mouse-eared	*Cerastium vulgatum*	Common
Leafy spurge	*Euphorbia esula*	Noxious
Narrow-leaved hawk's-beard	*Crepis tectorum*	Common
Night-flowering catchfly	*Silene noctiflora*	Common
Nodding thistle	*Carduus nutans*	Prohibited Noxious
Ox eye daisy	*Leucanthemum vulgare*	Noxious
Sow-thistle, perennial	*Sonchus arvense*	Noxious
Sow-thistle, annual	*Sonchus oleraceus*	Common
Spotted knapweed	*Centaurea maculosa*	Prohibited Noxious
Redroot pigweed	*Axyris retroflexus*	Common
Russian thistle	*Salsola kali*	Common
Rough cinquefoil	*Potentilla norvegica*	Common
Round-leaved mallow	*Malva rotundifolia*	Common
Scentless chamomile	*Tripleurospermum inodorum*	Noxious
Stinkweed	*Thlaspi arvense*	Common
Tall buttercup	*Ranunculus acris*	Noxious
Wild buckwheat	*Polygonum convulvulus*	Common
Wild mustard	*Sinapis arvensis*	Common
Wild oats	*Avena fatua*	Common

Sweet clover on a well site in Rumsey (Desserud 2006)

Strategies to Minimize Impacts on Central Parkland and Northern Fescue Grasslands

The final sections of this document list strategies to minimize disturbance that have been developed specifically for the Central Parkland and Northern fescue grasslands. These strategies are based from a large suite of principles and guidelines developed in Alberta in efforts to minimize disturbance on grasslands. Although these strategies have been developed for the Central Parkland and Northern Fescue NSR's, it is important to note they do come from a broader background of principles, guidelines and tools whose history is documented below.

The first guidelines, crafted to minimize surface disturbance and improve reclamation outcomes for native grasslands, were a direct result of the Prairie Conservation Action Plan 1989-1994 (PCF 1989). The Plan was used as intervener evidence by a Special Areas landowner during an ERCB hearing for a well site and access road. The landowner was opposed to disturbance of plains rough fescue grasslands. The hearing recommended agencies collaborate to reduce industrial impact in native grasslands. The ERCB subsequently joined the Prairie Conservation Forum, resulting in the first guidelines, ERCB Information Letter 92-12, Guidelines for Minimizing Disturbance in Native Prairie Areas (ERCB IL 92-12). As knowledge and experience was gained the guidelines were revised and captured in Informational Letter (IL) IL 96-9 Revised Guidelines for Minimizing Disturbance in Native Prairie Areas (ERCB IL 96-9). This IL was subsequently revised in 2002 to include Parkland Areas; IL2002-01: Principles for Minimizing Surface Disturbance in Native Prairie and Parkland Areas (EUB IL 2002-1). In 2014, Alberta Environment and Parks undertook a major review and updating of IL2002-01 to include all industrial disturbances, and include considerable additional experience in both development practices and restoration outcomes
(AEP 2016).

These information letters came about through the experience and adaptive learning of a multi-stakeholder group with representatives from government, industry and the prairie conservation community (EUB IL2002-1) (AEP 2016).

Another important document these strategies were based from is Industrial Activity in the Foothills Fescue Grassland - Guidelines for Minimizing Surface Disturbance (ASRD 2010). The purpose of that document was to support policy to minimize surface disturbance in the southwest foothills fescue landscape of Alberta. The strategies incorporated here are to align with those guidelines but also ensure distinction between the two types of fescue grasslands in Alberta.

Avoidance of Native Plant Communities in Central Parkland and Northern Fescue

Avoidance is accomplished by siting development (this includes all industrial, agricultural, residential and recreational developments) adjacent to existing transportation corridors, on cultivated lands or improved pasture, and by using existing access trails or previously disturbed and non-native cover areas. It is important to include the infrastructure required during all phases of the project during planning.

Native grasslands on black and dark brown loamy soils are most critical to avoid due to their sensitivity to disturbance, potential for invasive species, and their already highly fragmented nature. Avoidance is achieved through knowledge of the location, integrity and ecological status of rough fescue and other native plant communities. Native grasslands occurring on sandy soils may tolerate minimal disturbance techniques; however, should also be avoided if possible. The degree of cultivation existing in the Central Parkland and Northern Fescue NSRs should make it fairly easy to find alternate sites or routes for development.

Tools for Avoidance

A number of tools are available to assist with siting disturbances to avoid sensitive grasslands. Descriptions of these can be found in **AEP 2016** and include:

1. Vegetation/Soil Inventories including Grassland Vegetation Inventory
2. Ecological Site Restoration Risk Analysis
3. The Landscape Analysis Tool
4. Protective Notations (PNT)
5. Conservation Easements
6. The Alberta Conservation Information Management System (ACIMS)
7. Online Permitting and Clearance (OPAC) System
8. The Fisheries and Wildlife Management Information System (FWMIS)
9. Species at Risk Information on ESRD website
10. Range Health Assessment protocol and the Range Health Assessment Field Workbook
11. Riparian Health Assessment and Riparian Health Assessment Field Workbooks
12. Sensitive Species Inventory Guidelines (GoA 2013)
13. Alberta Native Plant Council Guidelines for Rare Vascular Plant Surveys in Alberta - 2012 Update
14. Industrial Activity in Foothills Fescue Grasslands (ASRD 2010)

Reducing Surface Soil Disturbance

Due to the fragmented nature of all grasslands in the Central Parkland and Northern Fescue NSRs, avoidance is preferred and usually attainable. However, where avoidance is not possible, it may be possible to reduce the area of surface disturbance and amount of soil disturbance through construction practices appropriate for conservation of soil resources; and that optimize potential recovery of the native plant community while allowing industrial activity to be constructed and operated safely. The following guidelines apply to all development activities:

Tools for reducing surface land disturbance

A number of tools are available to assist with reducing surface land disturbance in Central Parkland and Northern Fescue NSRs. Descriptions of these can be found in **AEP 2016** and include:

1. Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta (GoA 2011)
2. Minimal Disturbance Practices specific to industry types

   The petroleum industry has been able to reduce the footprint of development activity on the native prairie landscape through:

   - Directional drilling of multiple wellbores from a single well pad;
   - Aligning flowlines with access requirements and by utilizing existing pipeline corridors. New pipeline developments should overlap preexisting by at least 1/3;
   - No strip or ploughed-in flow line construction; and,
   - Detailed soil handling procedures for large diameter pipelines with trench line stripping implemented in all areas that do not require grading

   All industrial developments are expected to incorporate the best available technology to reduce surface soil disturbance. This may include but is not limited to:

   - Use of geotextiles to reduce the amount of topsoil stripping during construction where grading is required, and to reduce scalping of native prairie sod during topsoil and grade replacement in the rough micro-topography of native grasslands
   - Use of interlocking rig mats installed over the grassland for temporary access or where appropriate, to avoid surface soil disturbance;
   - Minimize disturbance related to fence line development (no grading of fence line route);
   - Erosion control such as certified straw crimping, and soil trackifiers have merit on sandy soils in particular; and,
   - Locate agricultural infrastructure development (corrals, water developments etc.) to avoid native grassland disturbance.

Reducing Cumulative Impacts

Reducing cumulative impacts Central Parkland and Northern Fescue grasslands is both challenging and critical on conservation of native grasslands in these areas. Key components of reducing cumulative impacts lie in alignment to existing policy and planning initiatives such as the *Alberta Wetland Policy* and Regional Plans. Organizations such as the Foothills Restoration Forum and Alberta Prairie Conservation Forum are designed to promote collaboration and dissemination of technical knowledge, experience and tools from all sectors.

To reduce cumulative impacts, consideration of all components of the full development area is requisite. Particularly in the Central Parkland and Northern Fescue NSRs these include:

- Move developments onto already modified areas such as cropland and tame pasture or preexisting developments, e.g., well pads or pipeline right of ways.
- Utilize existing trails and create access management plans that are used by all industrial users
- Utilize common utility corridors
    - Reclaim and restore disturbances as soon as possible

AEP 2016 contains more details and tools for reducing cumulative effects on grassland areas in general.

Reducing Impacts through Scheduling

Experience with minimal disturbance construction during the dormant season (August to April) has reduced impacts to native grasslands when implemented under dry or frozen ground conditions in the Central Parkland and Northern Fescue NSRs. Chinooks are not common in the Central Parkland and Northern Fescue NSRs; however, high soil moisture levels may occur during spring and early summer seasons (May to July). This may result in serious rutting of sod in black and brown soils, and there can be degradation of stripped soil quality and quantity through wind and water erosion. Sandy soils are drier and hence more tolerant of early summer disturbances.

Time Soil Handling to Minimize Loss

Erosion control measures must be considered when specifying construction methods, soil conservation during construction, interim stabilization of conserved soils during operations and final reclamation at abandonment.

Where soil disturbance is necessary, the timing of topsoil stripping and replacement can have a dramatic effect on the success of the restoration strategy. Soil handling in the fall after the seed set of most species is more successful than at other times of the year. It is important to reduce the timeframe between topsoil stripping and replacement. It is also important not to re-disturb an area left to recover naturally. Ideally topsoil stripping and replacement should occur when native vegetation is dormant within the same year and before the next growing season.

Restoration Planning During All Phases of Development

The focus of reclamation practices in native grassland has shifted from controlling soil erosion and establishing sustainable grass cover to development planning with pre-disturbance assessment and implementation procedures designed to facilitate restoration of the native plant community structure, health and function. This need for a shift in focus from reclamation to restoration was acknowledged in the 2010 Reclamation Criteria for Wellsites and Associated Facilities in Native Grasslands www.aer.ca/documents/ils/pdf/il2002-01.pdf.

Understand the Natural Subregion Context

The Central Parkland is the southern-most area of Alberta's forest zone, forming a gradual transition from the Dry Mixedwood NSR to the north and west to the Grassland Natural regions to the south and east. Native grasslands are found in a mosaic with aspen poplar groves, saline wetlands and stabilized sand dunes. Fire suppression and elimination of historical bison grazing in the Central Parkland has resulted in expansion of aspen groves at the expense of the remaining pockets of native grasslands. The Northern Fescue NSR comprises a transition from Central Parkland to the north to the Dry Mixedgrass NSR to the south. Aspen grove density is reduced and they are limited to mesic areas. Shrubland increases and grassland is mixed with drier vegetation species.

Choose the Appropriate Recovery Strategy

The Recovery Strategies Project developed a document for industry reclamation the Northern Fescue NSR (Lancaster et al. 2014) to provide guidance for reclamation practitioners, contractors, landowners and Government of Alberta regulatory authorities. The project is comprised of a literature review, a field component based long term monitoring, and data analysis. A similar document is proposed for future development for the Central Parkland. In the meantime, since both areas include rough fescue grasslands, recovery strategies for the Northern Fescue NSR may be applied in the Central Parkland.

In the Central Parkland and Northern Fescue NSRs, natural recovery is fairly successful on small disturbances in sandy soils. On loamy soils, recovery is poor and avoidance is recommended.

Small disturbances may be assisted with native hay cut from adjacent grassland. The use of native hay has been successful in reclamation experiments in black soils in the Central Parkland. However, restoration of disturbed sites previously seeded with invasive species will have limited success, due to long-term survival of the seed bank. Also, sites in close proximity to areas already invaded with species like smooth brome will be subjected to wind-blown seed rain and/or rhizomal activity.

The majority of commercially available seed mixes are comprised of cultivars[1], especially wheatgrasses – western, northern and slender. Green needle grass is also a common seed mix species for the Central Parkland and Northern Fescue NSRs. Cultivars should be used with caution when reclaiming rough fescue grassland. Cultivars are developed for rapid germination and establishment and are commonly larger and more aggressive than their native counterparts.

[1] Cultivars are plant varieties which have undergone genetic restriction through selection by plant breeders and have been registered by a certifying agency.

Assessment of sites in the Central Parkland and Northern Fescue NSRs previously seeded with wheatgrasses and green needle grass cultivars found them dominating the disturbance years after seeding, resulting in a permanent net loss of plains rough fescue grasslands. On public lands, seed mixes must be approved by the appropriate regulatory body.

A detailed pre-development site assessment is required to determine restoration risk associated with development activity. Seeds of invasive non-native plants are easily transported by wind, water, livestock, and machinery from source points within a much larger landscape.

Spiderplow pipeline installation Northern Fescue NSR during dry conditions in November (Desserud 2009)

The following tools are important for determining restoration risk:

- Characterization of ecological range sites within the development footprint and local study area. Utilization of the Ecological Site Restoration Risk Analysis Tool (Graminae Services Ltd. 2009);
- Range Health assessment by a suitably trained rangeland agrologist of the local study area;
- Consultation with local municipal authorities (MD Council and Ag Fieldsman) to determine weed species of local concern with elevated status under the Alberta Weed Control act;
- Identification of potential source points for invasive non-native species within the regional study area;
- Habitat requirements for the invasive species identified within the source points; and,
- Knowledge of the grazing management plan within the project footprint and local area.

Further information is found in the literature review - *Reclamation practices in the Central Parkland and Northern Fescue Natural Subregions* (Desserud 2016). AEP 2016 includes a guideline for defining expectations for the timeframe for recovery.

Natural recovery on Spiderplow-installed pipeline 2 years later (Desserud 2010)

Importance of Site Maintenance and Long-Term Monitoring

Implement an effective monitoring program to ensure that reclamation objectives are met.

Restoration and stewardship of native grasslands requires long term commitments by those that choose to live on the landscape, maintain sustainable ranching operations or develop sub-surface resources. There are no quick fixes for errors made, and recovery takes a long time. The petroleum industry requirements for reclamation certification at abandonment in native grasslands recognize the importance of maintaining native grassland ecological health and function. Industry should be aware that sufficient funds for maintenance programs such as weeds and invasive non-native species control will be required during construction, production and reclamation phases of development. Science-based monitoring programs are required to guide recovery of industrial disturbances in native grasslands. Well-designed monitoring programs are particularly important during the first five years following construction and reclamation. During this initial recovery period, issues can be flagged and management adjustments made that will increase the probability of success of the restoration efforts. Examples could include removing the perimeter fence to facilitate grazing on a well site to reduce Kentucky bluegrass invasion, or controlling early erosion issues on a pipeline, access road or production site. Range Health assessments conducted at years 5 and 10 are particularly important to ensure the process of native species recovery is proceeding well.

Use Standardized Methodology to Measure Success

AEP 2016 lists recovery strategy documents which provide guidance for post-construction monitoring programs, adaptive management, and standardized data collection required to measure restoration success.

Retain Records and Data for Long-Term Monitoring

Keep accurate records during construction and reclamation regarding the efficacy of best management practices and mitigation methods implemented. These records are useful in implementing site specific restoration monitoring. Retain all records until the site/project has been reclaimed. Transfer records if a change of ownership occurs.

Keeping detailed records of post-construction weed control and invasive non-native species management allows for accurate evaluation of the success of products and methods used and facilitate research and development of new methods and products.

Wellsite in the Northern Fescue NSR – year 1 (Desserud 2008)

Wellsite in the Northern Fescue NSR – year 6 (Desserud 2014)

Additional Information

Alberta Environment and Parks

2010 Reclamation Criteria for Wellsites and Associated Facilities for Native Grasslands
http://aep.alberta.ca/lands-forests/land-industrial/programs-and-services/reclamation-and-remediation/upstream-oil-and-gas-reclamation-and-remediation-program/documents/2010-ReclamationCriteria-NativeGrassland.pdf

http://aep.alberta.ca/lands-forests/land-industrial/programs-and-services/reclamation-and-remediation/upstream-oil-and-gas-reclamation-and-remediation-program/documents/2010-ReclamationCriteria-Factsheet.pdf

Alberta Invasive Plant Council

www.invasiveplants.ab.ca/

Range Plant Community Guides

Range Plant Communities and Range Health Assessment Guidelines for the Central Parkland Subregion
http://aep.alberta.ca/lands-forests/grazing-range-management/documents/CentralParklandRangePlantGuide.pdf

Range Plant Communities and Range Health Assessment Guidelines for the Northern Fescue Natural Subregion http://aep.alberta.ca/lands-forests/grazing-range-management/documents/NorthernFescue-NaturalSubregionGuide.pdf

Range Health Assessment for Grassland, Forest & Tame Pasture, Field Workbook
http://aep.alberta.ca/lands-forests/grazing-range-management/documents/RangelandHealthAssessment-Revised-2009.pdf

http://aep.alberta.ca/lands-forests/grazing-range-management/documents/RangeHealthWorksheet-Grasslands-May2011.pdf

AER Information Letters

IL-2002-1 Principles for Minimizing Surface Disturbance in Native Prairie and Parkland Areas
www.aer.ca/rules-and-regulations/informational-letters

Recovery Strategies

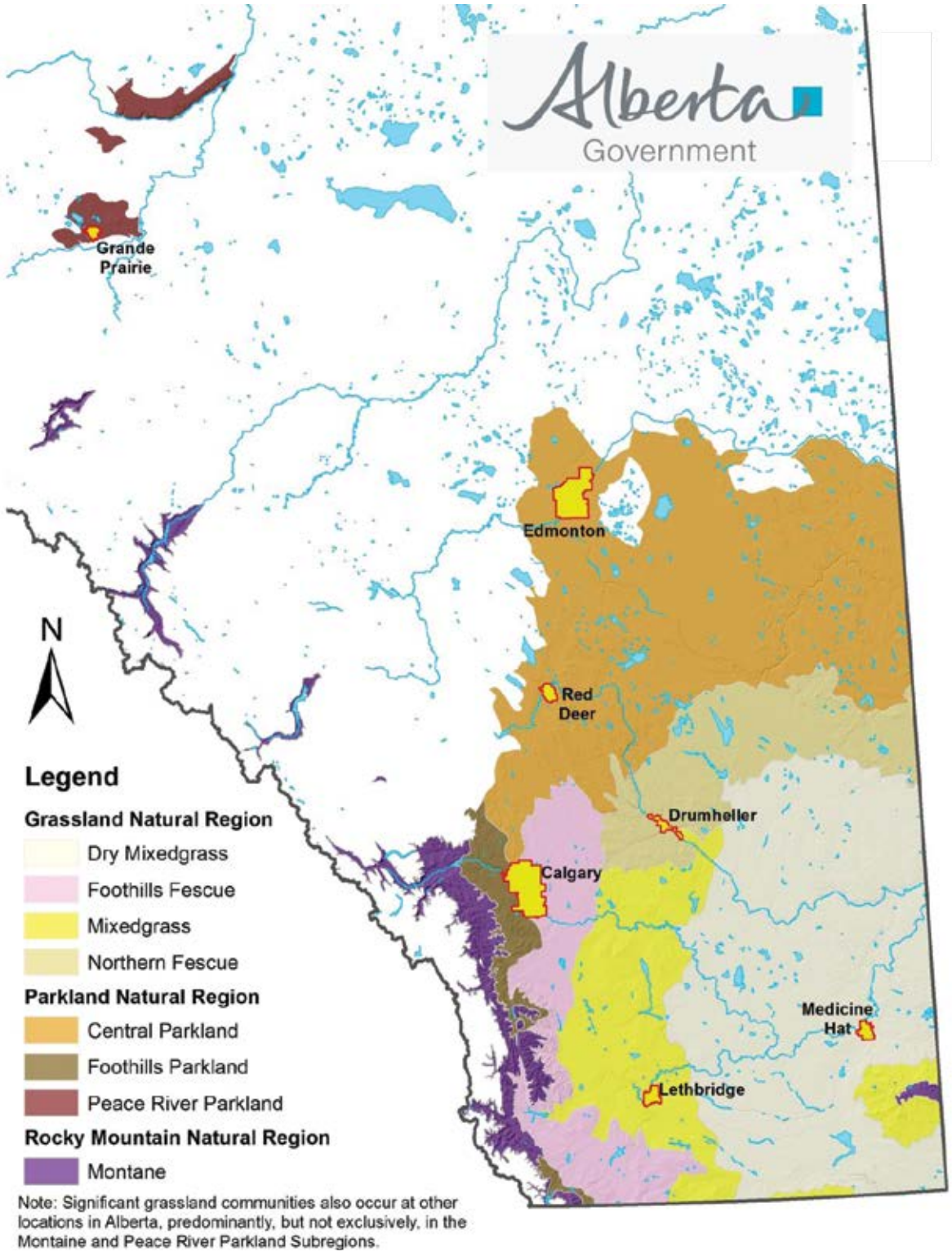
Recovery Strategies for Industrial Development in Native Prairie for the Mixedgrass Natural Subregion www.foothillsrestorationforum.ca/recovery-strategies/

Recovery Strategies for Industrial Development in Native Prairie for the Dry Mixedgrass Natural Subregion www.foothillsrestorationforum.ca/recovery-strategies/

Long-term Revegetation Success of Industry Reclamation Techniques for Native Grassland: Northern Fescue Natural Subregion www.foothillsrestorationforum.ca/

Recovery Strategies for Industrial Development in Native Prairie for the Foothills Fescue, Foothills Parkland and Montane Natural Subregion www.foothillsrestorationforum.ca/ - Not yet released.

Grassland Natural Subregions of Alberta



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