



INVENTORY OF NATIVE SPECIES SEED
MIXES IN ALBERTA:
DECEMBER 2018 UPDATE

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RECLAMATION
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EXECUTIVE SUMMARY

The Government of Alberta has long been a strong proponent of the use of native species for land reclamation and restoration projects. In 1973, the Department of Agriculture began an evaluation of native species suitable for reclamation of industrially disturbed lands (Vaartnou and Wheeler, 1975). That work eventually led to the creation of the Native Species Research Program at the Alberta Environmental Centre (now InnoTech Alberta) in the late 1970s.

InnoTech Alberta sponsored two workshops in November 2016 to gather stakeholder input for the Business Case to redesign the Native Species Research Program (Small et al., 2016a). One of the recommendations from the workshops was to:

Develop and maintain a list of existing prescribed native plant seed mixes to help growers identify opportunities and to drive work to provide improved mixes.

This report updates the first attempt (Powter et al., 2017) to inventory native grass seed mixes required or recommended for use in Alberta and those that are commercially available. The inventory was developed primarily through web-based searches and reaching out to researchers and land managers.

The report focuses on native species seed mixes for use in revegetation projects (reclamation, restoration, naturalization and remediation) undertaken for or by government or industry. Mixes labeled agronomic, forage, tame forage, hay, pasture, lawn, turf, park, etc. are not included in this report. However, some of the mixes contain agronomic species – these may be present to provide a nurse/cover crop that will allow the native species to establish, or they may be present because the mix represents a transition to a fully native mix.

While the majority of seed mixes in the inventory are sourced from materials produced since 2010, there are mixes dating back as far as 1977 to provide some perspective and insights into the extent of progress in seed mix design.

Some of the commercial mixes reported here are marketed for both large-scale projects and smaller projects such as homes or acreages – readers should check with the vendor to determine availability and volumes.

The following opportunities for the native plants community, government agencies and researchers arise based on the inventory of mixes and seed sources found to date.

1. A number of Required Mixes are currently in place which should be a driver for the development and use of native species seed. However the requirements must be enforced to be effective.

OPPORTUNITY: Canvass agencies with Required Seed Mixes and the project proponents who must follow the requirements to determine the level of compliance with the Required Seed Mixes and identify barriers to successful compliance.

OPPORTUNITY: Once barriers have been identified, devise a follow-up action plan to increase compliance.

2. Some municipalities require use of native seed mixes where the revegetation goal is naturalization. Two municipalities (City of Airdrie (2014), and City of Chestermere (2015)) were found to require native seed mixes but leave it to the project proponent to propose a seed mix for approval.

OPPORTUNITY: Obtain information on approved seed mixes to be added to this inventory.

OPPORTUNITY: Work with municipal associations (e.g., Rural Municipalities of Alberta¹ and Alberta Urban Municipalities Association²) or individual municipalities to increase awareness of the benefits of naturalization and native seed mixes with the ultimate goal of increasing the number of municipalities with Required Seed Mixes.

3. Seed mixes evolve over time (e.g., Jasper National Park historical vs. current mixes) and may move from the R&D stage to operational (e.g., AITF oil sands tailings stabilization mix -> Suncor erosion control mix), recommended or required mixes over time.

OPPORTUNITY: Track and report on changes over time to the content and use (classification) of seed mixes.

4. Specifying seed mix requirements in project tender specifications and/or project proposals can be problematic if the species or varieties or adequate volumes are not available.

OPPORTUNITY: Specify alternate species or varieties that will meet the same ecological needs but are more likely to be available (see for example the EnCana CFB Suffield mixes or the AEP loam to silty soils native seed mix for Northern Fescue Grasslands in this inventory).

OPPORTUNITY: Publish suitable alternate species for those currently in the Required Seed Mixes (see, for example, Pickseed (nd) or Native Plant Working Group (2000)).

5. Over the past 20 years InnoTech Alberta has registered 22 native seed varieties for use in Alberta representing 17 species but there were 100 species in Required Seed Mixes alone and 132 species in the Required Seed Mixes and Recommended Seed Mixes combined.

OPPORTUNITY: Continue to develop registered native species seed varieties to allow demand for seed in Required Seed Mixes to be fulfilled and to enable the Recommended Seed Mixes to shift to required (with appropriate proof of performance).

6. Even though there is strong interest in wetland mitigation and compensation, pit lake and wetland reclamation in pits and mines, and urban stormwater pond reclamation, only 27 seed mixes were identified for use in wet soils, wet areas or wetlands, and only 8 mixes contained *Carex* spp.

OPPORTUNITY: Develop and publish recommended seed mixes for wetland mitigation and compensation projects.

¹ See <https://rmalberta.com/>

² See <https://auma.ca/>

7. Although understory species in forested environments are key components of a functioning ecosystem there were only 14 seed mixes for the Boreal forest.

OPPORTUNITY: Develop and publish recommended seed mixes for use in Boreal forest revegetation projects.

8. There is a developing interest in pollinator mixes for urban naturalization projects. Four mixes in the inventory were designed for pollinators.

OPPORTUNITY: Develop and field test pollinator mixes for a variety of ecological settings, reclamation and urban naturalization projects in Alberta.

9. Most of the seed mixes in this report focus on development of target communities. In addition to the pollinator mixes described above, there are opportunities to design fit-for-purpose seed mixes to target specific use objectives (e.g., wildlife, traditional use, fire resistance, green roofs, etc.). Some examples of these mixes are found in the report.

OPPORTUNITY: Seek out additional examples of fit-for-purpose seed mixes and include them in the next iteration of the Inventory.

10. There are at least two commercial strategies that growers and vendors can adopt: target those species that have the highest demand and volume; and/or, target the low volume species in mixes that often are the key to increasing diversity and ultimate achievement of target ecosystems.

OPPORTUNITY: Continue to produce and update the Alberta Native Plant Council's inventory of native seed producers³ with an increased emphasis on relating the inventory to, at least, the Required Seed Mixes (and ideally the Recommended Seed Mixes).

OPPORTUNITY: Vendors should increase efforts to relate their available seed or seed mix products to the Required Seed Mix list (and ideally the Recommended Seed Mixes).

11. One of the difficulties in preparing this inventory was the different nomenclature (e.g., common name(s), old scientific name, new scientific name) and seed mix description formats (simple lists, wt %, PLS%, PLS/m², etc.). The latter is particularly noteworthy given the extensive literature recommending use of PLS/m² as the best method to ensure the appropriate seeding rates for individual species in a mix.

OPPORTUNITY: Develop a standard format for seed mix descriptions and require its use in project bid packages and regulatory documents.

OPPORTUNITY: Update all Required, Recommended and Commercial seed mixes to reflect currently accepted species names.

³ See <http://anpc.ab.ca/wp-content/uploads/2018/07/ANPC-Native-Plant-Source-2018May.xlsx>

12. The vast number of seed mixes identified to date was not predicted when this project started, in part because there is not enough publicity around the requirements for, and use of, native species seed mixes in revegetation projects.

OPPORTUNITY: Create an information portal to provide current information on native species seed mixes (and native species in general) and an opportunity for practitioners, industry and regulators to share knowledge and raise issues. The portal can build on, and link to, existing information sources such as InnoTech Alberta, NAIT Centre for Boreal Research, the Alberta Native Plant Council, and the Foothills Restoration Forum.

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TABLE OF CONTENTS

DISCLAIMER	i
EXECUTIVE SUMMARY	ii
ACKNOWLEDGEMENTS.....	vi
CITATION	vii
TABLE OF CONTENTS	viii
LIST OF TABLES.....	xii
LIST OF FIGURES.....	xxiv
LIST OF SPECIES IN THIS REPORT.....	xxvi
ADDITIONAL MATERIAL IN THIS UPDATE	xlii
1.0 INTRODUCTION	1
1.1 REPORT SCOPE	1
1.2 BUILDING A SEED MIX.....	2
1.2.1 Plant Characteristics.....	3
1.2.2 Cover Crops.....	4
1.3 REPORT NOTES.....	5
1.4 LIMITATIONS AND CAVEATS.....	6
2.0 REQUIRED SEED MIXES	7
2.1 ALBERTA TRANSPORTATION MIXES.....	7
2.2 CITY OF EDMONTON.....	10
2.3 CITY OF LETHBRIDGE.....	12
2.4 EASTERN IRRIGATION DISTRICT.....	13
2.5 NATIONAL PARKS.....	13
2.5.1 Banff National Park.....	13
2.5.2 Elk Island National Park.....	16
2.5.3 Jasper National Park	19
2.5.4 Waterton Lakes National Park.....	28
2.6 SUFFIELD MILITARY BASE	32
2.7 TOWN OF CANMORE	32
3.0 RECOMMENDED SEED MIXES	34
3.1 ALBERTA ENVIRONMENT AND PARKS	34

3.2	DUCKS UNLIMITED CANADA	35
3.3	INNO TECH ALBERTA	35
3.3.1	Alberta Innovates – Technology Futures Recommended Delusion Lakes Wellsite Mix.....	35
3.3.2	Alberta Innovates – Technology Futures Regional Seed Mixes.....	36
3.3.3	Alberta Innovates – Technology Futures Wainwright Recommended Mix	41
3.3.4	InnoTech Alberta Recommended Saline Seed Mix.....	41
3.4	RECOVERY STRATEGIES	41
3.4.1	Dry Mixedgrass Natural Subregion Recovery Strategy.....	42
3.4.2	Mixed Grass Natural Subregion Recovery Strategy.....	43
3.4.3	Northern Fescue Natural Subregion Recovery Strategy.....	46
3.4.4	Foothills Fescue, Foothills Parkland and Montane Natural Subregion Recovery Strategy	48
3.5	SPECIAL AREAS BOARD	51
3.6	THE CITY OF CALGARY.....	53
4.0	OPERATIONAL SEED MIXES.....	70
4.1	ALBERTA CROPLAND CARBON CONVERSION PROTOCOL.....	70
4.2	ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT	71
4.3	ATCO HERITAGE NATIVE GRASSLAND.....	72
4.4	BENGA MINING LIMITED GRASSY MOUNTAIN COAL PROJECT	72
4.5	BROOKS POWER PROJECT	75
4.6	COALSPUR VISTA MINE.....	75
4.7	COAL VALLEY RESOURCES INC. ROBB TREND COAL MINE	77
4.8	ENBRIDGE LINE 3 REPLACEMENT	78
4.9	ENCANA CFB SUFFIELD.....	78
4.10	EXPRESS PIPELINE	80
4.11	GRANDE CACHE COAL	84
4.12	LUSCAR LTD. SHEERNESS MINE.....	85
4.13	MEG ENERGY CORP. – MAY RIVER IN-SITU PROJECT	86
4.14	MANYBERRIES GRASSLAND RESTORATION	86
4.15	NORTHERN FESCUE PIPELINE RECLAMATION.....	87
4.16	PEACE RIVER REMOTE SUMP	88

4.17	SUNCOR ENERGY INC.	89
	4.17.1 Suncor Tailings Sand Slopes	89
	4.17.2 Suncor Erosion Control.....	89
4.18	SYNGENTA OPERATION POLLINATOR	90
4.19	TOWN OF HIGH RIVER FLOOD MITIGATION.....	90
4.20	TRANSCANADA KEYSTONE PIPELINE GP LTD. KEYSTONE PIPELINE	92
4.21	TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT	95
5.0	RESEARCH AND DEVELOPMENT SEED MIXES	98
5.1	INNO TECH ALBERTA	98
	5.1.1 AltaLink Transmission Line Right-of-Way.....	98
	5.1.2 Imaginea Wellsite Enhanced Reclamation and Remediation Demonstration	98
	5.1.3 ARC Research Projects.....	99
	5.1.4 AITF Research Projects	107
5.2	UNIVERSITY OF ALBERTA	109
	5.2.1 Bush – Native Seed Mixes for Diversity.....	109
	5.2.2 Cartier – Calcareous Soil Reclamation Mix.....	113
	5.2.3 Cohen-Fernandez – Limestone Quarry Revegetation.....	114
	5.2.4 deBertoli – Oil Sands Forb Mix.....	114
	5.2.5 Desserud and Naeth – Festuca hallii Recovery	115
	5.2.6 Fluker – Impacts of Soil Nutrient Levels and Interspecific Competition .	116
	5.2.7 Hammermeister et al. – Native Prairie Wellsite Reclamation.....	116
	5.2.8 Naeth et al. – Pipeline Rangeland Revegetation	118
	5.2.9 Pelech – Native vs. Introduced Comparison	118
	5.2.10 Pitchford – Aspen Parkland	120
	5.2.11 Rojas – City of Edmonton Naturalization	122
	5.2.12 Salisbury – Boreal Forest Pipeline Revegetation.....	123
	5.2.13 Sherritt – Festuca hallii and Festuca campestris Revegetation	123
	5.2.14 Turner – Fort Saskatchewan Phosphogypsum Stack Reclamation	124
	5.2.15 Wruck – Parkland Pipeline Seeding vs. Natural Recovery	124
5.3	OTHER RESEARCHERS.....	125
	5.3.1 Baxter and Woosaree Fire Resistant Species.....	125
	5.3.2 McGregor – Native Rhizomatous Grass Species.....	126

5.3.3	Russell – Mountain Coal Mine Overburden.....	126
5.3.4	Woosaree and Otfinowski – Northern Fescue and Central Parkland Wellsites.....	127
6.0	COMMERCIAL SEED MIXES.....	129
6.1	BRETTYOUNG SEEDS.....	129
6.2	GOLD MEDAL SEEDS LTD.....	131
6.2.1	Alberta Hiways Grass Seed Mixtures.....	131
6.2.2	Forage and Reclamation Mixtures	133
6.2.3	Suffield Cluster Mixtures	134
6.2.4	Special Areas Native Grass Seed Mixes	136
6.3	GPEC GREEN PATCH ENVIRONMENTAL CONSULTING LTD.....	139
6.4	HANNAS SEEDS.....	141
6.5	NORTHSTAR SEED.....	143
6.6	PICKSEED	145
6.6.1	Foothills Natural Region	145
6.6.2	Boreal Forest Natural Region.....	146
6.6.3	Rocky Mountain Natural Region	148
6.6.4	Parkland Natural Region.....	148
6.6.5	Grassland Natural Region.....	149
6.6.6	Native Grass Blends	150
6.7	SEABORN SEEDS INC.	152
6.8	WILD ABOUT FLOWERS.....	153
7.0	SOURCES OF INDIVIDUAL SPECIES IN MIXES.....	164
7.1	INNO TECH ALBERTA VARIETIES.....	164
7.2	COMMERCIAL SEED SOURCES	165
8.0	SUMMARY AND OPPORTUNITIES	167
8.1	SUMMARY.....	167
8.2	OPPORTUNITIES	169
9.0	REFERENCES.....	173
9.1	ADDITIONAL READING	184
9.2	USEFUL WEBSITES.....	185
10.0	GLOSSARY	187
10.1	TERMS	187

10.2	ACRONYMS.....	187
APPENDIX 1:	List of Species in this Report by Scientific Name.....	189
APPENDIX 2:	Methods Used to Select Scientific and Common Names.....	204

LIST OF TABLES

Table 1.	List of species in this report.....	xxvi
Table 2.	Sources for plant characteristics information required to build a seed mix.....	3
Table 3.	Alberta Transportation Zone 1 mixed wetland seed mix,	7
Table 4.	Alberta Transportation Zone 2 dry mixedwood seed mix.....	8
Table 5.	Alberta Transportation Zone 3 central mixedwood seed mix.....	9
Table 6.	Alberta Transportation Zone 4 mixedgrass and dry mixedgrass seed mix.....	9
Table 7.	Alberta Transportation Zone 5 central parkland seed mix.....	9
Table 8.	Alberta Transportation Zone 6 lower foothills seed mix.	10
Table 9.	City of Edmonton native seed mix – Peace River parkland.	10
Table 10.	City of Edmonton native seed mix – central parkland.	11
Table 11.	City of Edmonton non-maintained naturalization landscaping – wet meadow seed mix.....	11
Table 12.	City of Edmonton non-maintained naturalization landscaping – dry meadow seed mix.....	11
Table 13.	City of Edmonton non-maintained naturalization landscaping – grassland wet seed mix.....	12
Table 14.	City of Lethbridge dryland seed mixture.	12
Table 15.	Eastern Irrigation District reclamation seed mix.....	13
Table 16.	Banff National Park Trans Canada Highway mix.	14
Table 17.	Banff Airstrip mix.	14
Table 18.	Banff LLYK seed mix A.....	15
Table 19.	Banff LLYK seed mix B.	15
Table 20.	Banff LLYK seed mix D.....	15
Table 21.	Banff LLYK seed mix F.....	15
Table 22.	Elk Island National Park simple seed mix for roadway and ditch projects.	16
Table 23.	Elk Island National Park grassland restoration sites mix.	16

Table 24.	Elk Island National Park aspen-dominated forest restoration sites mix.	16
Table 25.	Elk Island National Park coniferous/mixedwood-dominated forest restoration sites mix.	17
Table 26.	Elk Island National Park riparian restoration sites mix.	18
Table 27.	Erichsen Arychuk Elk Island grass-forb seed mix.	18
Table 28.	Naeth and Wilkinson Elk Island fire break mix.	19
Table 29.	Jasper National Park mix 1A – open deciduous.	19
Table 30.	Jasper National Park mix 1B – open coniferous.	20
Table 31.	Jasper National Park mix 1C – closed coniferous.	20
Table 32.	Jasper National Park mix 1D – grasslands.	21
Table 33.	Jasper National Park mix 1E – riparian and wetlands.	21
Table 34.	Jasper National Park mix 2 – calcareous soils.	21
Table 35.	Jasper National Park mix 3 – cedar forest.	22
Table 36.	Jasper National Park mix 4 – non-attractant highway/roadway.	22
Table 37.	Jasper National Park montane / valley bottom / low elevation (1000 m – 1300 m ASL) – moist sites mix.	22
Table 38.	Jasper National Park montane / valley bottom / low elevation (1000 m – 1300 m ASL) – dry sites mix.	23
Table 39.	Jasper National Park montane / valley bottom / low elevation (1000 m – 1300 m ASL) – general sites mix.	23
Table 40.	Jasper National Park sub-alpine / moderate or mid elevation (1300 m – 1800 m ASL) mix.	23
Table 41.	Jasper National Park alpine / high elevation (1800 m – 2000 m ASL) mix.	23
Table 42.	Jasper Lake Dunes Pipeline Relocation Project – highway lands mix.	24
Table 43.	Jasper Lake Dunes Pipeline Relocation Project – sand dune banks mix.	24
Table 44.	Jasper Lake Dunes Pipeline Relocation Project – upland forest mix.	24
Table 45.	Mile 12 Pipeline Relocation Project – mix 1.	24
Table 46.	Mile 12 Pipeline Relocation Project – mix 2.	25
Table 47.	Athabasca River Pipeline Removal mix.	25
Table 48.	Athabasca River Bank Armouring Project mix.	25
Table 49.	Pocohontas Service Station Remediation Project mix.	25
Table 50.	Jasper Park Lodge Landfill Reclamation Project mix.	26
Table 51.	Marmot Eagle Ridge Tower mix.	26
Table 52.	Jasper Airstrip – general mix.	26

Table 53.	Jasper Airstrip – spot seeding mix.....	27
Table 54.	Wishart montane pipeline mix 1.....	27
Table 55.	Wishart montane pipeline mix 2.....	28
Table 56.	Wishart montane pipeline mix 3.....	28
Table 57.	Naeth and Wilkinson Jasper fire break mix.	28
Table 58.	Waterton Lakes Redrock Parkway restoration mix – open fescue grassland.	29
Table 59.	Waterton Lakes Redrock Parkway restoration mix – aspen / shrub community dry open stands.....	29
Table 60.	Waterton Lakes Redrock Parkway restoration mix – aspen / shrub community wet or closed stands.....	30
Table 61.	Waterton Lakes Bar U Ranch National Heritage Site restoration mix.	30
Table 62.	Waterton Lakes Akamina Parkway mix.....	30
Table 63.	Stover Waterton Lakes National Park wild-collected seed mix.	31
Table 64.	Suffield Block native grass seed mix (1977).	32
Table 65.	Town of Canmore mowing tolerant native grass seed mixture – slopes, natural areas and non-maintained areas.	32
Table 66.	Town of Canmore non-mowed native grass seed mixture – slopes, natural areas and non-maintained areas.	33
Table 67.	Town of Canmore wild flower mix – slopes, natural areas and non-maintained areas. 33	
Table 68.	AEP loam to silty soils native seed mix for Northern Fescue Grasslands.	34
Table 69.	Ducks Unlimited Canada loamy range site, simple pasture mix.....	35
Table 70.	AITF Delusion Lakes wellsite mix.....	35
Table 71.	AITF seral <i>Festuca hallii</i> grassland mix.....	36
Table 72.	AITF sub-seral <i>Festuca hallii</i> grassland mix.	36
Table 73.	AITF northern fescue grasslands loam soils mix.....	37
Table 74.	AITF mixed grass seed mix.	37
Table 75.	AITF mixed grass depressions and wetlands (including saline sites) mix.	38
Table 76.	AITF dry mixed grass seed mix.	38
Table 77.	AITF dry mixed grass sandy soils (south) mix.	38
Table 78.	AITF foothills fescue seed mix.	39
Table 79.	AITF parkland sandy soil mix.....	39
Table 80.	AITF fescue grassland north sandy soil mix.	40
Table 81.	AITF Peace River parkland seed mix.	40

Table 82.	Alberta Innovates – Technology Futures Wainwright recommended mix.	41
Table 84.	InnoTech Alberta recommended saline seed mix.	41
Table 85.	Dry Mixedgrass recovery strategy seed mix for loamy, shallow to gravel and gravel range sites.	42
Table 86.	Dry Mixedgrass recovery strategy seed mix for blowout and clayey range sites.	42
Table 87.	Dry Mixedgrass recovery strategy seed mix for sands, sandy and choppy sandhill range sites.	42
Table 88.	Dry Mixedgrass recovery strategy seed mix for DMGA13 western porcupine grass – needle-and-thread – sand grass sites.	43
Table 89.	Mixedgrass recovery strategy seed mix for Cypress upland on loamy, shallow to gravel, gravel and thin breaks range sites.	43
Table 90.	Mixedgrass recovery strategy seed mix for Cypress Upland: low elevation dry loamy and blowout range sites.	43
Table 91.	Mixedgrass recovery strategy seed mix for Cypress Upland: saline lowland range sites.	44
Table 92.	Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: overflow range sites.	44
Table 93.	Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: loamy and thin breaks range sites.	44
Table 94.	Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: clayey and blowout range sites.	44
Table 95.	Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: sandy range sites.	45
Table 96.	Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: saline lowland range sites.	45
Table 97.	Mixedgrass recovery strategy seed mix for Lethbridge, Vulcan Plain: loamy range sites.	45
Table 98.	Mixedgrass recovery strategy seed mix for Lethbridge, Vulcan Plain: sandy and sands range sites.	46
Table 99.	Mixedgrass recovery strategy seed mix for Lethbridge, Vulcan Plain: saline lowland range sites.	46
Table 100.	Mixedgrass recovery strategy seed mix for Majorville Upland: loamy ecological range sites.	46
Table 101.	Northern Fescue recovery strategy seed mix for plains rough fescue – sedge plant communities.	47
Table 102.	Northern Fescue recovery strategy seed mix for plains rough fescue – western porcupine grass communities.	47

Table 103.	Northern Fescue recovery strategy seed mix for blunt sedge – western porcupine grass communities.	47
Table 104.	Northern Fescue recovery strategy seed mix for sedge - western wheatgrass communities.	48
Table 105.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills fescue loamy 1; thin breaks 1 ecological range sites.	48
Table 106.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills fescue loamy 2; shallow to gravel; gravel ecological range sites.	48
Table 107.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills fescue loamy 3; loamy 4; limy 1; clay ecological sites.	49
Table 108.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills parkland rich loamy ecological sites – Mountain Rough Fescue – Parry oatgrass communities.	49
Table 109.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills parkland rich loamy ecological sites – Mountain Rough Fescue – Parry oatgrass communities.	49
Table 110.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane subxeric/medium bluebunch wheatgrass ecological sites.	50
Table 111.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane (c5) Parry oat grass – foothills fescue – Bluebunch Fescue communities.	50
Table 112.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane foothills fescue – intermediate oat grass communities.	50
Table 113.	Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane (cc1) foothills fescue – Bluebunch Fescue – Parry oat grass communities.	51
Table 114.	Special Areas Board dry loamy soils mix.	51
Table 115.	Special Areas Board moist loamy soils mix.	51
Table 116.	Special Areas Board sandy soils mix.	52
Table 117.	Special Areas Board solonetzic clay soils mix.	52
Table 118.	Special Areas Board saline soils mix.	52
Table 119.	City of Calgary open riparian forest seed mix.	53
Table 120.	City of Calgary open forest seed mix.	53
Table 121.	City of Calgary forest edge seed mix for sites containing remnant fescue stands.	54
Table 122.	City of Calgary upland open forest seed mix.	54
Table 123.	City of Calgary open forest grass seed mix – high usage areas.	55

Table 124.	City of Calgary open forest forb seed mix – high usage areas.	55
Table 125.	City of Calgary wetland peripheral low prairie zone seed mix.	55
Table 126.	City of Calgary open riparian area grass seed mix.	56
Table 127.	City of Calgary sandy/gravelly river bank seed mix.	56
Table 128.	City of Calgary saline wetland peripheral low prairie zone seed mix – natural. .	56
Table 129.	City of Calgary saline wetland peripheral low prairie zone seed mix – anthropogenic.....	57
Table 130.	City of Calgary colourful mesic grassland seed mix.	58
Table 131.	City of Calgary aggressive native grassland seed mix.	59
Table 132.	City of Calgary aggressive soil building seed mix.	59
Table 133.	City of Calgary aggressive seed mix for gravel and subsoil-soil building.	59
Table 134.	City of Calgary xeric prairie seed mix.	59
Table 135.	City of Calgary coverage seed mix for silt deposition.....	60
Table 136.	City of Calgary boulevard grass cover seed mix.....	60
Table 137.	City of Calgary early successional summer seed mix for boulevards.....	61
Table 138.	City of Calgary boulevard seed mix for pollinators.	61
Table 139.	City of Calgary bioretention feature seed mix – meadow aesthetic.	62
Table 140.	City of Calgary native bright seed mix.	63
Table 141.	City of Calgary foothills (mountain) rough fescue grassland seed mix.....	63
Table 142.	City of Calgary berm stabilization seed mix.	63
Table 143.	City of Calgary xeric slope seed mix – graminoids only.....	64
Table 144.	City of Calgary xeric slope seed mix – forbs only.	64
Table 145.	City of Calgary dry slope seed mix – graminoids only.	65
Table 146.	City of Calgary dry slope seed mix – forbs only.	65
Table 147.	City of Calgary green roof forbs seed mix – thick soil profile.....	65
Table 148.	City of Calgary green roof forbs seed mix – thin inorganic medium.....	66
Table 149.	City of Calgary green roof grass seed mix – thin inorganic medium.....	66
Table 150.	City of Calgary xeric forbs seed mix – prairie naturalization.....	67
Table 151.	City of Calgary grass seed mix – prairie naturalization for meadow and shrub beds. 67	
Table 152.	City of Calgary mulched shrub bed naturalization seed mix.....	67
Table 153.	City of Calgary native seed mix for erosion control textiles.....	68

Table 154.	City of Calgary fresh water riparian graminoid seed mix at or above 1:2 flood water surface elevation.	68
Table 155.	City of Calgary fresh water riparian seed mix at or above 1:5 flood water surface elevation.	69
Table 156.	Alberta Cropland Carbon Conversion Protocol simple seed mix.....	70
Table 157.	Alberta Cropland Carbon Conversion Protocol diverse seed mix.	71
Table 158.	Alberta Transportation Springbank Off-stream Reservoir Project seed mix.	71
Table 159.	ATCO Heritage Native Grassland mix.	72
Table 160.	Benga Mining Limited direct placement mix.	72
Table 161.	Benga Mining Limited grassland, open forest mix.	72
Table 162.	Benga Mining Limited closed conifer forest mix.....	73
Table 163.	Benga Mining Limited mixed forest mix.....	73
Table 164.	Benga Mining Limited treed wetland mix.	73
Table 165.	Benga Mining Limited direct placement monoculture mix.....	74
Table 166.	Benga Mining Limited mixed forest revised mix.....	74
Table 167.	Benga Mining Limited treed wetland revised mix.	74
Table 168.	Brooks Power Project native mix.....	75
Table 169.	Coalspur direct placement mix.....	75
Table 170.	Coalspur forest mesic or drier mix.	75
Table 171.	Coalspur forest subhygric or wetter mix.....	76
Table 172.	Coalspur steep, watercourse sensitive mix.	76
Table 173.	CVRI lower foothills native mix.	77
Table 174.	CVRI wetland mix.	77
Table 175.	Enbridge Line 3 Seed Mix B for wet or saline non-gravelled disturbed areas.	78
Table 176.	EnCana CFB Suffield wetland margins mix.....	78
Table 177.	EnCana CFB Suffield sandy soil mix.....	79
Table 178.	EnCana CFB Suffield solonetzic soil mix.....	79
Table 179.	Express Seed Mix 1 – aspen parkland.....	80
Table 180.	Express Seed Mix 2 – rough fescue – mixedgrass transition prairie.....	81
Table 181.	Express Seed Mix 3 – dry mixedgrass prairie sandy soils.....	82
Table 182.	Express Seed Mix 4 – dry mixedgrass prairie solonetzic soils.....	83
Table 183.	Express Seed Mix 5 – prairie wetlands.	84
Table 184.	GCC mix.....	84

Table 185.	Sheerness Mine sandy soil mix.	85
Table 186.	Sheerness Mine loamy soil mix.	85
Table 187.	Sheerness Mine solonetzic soil mix.	85
Table 188.	Sheerness Mine saline soil mix.	86
Table 189.	MEG Energy Corp. native seed mix suitable for soil stockpiles and bare areas. ...	86
Table 190.	Manyberries grassland restoration mix.	87
Table 191.	Northern Fescue pipeline 3-year reclamation mix 1.	87
Table 192.	Northern Fescue pipeline 3-year reclamation mix 2.	87
Table 193.	Northern Fescue pipeline 3-year reclamation mix 3.	87
Table 194.	Northern Fescue pipeline 22-year reclamation mix.	88
Table 195.	Peace River remote sump reclamation grass mix.	88
Table 196.	Suncor tailings sand slope hydroseeding mix.	89
Table 197.	Suncor erosion control mix.	89
Table 198.	Syngenta Operation Pollinator western Canada golf course mix.	90
Table 199.	Town of High River dike mix.	90
Table 200.	Town of High River naturalized area wet meadow mix.	91
Table 201.	Town of High River naturalized area riparian mix.	91
Table 202.	Town of High River naturalized area upland mix.	92
Table 203.	Keystone seral <i>Festuca hallii</i> grassland mix.	92
Table 204.	Keystone sub-seral <i>Festuca hallii</i> grassland mix.	93
Table 205.	Keystone depression and wetland (including saline sites) mix.	93
Table 206.	Keystone sandy soils (north) mix.	93
Table 207.	Keystone sandy soils (south) mix.	94
Table 208.	Keystone mixed grass and dry mixed grass mix.	94
Table 209.	Trans Mountain dry or moist soil mix or native erosion control mix CP-1.	95
Table 210.	Trans Mountain wet soil mix CP-2.	95
Table 211.	Trans Mountain wet soil mix DMW-2.	95
Table 212.	Trans Mountain wet soil mix CMW-2.	96
Table 213.	Trans Mountain general dry or moist soils or native erosion control mix LF-1. ...	96
Table 214.	Trans Mountain wet soil mix LF-2.	96
Table 215.	Trans Mountain general dry or moist soils or native erosion control mix M-1. ...	97
Table 216.	Trans Mountain wet soil mix M-2.	97

Table 217.	InnoTech Alberta AltaLink Hansman Lake seed mix.	98
Table 218.	InnoTech Alberta Imaginea wellsite 1 seed mix.	98
Table 219.	ARC northern fescue mesic wellsite modified reclamation mix.	99
Table 220.	ARC northern fescue mesic wellsite simple mix.	100
Table 221.	ARC northern fescue mesic wellsite diverse mix.	100
Table 222.	ARC northern fescue sandy wellsite modified reclamation mix.	101
Table 223.	ARC northern fescue sandy wellsite simple mix.	101
Table 224.	ARC northern fescue sandy wellsite diverse mix.	101
Table 225.	ARC sandy soil wellsite mix.	102
Table 226.	ARC sandy soil wellsite – operator mix.	103
Table 227.	ARC fescue prairie pipeline – ARC seed mix.	103
Table 228.	ARC fescue prairie pipeline – contractor seed mix.	104
Table 229.	ARC Dilberry gravel pit mix.	104
Table 230.	ARC low growing, drought tolerant seed mix for coarse Fort Saskatchewan roadside soils.	105
Table 231.	ARC Fort Saskatchewan green space mix.	105
Table 232.	ARC spill site mix.	105
Table 233.	ARC Rumsey wellsite mix 1.	106
Table 234.	ARC Rumsey wellsite mix 2.	106
Table 235.	AITF foothills fescue mix.	107
Table 236.	AITF foothills fescue wellsite mix.	108
Table 237.	AITF oil sands tailings stabilization mix.	108
Table 238.	AITF pollinator mix.	109
Table 238.	Bush grass mix 1.	109
Table 239.	Bush grass mix 2.	109
Table 240.	Bush forbs mix 1.	110
Table 241.	Bush legume mix 1.	110
Table 242.	Bush NOVA mix.	111
Table 243.	Bush grass mix 3.	111
Table 244.	Bush grass mix 4.	111
Table 245.	Bush forbs mix 2.	112
Table 246.	Bush legume mix 2.	112
Table 247.	Bush Ducks Unlimited Canada mix.	113

Table 248.	Cartier – Calcareous soil reclamation mix.....	113
Table 249.	Cohen-Fernandez limestone quarry seed mix.	114
Table 250.	deBertoli oil sands forb mix.....	114
Table 251.	Desserud and Naeth Ellerslie and Byemoor native mix.....	115
Table 252.	Desserud and Naeth Drumheller native mix.....	115
Table 253.	Fluker native mix.	116
Table 254.	Fluker native-introduced mix.	116
Table 255.	Hammermeister et al. dry mixed grass low diversity industry mix.	116
Table 256.	Hammermeister et al. dry mixed grass simple mix.	117
Table 257.	Hammermeister et al. dry mixed grass diverse mix.	117
Table 258.	Naeth et al. Milo Lateral native seed mix.	118
Table 259.	Naeth et al. Porcupine Hills Lateral seed mix.....	118
Table 260.	Pelech native pasture mix.	118
Table 261.	Pelech native hay mix.....	119
Table 262.	Pelech native mix.	119
Table 263.	Pelech alternate native mix.....	119
Table 264.	Pitchford – Aspen Parkland mix 1.....	120
Table 265.	Pitchford – Aspen Parkland mix 2.....	120
Table 266.	Pitchford – Aspen Parkland mix 1 plus.....	120
Table 267.	Pitchford – Aspen Parkland mix 2 plus.....	121
Table 268.	Rojas – Short grass native seed mix.....	122
Table 269.	Rojas – Tall grass native seed mix.	122
Table 270.	Salisbury Alliance Pipeline mix.	123
Table 271.	Sherritt <i>Festuca hallii</i> mix.	123
Table 272.	Sherritt <i>Festuca campestris</i> mix.	123
Table 273.	Turner phosphogypsum stack seed mix.....	124
Table 274.	Wruck Alliance Pipeline sandy soil mix.	124
Table 275.	Baxter and Woosaree Vegreville flammability mix.	125
Table 276.	Baxter and Woosaree Chisolm flammability mix #1.	125
Table 277.	Baxter and Woosaree Chisolm flammability mix #2.	125
Table 278.	Baxter and Woosaree Chisolm flammability mix #3.	125
Table 279.	McGregor – Native rhizomatous grass species competition mix.....	126

Table 280.	Russell Overburden mixture 1.....	126
Table 281.	Russell Overburden mixture 2.....	126
Table 282.	Russell Overburden mixture 3.....	127
Table 283.	Russell Overburden mixture 4.....	127
Table 284.	Woosaree and Otfinowski reclamation mix.....	127
Table 285.	Woosaree and Otfinowski simple mix.....	127
Table 286.	Woosaree and Otfinowski diverse mix.....	128
Table 287.	BrettYoung Boreal Forest Natural Region mix.....	129
Table 288.	BrettYoung Foothills Natural Region mix.....	129
Table 289.	BrettYoung Grassland Natural Region mix.....	130
Table 290.	BrettYoung Parkland Natural Region mix.....	130
Table 291.	BrettYoung Rocky Mountain Natural Region mix.....	130
Table 292.	GMSL Zone 1 wetland mixed wood native mix.....	131
Table 293.	GMSL Zone 2 wetland mixed wood native mix.....	131
Table 294.	GMSL Zone 3 central mixed wood native mix (with ticklegrass).....	131
Table 295.	GMSL Zone 3 central mixed wood native mix (without ticklegrass).....	132
Table 296.	GMSL Zone 4 mixed grass & dry mixed grass mix.....	132
Table 297.	GMSL Zone 5 central parkland mix.....	132
Table 298.	GMSL Zone 6 lower foothills mix (with Rough Hair Grass).....	133
Table 299.	GMSL Zone 6 lower foothills mix (without Rough Hair Grass).....	133
Table 300.	GMSL EID reclamation mixture.....	133
Table 301.	GMSL EID prairie mixture.....	134
Table 302.	GMSL SNC native fescue mixture.....	134
Table 303.	GMSL Crown mixture.....	134
Table 304.	GMSL Suffield cluster 2 mixture.....	135
Table 305.	GMSL Suffield cluster 3 mixture.....	135
Table 306.	GMSL Suffield cluster 4 mixture.....	135
Table 307.	GMSL Suffield cluster 5 mixture.....	135
Table 308.	GMSL Suffield cluster 6 mixture.....	136
Table 309.	GMSL Special Areas loamy mix 1 (Brown Soil Zone - Dry Mixedgrass).....	136
Table 310.	GMSL Special Areas solonetzic mix 1 (Brown Soil Zone - Dry Mixedgrass).....	136
Table 311.	GMSL Special Areas sandy mix 1 (Brown Soil Zone - Dry Mixedgrass).....	137

Table 312.	GMSL Special Areas loamy mix 2 (Dark Brown Soil Zone – Mixedgrass).	137
Table 313.	GMSL Special Areas solonetzic mix 2 (Dark Brown Soil Zone – Northern Fescue).	137
Table 314.	GMSL Special Areas sandy mix 2 (Dark Brown Sol Zone – Northern Fescue)...	138
Table 315.	GMSL Special Areas loamy mix 3 (Dark Brown Soil Zone – Northern Fescue).	138
Table 316.	GMSL Special Areas sandy mix 3 (Dark Brown Soil Zone – Central Parkland).	138
Table 317.	GMSL Special Areas saline mix (all soil zones).	138
Table 318.	GPEC alpine blend.....	139
Table 319.	GPEC upper foothills blend.	139
Table 320.	GPEC lower foothills blend.	140
Table 321.	GPEC central blend.....	140
Table 322.	GPEC central parkland blend.....	140
Table 323.	GPEC mixed grasses blend.....	141
Table 324.	Hannas natural blend.	141
Table 325.	Hannas native “A” blend.....	141
Table 326.	Hannas dry loamy blend.	142
Table 327.	Hannas moist loamy blend.....	142
Table 328.	Hannas sandy blend.	142
Table 329.	Hannas solonetzic clay blend.....	143
Table 330.	Hannas saline blend.	143
Table 331.	Northstar foothills native blend.....	143
Table 332.	Northstar north/central parkland native blend.	143
Table 333.	Northstar southern prairie native blend.....	144
Table 334.	Northstar sandy soils native blend.....	144
Table 335.	Northstar wetland native blend.....	144
Table 336.	Northstar slope stabilization native blend.	145
Table 337.	Pickseed lower foothills blend.	145
Table 338.	Pickseed lower foothills (sandy slopes) blend.....	145
Table 339.	Pickseed upper foothills blend.....	146
Table 340.	Pickseed central mixedwood blend.....	146
Table 341.	Pickseed central mixedwood with Italian Ryegrass blend.	146
Table 342.	Pickseed dry mixedwood blend.	147
Table 343.	Pickseed boreal highlands blend.	147

Table 344.	Pickseed subalpine subregion blend.....	148
Table 345.	Pickseed alpine subregion blend.	148
Table 346.	Pickseed Peace River parkland blend.	148
Table 347.	Pickseed central parkland blend.....	149
Table 348.	Pickseed foothills parkland blend.	149
Table 349.	Pickseed dry mixedgrass / mixed grass prairie blend.....	149
Table 350.	Pickseed foothills fescue blend.	150
Table 351.	Pickseed northern fescue blend.	150
Table 352.	Pickseed aspen parkland blend.	150
Table 353.	Pickseed moist mixed grassland blend.....	151
Table 354.	Pickseed mixed grassland blend.....	151
Table 355.	Pickseed grassland wet blend.	152
Table 356.	Pickseed cypress upland blend.....	152
Table 357.	Seaborn Seeds Inc. green native mix.	152
Table 358.	Wild about Flowers prairie meadow native grass seed mix.....	153
Table 359.	Wild about Flowers short grass wildflower meadow mix.....	153
Table 360.	Wild about Flowers high diversity mix – prairie meadow.	154
Table 361.	Wild about Flowers high diversity mix – dry/rocky.	156
Table 362.	Wild about Flowers high diversity mix – open woodland.	157
Table 363.	Wild about Flowers high diversity mix – moist sun.	158
Table 364.	Wild about Flowers wildlife mix – wildflowers for bees.	159
Table 365.	Wild about Flowers wildlife mix – wildflowers for butterflies.....	160
Table 366.	Wild about Flowers wildlife mix – wildflowers for birds.....	161
Table 367.	Wild about Flowers Waterton Park wildflower mix – shade.	161
Table 368.	Wild about Flowers Waterton Park wildflower mix – sun.	162
Table 369.	InnoTech Alberta Native Grass Varieties.	164

LIST OF FIGURES

Figure 1.	Alberta Transportation seed mix zones.....	8
Figure 2.	Types of mixes.....	167

Figure 3. Number of mixes by zone..... 168
Figure 4. Number of species in mixes..... 168
Figure 5. Number of mixes by formulation. 169



LIST OF SPECIES IN THIS REPORT

In spring of 2018 the InnoTech Alberta Reclamation Team decided to adopt the Alberta Conservation Information Management System (ACIMS) plant nomenclature⁴; as a result, some of the common and scientific species names in the original report have been changed to match the ACIMS names. The name changes are highlighted in blue in the table below. The 144 new species added since the last report are highlighted in green.

ACIMS staff provided the following guidance relative to use of the ACIMS database:

ACIMS generally follows the Flora of North America (FNA)⁵ unless there have been more current taxonomic name changes. ACIMS names tend to align with the Database of Vascular Plants of Canada (VASCAN)⁶. In several instances you may notice that the *sname* [subnational name – provincially accepted name used in Alberta] differs from the *gname* [global name – globally accepted name] on the ACIMS vascular plant list. This is generally associated with cases where taxonomy is not clear at the moment and provincial experts continue to use a specific taxonomy. Please note ACIMS focuses on native species and does not document all of the exotic species present in the province.

The Alberta Status column in the Table is based on the ACIMS classification as Native or Exotic; Introduced is used here in place of exotic. Where a species is not found in ACIMS it is listed as Introduced; note, however, that the species distribution maps in VASCAN may show a species as being native to Alberta even though it is not found in ACIMS. There are 34 Introduced species in the mixes.

[Appendix 1](#) contains the list of species sorted by scientific name. [Appendix 2](#) provides a guide to the methods used to determine which scientific and common names to use in the Inventory.

Table 1. List of species in this report.

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Alfalfa	<i>Medicago sativa</i>			Introduced
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	<i>Poa juncifolia</i> <i>Poa ampla</i>	Big Bluegrass	Introduced
Alkali Grass	<i>Puccinellia distans</i>		Slender Salt-Meadow Grass Spreading Alkali Grass	Introduced
Alpine Aster	<i>Aster alpinus</i>			Native

⁴ <https://www.albertaparks.ca/media/6493459/list-of-elements-ab-vascular-plants.xlsx>

⁵ http://www.efloras.org/flora_page.aspx?flora_id=1

⁶ <http://data.canadensys.net/vascan/search?lang=en>

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Alpine Bluegrass	<i>Poa alpina</i>			Native
Alpine Everlasting	<i>Antennaria aprica</i>		Common Pussytoes Alpine Pussytoes	Native
Alpine Fescue	<i>Festuca brachyphylla</i>			Native
Alpine Forget-me-not	<i>Myosotis asiatica</i>			Native
Alpine Goldenrod	<i>Solidago multiradiata</i>		Northern Goldenrod	Native
Alpine Hedysarum	<i>Hedysarum alpinum</i>	<i>Hedysarum alpinum</i> <i>var. americanum</i>	American Sweet Vetch Alpine Sweetvetch	Native
Alpine Red Paintbrush	<i>Castilleja rhexiifolia</i>		Rhexia-leaf Indian-paintbrush	Native
Alsike Clover	<i>Trifolium hybridum</i>			Introduced
Arctic Aster	<i>Eurybia sibirica</i>		Siberian Aster	Native
Arctic Bluegrass	<i>Poa arctica</i>			Native
Ascending Purple Milk Vetch	<i>Astragalus laxmannii</i> <i>var. robustior</i>	<i>Astragalus striatus</i>	Rattle Milkvetch	Native
Aspen Sunflower	<i>Helianthella quinquenervis</i>		Five-nerved Sunflower Little Sunflower)	Native
Awnless Wildrye	<i>Elymus curvatus</i>	<i>Leymus triticoides</i>	Beardless Wild Rye	Introduced
Balsamroot	<i>Balsamorhiza sagittata</i>		Arrowleaf Balsamroot Balsamroot	Native
Beeplant	<i>Peritoma serrulata</i>		Rocky Mountain Beeplant Bee Spider-flower	Native
Bird's-foot Trefoil	<i>Lotus corniculatus</i>		Garden Bird's-foot-trefoil	Introduced

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Bishop's-cap	<i>Mitella pentandra</i>		Five-point Bishop's-cap Mitrewort	Native
Black-eyed Susan	<i>Rudbeckia hirta</i>			Introduced
Blue Beardtongue	<i>Penstemon albertinus</i>		Alberta Beardtongue Alberta Penstemon	Native
Blue Camas	<i>Camassia quamash</i>		Common Camassia	Native
Blue Columbine	<i>Aquilegia brevistyla</i>			Native
Blue Grama	<i>Bouteloua gracilis</i>			Native
Bluebunch Fescue	<i>Festuca idahoensis</i>		Idaho Fescue	Native
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	<i>Agropyron spicatum</i>		Native
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i> <i>ssp. spicata</i>			Native
Bluejoint	<i>Calamagrostis canadensis</i>		Canada Reed Grass Blue-joint Reedgrass	Native
Blunt-fruited Sweet Cicely	<i>Osmorhiza berteroi</i>		Chilean Sweet-cicely	Native
Branched Cinquefoil	<i>Potentilla effusa</i>		Silver Cinquefoil	Native
Bronzebells	<i>Stenanthium occidentale</i>		Western Featherbells	Native
Broom Weed	<i>Gutierrezia sarothrae</i>		Broom Snakeweed	Native
Bunchberry	<i>Cornus canadensis</i>		Dwarf Dogwood	Native
Canada Anemone	<i>Anemone canadensis</i>			Native
Canada Bluegrass	<i>Poa compressa</i>			Introduced
Canada Goldenrod	<i>Solidago canadensis</i>			Introduced
Canada Wild Rye	<i>Elymus canadensis</i>			Native
Canadian Milk Vetch	<i>Astragalus canadensis</i>		Canada Milk Vetch	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Clasping-leaved Twisted-stalk	<i>Streptopus amplexifolius</i>		Clasping Twisted-stalk Twisted Stalk	Native
Columbia Needle Grass	<i>Achnatherum nelsonii</i> ssp. <i>dorei</i>	<i>Achnatherum nelsonii</i> <i>Stipa columbiana</i>	Nelson Achnatherum	Native
Common Annual Sunflower	<i>Helianthus annuus</i>		Common Sunflower	Native
Common Bearberry	<i>Arctostaphylos uva-ursi</i>		Bearberry	Native
Common Blue-eyed Grass	<i>Sisyrinchium montanum</i>		Strict Blue-eyed-grass	Native
Common Fireweed	<i>Chamerion angustifolium</i>	<i>Epilobium angustifolium</i>	Fireweed	Native
Common Pink Wintergreen	<i>Pyrola asarifolia</i>		Pink Wintergreen	Native
Common Red Paintbrush	<i>Castilleja miniata</i>		Greater Red Indian-paintbrush	Native
Common Tall Sunflower	<i>Helianthus nuttallii</i>		Nuttall's Sunflower	Native
Common Tickseed	<i>Coreopsis tinctoria</i>		Golden Tickseed Plains Coreopsis	Native
Cow Parsnip	<i>Heracleum maximum</i>			Native
Cream-colored Vetchling	<i>Lathyrus ochroleucus</i>		Pale Vetchling	Native
Creeping Juniper	<i>Juniperus horizontalis</i>			Native
Creeping White Prairie Aster	<i>Symphotrichum falcatum</i> var. <i>falcatum</i>		White Prairie Aster	Native
Curly-cup Gumweed	<i>Grindelia squarrosa</i>		Broadleaf Gumweed	Native
Cut-leaved Anemone	<i>Anemone multifida</i>			Native
Cut-leaved Fleabane	<i>Erigeron compositus</i>		Dwarf Mountain Fleabane	Native
Dotted Blazingstar	<i>Liatris punctata</i>		Dotted Gayfeather	Native
Early Blue Violet	<i>Viola adunca</i>		Sand Violet	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Early Yellow Locoweed	<i>Oxytropis sericea</i>		Silky Locoweed White Point-vetch	Native
Elegant Goldenrod	<i>Solidago lepida</i>			Native
Elephant's-head	<i>Pedicularis groenlandica</i>		Bull Elephant's-head	Native
Fairybells	<i>Prosartes trachycarpa</i>		Rough-fruited Mandarin	Native
False Sunflower	<i>Heliopsis helianthoides</i>		Ox-eye Sunflower	Introduced
Fern-leaved Desert-parsley	<i>Lomatium dissectum</i>		Fernleaf Desert-parsley	Native
Fowl Bluegrass	<i>Poa palustris</i>			Native
Fowl Manna Grass	<i>Glyceria striata</i>		Fowl Mannagrass	Native
Fringed Brome	<i>Bromus ciliatus</i>			Native
Fringed Loosestrife	<i>Lysimachia ciliata</i>			Native
Gaillardia	<i>Gaillardia aristata</i>		Brown Eyed Susan Blanket Flower Great Blanket-flower	Native
Geyer's Sedge	<i>Carex geyeri</i>			Native
Giant Hyssop	<i>Agastache foeniculum</i>		Blue Giant Hyssop	Native
Giant Wild Rye	<i>Leymus cinereus</i>		Great Basin Wildrye	Native
Glacier Lily	<i>Erythronium grandiflorum</i>		Large-flower Yellow Fawnlily	Native
Golden Aster	<i>Heterotheca villosa</i>		Hairy Golden Aster Hairy False Golden Aster	Native
Golden Bean	<i>Thermopsis rhombifolia</i>		Roundleaf Thermopsis	Native
Golden Sedge	<i>Carex aurea</i>		Golden-fruit Sedge	Native
Graceful Cinquefoil	<i>Potentilla gracilis</i>		Slender Cinquefoil Fanleaf Cinquefoil	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Green Needle Grass	<i>Nassella viridula</i>	<i>Stipa viridula</i>		Native
Green Wheatgrass – AC Saltlander	<i>Elymus hoffmannii</i>			Introduced
Hairy Wild Rye	<i>Leymus innovatus</i>	<i>Elymus innovatus</i>	Northwestern Wildrye	Native
Hard Fescue	<i>Festuca trachyphylla</i>	<i>Festuca ovina var. duriscula</i>		Introduced
Harebell	<i>Campanula rotundifolia</i>		American Harebell	Native
Hay Sedge	<i>Carex siccata</i>		Dry-spike Sedge	Native
Heart-leaved Alexanders	<i>Zizia aptera</i>		Heartleaf Alexanders	Native
High Wildrye	<i>Elymus violaceus</i>	<i>Agropyron violaceum</i> <i>Elymus trachycaulus ssp. violaceus</i>	Violet Wheatgrass Broad-glumed Wheatgrass	Native
Hooker's Cinquefoil	<i>Potentilla hookeriana</i>		Prairie Cinquefoil	Native
Hooker's Oat Grass	<i>Avenula hookeri</i>	<i>Helictotrichon hookeri</i>	Spike-oat	Native
Indian Rice Grass	<i>Achnatherum hymenoides</i>	<i>Orzyopsis hymenoides</i>	Indian Mountain-ricegrass	Native
Inland Bluegrass	<i>Poa interior</i>			Native
Intermediate Oatgrass	<i>Danthonia intermedia</i>		Timber oatgrass Vassey's Oatgrass	Native
Italian Ryegrass	<i>Lolium multiflorum</i>		Annual Ryegrass	Introduced
June Grass	<i>Koeleria macrantha</i>	<i>Koeleria gracilis</i> <i>Koeleria cristata</i>	Prairie Junegrass	Native
Kentucky Bluegrass	<i>Poa pratensis</i>			Introduced
Lance-leaved Stonecrop	<i>Sedum lanceolatum</i>		Lanceleaf Stonecrop	Native
Lance-leaved Tickseed	<i>Coreopsis lanceolata</i>		Lance-leaved Coreopsis	Introduced

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Late Yellow Locoweed	<i>Oxytropis monticola</i>		Yellow-flower Locoweed Mountain Locoweed	Native
Leafy Arnica	<i>Arnica chamissonis</i>			Native
Lilac-flowered Beardtongue	<i>Penstemon gracilis</i>		Slender Beardtongue	Native
Lindley's Aster	<i>Symphotrichum ciliolatum</i>	<i>Aster ciliolatus</i>		Native
Little Bluestem	<i>Schizachyrium scoparium</i>			Native
Long-fruited Wild Parsley	<i>Lomatium macrocarpum</i>		Large-fruit Desert-parsley	Native
Long-headed Anemone	<i>Anemone cylindrica</i>			Native
Low Goldenrod	<i>Solidago missouriensis</i>		Missouri Goldenrod	Native
Low Milkweed	<i>Asclepias ovalifolia</i>		Dwarf Milkweed	Native
Low Sedge	<i>Carex duriuscula</i>		Narrow-leaved Sedge	Native
Meadow Barley	<i>Hordeum brachyantherum</i>			Native
Meadow Blazingstar	<i>Liatris ligulistylis</i>		Strap-style Gayfeather	Native
Mealy Primrose	<i>Primula incana</i>		Hoary Primrose Jones Primrose	Native
Mountain Brome	<i>Bromus marginatus</i>	<i>Bromus carinatus</i>		Native
Mountain Cinquefoil	<i>Potentilla diversifolia</i>		Mountain Meadow Cinquefoil Smooth Leaved Cinquefoil	Native
Mountain Rough Fescue	<i>Festuca campestris</i>		Foothills Rough Fescue	Native
Mountain Shooting Star	<i>Dodecatheon conjugens</i>		Bonneville Shootingstar	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Mountain Timothy	<i>Phleum commutatum</i>	<i>Phleum alpinum</i>	Alpine Timothy	Native
Narrow-leaved Sunflower	<i>Helianthus maximilianii</i>		Maximilian Sunflower	Introduced
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	<i>Stipa comata</i> <i>Hesperostipa comata</i> <i>ssp. comata</i>	Spear Grass	Native
New England Aster	<i>Symphyotrichum novae-angliae</i>	<i>Aster novae-angliae</i>		Introduced
Nodding Onion	<i>Allium cernuum</i>			Native
Northern Bedstraw	<i>Galium boreale</i>			Native
Northern Grass-of-Parnassus	<i>Parnassia palustris</i>		Marsh Grass-of-Parnassus	Native
Northern Hedysarum	<i>Hedysarum boreale</i>	<i>Hedysarum boreale</i> <i>ssp. mackenzii</i>	Northern Sweetvetch	Native
Northern Locoweed	<i>Oxytropis campestris</i>		Field Locoweed Northern Yellow Point-vetch	Native
Northern Reed Grass	<i>Calamagrostis stricta</i> <i>ssp. inexpansa</i>		New England Northern Reedgrass	Native
Northern Rough Fescue	<i>Festuca altaica</i>	<i>Festuca scabrella</i>	Altai Fescue Rough Fescue Northern Fescue	Native
Northern Wheatgrass	<i>Elymus lanceolatus</i>	<i>Agropyron dasystachyum</i> <i>Elymus lanceolatus</i> <i>ssp. lanceolatus</i>	Streamside Wild Rye	Native
Nuttall's Larkspur	<i>Delphinium nuttalianum</i>		Nuttall's Delphinium	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>		Nuttall's Alkali Grass	Native
Oats	<i>Avena sativa</i>			Introduced
Owl-clover	<i>Orthocarpus luteus</i>		Yellow Owl's-clover	Native
Parry Oatgrass	<i>Danthonia parryi</i>		Parry's Oatgrass	Native
Parry's Townsendia	<i>Townsendia parryi</i>		Parry's Townsend-daisy	Native
Pasture Sagewort	<i>Artemisia frigida</i>		Prairie Sagebrush	Native
Pearly Everlasting	<i>Anaphalis margaritacea</i>		Western Pearly Everlasting	Native
Perennial Ryegrass	<i>Lolium perenne</i>			Introduced
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>			Native
Pine Reed Grass	<i>Calamagrostis rubescens</i>		Pine Grass	Native
Plains Reed Grass	<i>Calamagrostis montanensis</i>			Native
Plains Rough Fescue	<i>Festuca hallii</i>	<i>Festuca altaica</i> ssp. <i>hallii</i>	Rough Fescue	Native
Porter's Brome	<i>Bromus porteri</i>	<i>Bromus anomalus</i>	Nodding Brome Porter's Chess	Native
Prairie Cinquefoil	<i>Potentilla pensylvanica</i>		Pennsylvania Cinquefoil	Native
Prairie Coneflower	<i>Ratibida columnifera</i>		Upright Prairie Coneflower	Native
Prairie Cord Grass	<i>Spartina pectinata</i>		Fresh Water Cordgrass	Native
Prairie Crocus	<i>Anemone patens</i>	<i>Pulsatilla patens</i>	American Pasqueflower	Native
Prairie Gentian	<i>Gentiana affinis</i>			Native
Prairie Sagewort	<i>Artemisia ludoviciana</i>		White Sagebrush	Native
Prairie Sunflower	<i>Helianthus petiolaris</i>			Native
Prickly Rose	<i>Rosa acicularis</i>			Native
Prickly-Pear	<i>Opuntia polyacantha</i>			Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Pubescent Wheatgrass	<i>Thinopyrum intermedium</i>		Intermediate Wheatgrass	Introduced
Purple Avens	<i>Geum rivale</i>			Native
Purple Clematis	<i>Clematis occidentalis</i>			Native
Purple Coneflower	<i>Echinacea angustifolia</i>			Introduced
Purple Oatgrass	<i>Schizachne purpurascens</i>		False Melic Purple Oat	Native
Purple Prairie Clover	<i>Dalea purpurea</i>	<i>Petalostemon purpureum</i>	Purple Prairie-clover	Native
Purple Reed Grass	<i>Calamagrostis purpurascens</i>			Native
Purple-stemmed Aster	<i>Symphotrichum puniceum</i>	<i>Aster puniceus</i>	Swamp Aster	Native
Red and White Baneberry	<i>Actaea rubra</i>		Red Baneberry	Native
Red Fescue	<i>Festuca rubra</i>		Creeping Red Fescue	Introduced
Redtop	<i>Agrostis stolonifera</i>	<i>Agrostis gigantea</i>	Creeping Bentgrass	Introduced
Reflexed Locoweed	<i>Oxytropis deflexa</i>		Nodding Locoweed Pendant-pod Point-vetch	Native
Rhombic-leaved Sunflower	<i>Helianthus pauciflorus</i> <i>ssp. subrhomboideus</i>		Stiff Sunflower	Native
Rhomboid-leaved Saxifrage	<i>Micranthes occidentalis</i>		Western Saxifrage	Native
Richardson Needle Grass	<i>Achnatherum richardsonii</i>	<i>Stipa richardsonii</i>	Canada Mountain-ricegrass	Native
Richardson's Alumroot	<i>Heuchera richardsonii</i>			Native
Rocky Mountain Fescue	<i>Festuca saximontana</i>			Native
Rosy Everlasting	<i>Antennaria rosea</i>		Rosy Pussytoes	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Rough Hair Grass	<i>Agrostis scabra</i>		Tickle Grass Rough Bentgrass Hair Bentgrass	Native
Safflower	<i>Carthamus tinctorius</i>		False Saffron	Introduced
Sainfoin	<i>Onobrychis viciifolia</i>		Common Sainfoin	Introduced
Saline Shooting Star	<i>Dodecatheon pulchellum</i>		Few-flower Shootingstar	Native
Saltgrass	<i>Distichlis spicata</i>	<i>Distichlis spicata</i> ssp. <i>stricta</i> <i>Distichlis stricta</i>	Inland Saltgrass Seashore Saltgrass	Native
Sand Dropseed	<i>Sporobolus cryptandrus</i>			Native
Sand Grass	<i>Calamovilfa longifolia</i>		Prairie Sand Reed Sand Reed Grass	Native
Sand Nut Grass	<i>Cyperus schweinitzii</i>		Schweinitz's Flatsedge	Native
Sandberg Bluegrass	<i>Poa secunda</i>	<i>Poa sandbergii</i>	Curly Bluegrass	Native
Scabrous Black Sedge	<i>Carex atratiformis</i> ssp. <i>raymondii</i>		Black Sedge	Native
Sheep Fescue	<i>Festuca ovina</i>			Introduced
Shining Arnica	<i>Arnica fulgens</i>		Hillside Arnica	Native
Showy Aster	<i>Eurybia conspicua</i>	<i>Aster conspicuus</i>		Native
Showy Everlasting	<i>Antennaria pulcherrima</i>		Handsome Pussytoes	Native
Showy Fleabane	<i>Erigeron speciosus</i>		Aspen Fleabane	Native
Showy Jacob's-ladder	<i>Polemonium pulcherrimum</i>			Native
Showy Locoweed	<i>Oxytropis splendens</i>		Showy Point-vetch	Native
Showy Milkweed	<i>Asclepias speciosa</i>			Native
Shrubby Beardtongue	<i>Penstemon fruticosus</i>			Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Silky Lupine	<i>Lupinus sericeus</i>		Silky Perennial Lupine Pursh's Silky Lupine	Native
Silky Scorpionweed	<i>Phacelia sericea</i>			Native
Silverberry	<i>Elaeagnus commutata</i>		American Silverberry	Native
Silvery Perennial Lupine	<i>Lupinus argenteus</i>		Silvery Lupine	Native
Sitka Columbine	<i>Aquilegia formosa</i>		Crimson Columbine	Native
Slender Blue Beardtongue	<i>Penstemon procerus</i>		Slender Beardtongue Small-flower Beardtongue	Native
Slender Wheatgrass	<i>Elymus trachycaulus</i>	<i>Agropyron trachycaulum</i>		Native
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	<i>Agropyron subsecundum</i> <i>Agropyron trachycaulum var. unilaterale</i>	Awned Wheatgrass Awned Slender Wheatgrass	Native
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	<i>Agropyron trachycaulum var. trachycaulum</i>	Slender Wildrye	Native
Slough Grass	<i>Beckmannia syzigachne</i>		American Sloughgrass	Native
Small-leaved Everlasting	<i>Antennaria parvifolia</i>		Nuttall's Pussytoes Pussytoes	Native
Smooth Aster	<i>Symphotrichum laeve</i>	<i>Aster laevis</i>	Smooth Blue Aster	Native
Smooth Blue Beardtongue	<i>Penstemon nitidus</i>		Wax-leaf Beardtongue Waxleaf Penstemon	Native
Smooth Brome	<i>Bromus inermis</i>		Awnless Brome	Introduced
Smooth Fleabane	<i>Erigeron glabellus</i>			Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Smooth Wildrye	<i>Elymus glaucus</i>		Smooth Wild Rye	Native
Sparrow's-egg Lady's-slipper	<i>Cypripedium passerinum</i>			Native
Spear-leaved Arnica	<i>Arnica lonchophylla</i>		Northern Arnica	Native
Spike Trisetum	<i>Trisetum spicatum</i>		Narrow False Oats	Native
Spotted Joe Pyeweed	<i>Eutrochium maculatum</i>	<i>Eupatorium maculatum</i>		Native
Spotted Saxifrage	<i>Saxifraga bronchialis</i>		Matte Saxifrage	Native
Star-flowered Solomon's-seal	<i>Maianthemum stellatum</i>		Starflower Solomon's-plume Star-flowered False Solomon's-seal	Native
Sticky Alumroot	<i>Heuchera cylindrica</i>		Poker Alumroot	Native
Sticky Goldenrod	<i>Solidago simplex</i>		Spike Goldenrod	Native
Sticky Purple Geranium	<i>Geranium viscosissimum</i>		Sticky Geranium	Native
Stiff Goldenrod	<i>Solidago rigida</i>		Prairie Goldenrod	Native
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	<i>Agropyron riparium</i> <i>Elymus lanceolatus</i>		Native
Streambank Wheatgrass – Sodar	<i>Elymus lanceolatus ssp. psammophilus</i>			Introduced
Subalpine Umbrellaplant	<i>Eriogonum umbellatum</i>		Sulphur Flower Buckwheat	Native
Sun-loving Sedge	<i>Carex pensylvanica</i>			Introduced
Sweetgrass	<i>Anthoxanthum hirtum</i>	<i>Anthoxanthum nitens</i> <i>Hierochloe odorata</i> <i>Hierochloe hirta</i>	Northern Sweet Grass	Native
Tall Fescue	<i>Lolium arundinaceum</i>	<i>Schedonorus arundinaceus</i> <i>Festuca elatior</i>		Introduced
Tall Goldenrod	<i>Solidago altimssima</i>			Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Tall Jacob's- ladder	<i>Polemonium acutiflorum</i>			Native
Tall Larkspur	<i>Delphinium glaucum</i>		Pale Larkspur	Native
Tall Meadow Rue	<i>Thalictrum dasycarpum</i>		Purple Meadowrue	Native
Tall Wheatgrass	<i>Thinopyrum elongatum</i>	<i>Agropyron elongatum</i>		Introduced
Thickspike Wheatgrass	<i>Elymus macrourus</i>	<i>Elymus lanceolatus ssp. lanceolatus</i>		Introduced
Three-flowered Avens	<i>Geum triflorum</i>		Prairie Smoke	Native
Timothy	<i>Phleum pratense</i>		Meadow Timothy	Introduced
Tufted Fleabane	<i>Erigeron caespitosus</i>		Caespitose Fleabane	Native
Tufted Hair Grass	<i>Deschampsia caespitosa</i>		Tufted Hairgrass	Native
Tufted White Prairie Aster	<i>Symphotrichum ericoides</i>	<i>Aster ericoides</i>	White Heath Aster	Native
Twining Honeysuckle	<i>Lonicera dioica</i>		Mountain Honeysuckle	Native
Western Clematis	<i>Clematis ligusticifolia</i>		Western Virgin's-bower	Native
Western Dock	<i>Rumex occidentalis</i>			Native
Western Lousewort	<i>Pedicularis bracteosa</i>		Towering Lousewort	Native
Western Meadow-rue	<i>Thalictrum occidentale</i>		Western Meadowrue	Native
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	<i>Stipa curtiseta</i>		Native
Western Sweet Cicely	<i>Osmorhiza occidentalis</i>		Western Sweet-cicely	Native
Western Wheatgrass	<i>Pascopyrum smithii</i>	<i>Agropyron smithii</i>		Native
Western Willow Aster	<i>Symphotrichum lanceolatum</i>		Panicled Aster	Native
Western Wood Lily	<i>Lilium philadelphicum</i>		Wood Lily	Native
White Camas	<i>Zigadenus elegans</i>			Native
White Cinquefoil	<i>Drymocallis arguta</i>	<i>Potentilla arguta</i>	Tall Cinquefoil	Native
White Clover	<i>Trifolium repens</i>			Introduced

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
White Meadowsweet	<i>Spiraea betulifolia</i>			Native
White Prairie Clover	<i>Dalea candida</i>	<i>Petalostemon candidum</i>		Native
White-grained Mountain Rice Grass	<i>Oryzopsis asperifolia</i>		Mountain Rice Grass	Native
Wild Bergamot	<i>Monarda fistulosa</i>			Native
Wild Blue Flax	<i>Linum lewisii</i>		Prairie Flax <i>Linum perenne</i>	Native
Wild Chives	<i>Allium schoenoprasum</i>			Native
Wild Licorice	<i>Glycyrrhiza lepidota</i>			Native
Wild Mint	<i>Mentha arvensis</i>			Native
Wild Strawberry	<i>Fragaria virginiana</i>			Native
Wild Vetch	<i>Vicia americana</i>		American Vetch American Purple Vetch	Native
Wild White Geranium	<i>Geranium richardsonii</i>		Richardson's Geranium	Native
Wire Rush	<i>Juncus balticus</i>		Baltic Rush	Native
Woolly Cinquefoil	<i>Potentilla hippiana</i>		Horse Cinquefoil	Native
Woolly Gromwell	<i>Lithospermum ruderales</i>		Western Gromwell	Native
Yarrow	<i>Achillea millefolium</i>		Common Yarrow	Native
Yellow Angelica	<i>Angelica dawsonii</i>		Dawson's Angelica	Native
Yellow Beardtongue	<i>Penstemon confertus</i>		Yellow Penstemon	Native
Yellow Columbine	<i>Aquilegia flavescens</i>			Native
Yellow Evening Primrose	<i>Oenothera biennis</i>		Common Evening Primrose	Native
Yellow False Dandelion	<i>Agoseris glauca</i>		Pale Agoseris Pale Goat-chicory	Native
Yellow Mountain Avens	<i>Dryas drummondii</i>		Yellow Mountain-avens	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Yellow Umbrella-plant	<i>Eriogonum flavum</i>		Yellow Buckwheat	Native
Yellowbell	<i>Fritillaria pudica</i>		Yellow Missionbells	Native

NOTE: Selecting the appropriate scientific name for the wheatgrasses that were listed in the source documents with old scientific names or just common names was extremely challenging. This was particularly true for Awned, Northern, Slender and Streambank wheatgrasses, and is further complicated by ACIMS listing slender wheatgrass as any of *Elymus trachycaulus* ssp. *trachycaulus*, *Elymus trachycaulus* ssp. *subsecundus* or *Elymus trachycaulus*. Readers should consult the source documents to ensure that the correct name assignments have been made.

NOTE: For the purposes of this report and the accompanying Excel file, when the source document authors simply listed Vetch the genus *Astragalus* was assigned; however it could also be *Hedysarum* or *Vicia*.

NOTE: Another classification of particular interest to Grassland seed mixes is the grazing response of each species. Alberta's Combined Assessment Tool Record of Observations, used in support of reclamation certificate applications for wellsites and associated facilities, lists the grazing response of species as either: Increaser 1, Increaser 2, Decreaser or Invader (Alberta Environment and Parks, 2014). *Alberta Range Plants and Their Classification*⁷ also provides this information.

⁷ See [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex146](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex146)

ADDITIONAL MATERIAL IN THIS UPDATE

The following additions and changes have been made to this report and the accompanying Excel Inventory. In addition, some editorial corrections have been made. NOTE: the title of the report has been changed from Inventory of Native *Grass* Seed Mixes in Alberta to Inventory of Native *Species* Seed Mixes in Alberta to better reflect the increased use of forbs, and in rare cases shrubs, in seed mixes.

In spring of 2018 the InnoTech Alberta Reclamation Team decided to adopt the Alberta Conservation Information Management System (ACIMS) plant nomenclature; as a result, some of the species names in the original report have been changed to match the ACIMS names. The name changes are flagged in the List of Species table in the previous section.

There are now 366 mixes in the Inventory. The figures and statistics in Section 8.1 have been updated to reflect the additions noted below.

Additions

Required Mixes

A new section for mixes required in the National Parks has been added. Information was provided through personal communications with Parks staff and the University of Alberta. In addition, three published references were found.

Avens Consulting Inc., 2016. Seed Mixes and Reclamation Strategies for Projects in the LLYK Field Unit of Banff, Kootenay and Yoho National Parks. Avens Consulting Inc., Canmore, Alberta for Parks Canada, LLYK Field Unit. 14 pp. plus appendix.

Highwood Environmental Management Limited, 2005. Comprehensive Study Report for the Decommissioning of the Airstrip in Jasper National Park. Prepared for Parks Canada. Project No. 0011. https://ceaa-acee.gc.ca/Content/0/7/4/074F5693-9B69-4B8E-B105-B629A07B8A40/jasper_e.pdf

Highwood Environmental Management Limited, 2005b. Comprehensive Study Report for the Decommissioning of the Airstrip in Banff National Park. Prepared for Parks Canada. Project No. 0011. https://ceaa-acee.gc.ca/Content/0/7/4/074F5693-9B69-4B8E-B105-B629A07B8A40/banff_e.pdf

Recommended Mixes

Lancaster J., B. Adams, P. Desserud, R. Adams and M. Neville, 2017b. Recovery Strategies for Industrial Development in Native Grasslands for the Foothills Fescue, Foothills Parkland and Montane Natural Subregions of Alberta – First Approximation. Prepared for the Foothills Restoration Forum. 150 pp. <https://foothillsrestorationforum.ca/wp-content/uploads/2017/11/Recovery-Strategies-FF-FP-MON-First-Approx-FINALOctober2017-secured.pdf>

Special Areas Board, 2009. Recommended Native Grass Seed Mixes for Sites Located in Areas of Native Grass. Special Areas Board, Hanna, Alberta. 2 pp.

The City Of Calgary, 2018. City of Calgary Seed Mixes: Recommendations and Guidelines for Seed Mixes, Handling Procedures, Timing and Methodologies for The City Of Calgary to Inform Revegetation Work. The City Of Calgary, Parks Department, Calgary, Alberta. 85 pp. <http://www.calgary.ca/CSPS/Parks/Documents/Planning-and-Operations/seed-mixes.pdf>

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Operational Mixes

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Benga Mining Limited, 2018. Grassy Mountain Coal Project Environmental Impact Assessment. Supplemental Information Request Responses #1. Question 117, Table F.3.6-3. Benga Mining Limited, Blairmore, Alberta.

https://dds.aer.ca/iar_query/ShowAttachment.aspx?DOCNUM=3053890

Downey, B.A., F. Blouin, J.D. Richman, B.L. Downey and P.F. Jones, 2013. Restoring Mixed Grass Prairie in Southeastern Alberta, Canada. *Rangelands* 35(3): 16–20.

<https://journals.uair.arizona.edu/index.php/rangelands/article/download/19587/19222>

Enbridge Pipelines Inc., 2014. Line 3 Replacement Program. Appendix 1b: Facility Environmental Protection Plan. Section 7.4 Site Clean-up. p. 35. <https://apps.neb-one.gc.ca/REGDOCS/File/Download/2545532>

Friends of Fish Creek, 2018. ATCO Heritage Grassland. Friends of Fish Creek Provincial Park Society, Calgary, Alberta. <https://friendsoffishcreek.org/atco-2/>

Lancaster, J., M. Neville, P. Desserud, V. Craig, R. Adams, B. Adams and J. Woosaree, 2014. Long-term Revegetation Success of Industry Reclamation Techniques for Native Grassland: Northern Fescue Natural Subregion. PTAC Petroleum Technology Alliance Canada, Calgary, Alberta. <https://foothillsrestorationforum.ca/wp-content/uploads/2017/10/Long-term-Reveg-Success-of-Native-Grassland-Reclamation-Northern-Fescue-NSR.pdf>

MEG Energy Corp., 2017. May River Project Environmental Impact Assessment Report. MEG Energy Corp., Calgary, Alberta. Volume 1, section 6.2.3.1 Soil Stockpiles. <ftp://ftp.gov.ab.ca/env/fs/EIA/2017-02-MEGEnergyCorpMayRiverProject/Volume%201.pdf>

Peace River remote sump.

Suncor erosion control mix.

Syngenta Operation Pollinator golf course mix.

Town of High River flood mitigation.

Research Mixes

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Cartier, S.B., 2010. Early Stages of Calcareous Soil Reclamation Along the TMX-Anchor Loop Pipeline in Jasper National Park. M.Sc. Thesis. University of Alberta, Department of Renewable Resources, Edmonton, Alberta. 110 pp. https://era.library.ualberta.ca/rails/active_storage/blobs/9RcGBhNeG9RGHe6cx2ZHEiAD/Cartier_Sarah_Fall-202010.pdf

deBertoli, L.A., 2018. An Investigation of Potential Weed Management Practices and Multivariate Assessment Parameters for Alberta's Oil Sands Reclamation Efforts. M.Sc. Thesis. University of Alberta, Department of Renewable Resources, Edmonton, Alberta. 80 pp. https://era.library.ualberta.ca/rails/active_storage/blobs/9MGeUopCyZGShHCENVoaZo6q/deBortoli_Leah_A_201802_MSc.pdf

McGregor, L.M., 2013. Evaluating Establishment of Native Rhizomatous Grass Species for Reclaiming Sites in Southern Alberta with Limited Topsoil. M.L.A. Thesis. University of Guelph, Guelph, Ontario. 71 pp. https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/6585/McGregor_Laura_201304_MLA.pdf?sequence=3

Russell Ecological Consultants, 1986. Reclamation with Native Grasses in Alberta: Field Trial Results. Alberta Energy and Natural Resources, Edmonton, Alberta. ENR Technical Report Number: T/115. 57 pp. <https://era.library.ualberta.ca/items/08469bdb-8f4e-4ae1-8de0-8cfaffcbe657/download/f5dededf-1f63-4b12-b072-57da25661425>

Turner, E., 2013. Influence of Soil Cap Depth and Vegetation on Reclamation of Phosphogypsum Stacks in Fort Saskatchewan, Alberta. M.Sc. Thesis. University of Alberta, Department of Renewable Resources, Edmonton, Alberta. 172 pp. https://era.library.ualberta.ca/rails/active_storage/blobs/WdjBQM4sDSNnhuCpiPfquPMB/Turner_Elizabeth-20Lenore_Spring-202013.pdf

Woosaree, J. and R. Otfinowski, 2018. Importance of Species Diversity in the Revegetation of Alberta's Northern Fescue Prairies. *Biodiversity Conservation* 27: 665-680.

Commercial Mixes

BrettYoung Seeds

Wild About Flowers – wildflower mixes added

Sources of Individual Species

Clark Ecoscience & Sustainability – https://static1.squarespace.com/static/5875a099c534a5e7e2b1805e/t/58ae699de58c62b1f48eab0f/1487825311083/CES_2017-Price-List.pdf

Dynamic Seeds Ltd. – <http://www.peaceforagetool.ca/supplier/dynamic-seeds-ltd> (list as of February 2015)

Additional References for the Introduction

Tannas, S., 2015a. A Step-by-Step of Planning a Native Prairie Restoration Project: Designing for the Future. Presentation at the 2015 Native Prairie Restoration and Reclamation Workshop, Saskatchewan Prairie Conservation Action Plan. 52 pp. http://www.pcap-sk.org/rsu_docs/documents/2015-Steven-Tannas-Steps-of-Restoration.pdf

Tannas, S., 2015b. Seed Mix Design: Methods and Procedures used to Create a Successful Native Seed Mix for Restoration Projects. Presentation at the 2015 Native Prairie Restoration and Reclamation Workshop, Saskatchewan Prairie Conservation Action Plan. 54 pp. http://www.pcap-sk.org/rsu_docs/documents/2015-Steven-Tannas-Seed-Mix.pdf

Additional Reading

Jefferson et al., 2013

Neufeld, C.R., 2008

Saskatchewan Wetland Conservation Corporation, 2002

Smyth, C.R., 2002

Woosaree, J., 2000

Useful Websites

A new section providing an initial listing of useful websites.

Changes to the Excel Inventory

Common Name has been added as a separate header row to facilitate sorting and comparison with the Scientific Name. Variety names are now listed with the common name rather than with the scientific name as in the first edition.

A Stats tab has been added to provide a variety of data summaries; most of these are used as figures in this report.

Tabs for Most Frequent Species (species sorted by the number of mixes they appear in) and Unique Species List (species name with cultivars and varieties removed) have been provided.

1.0 INTRODUCTION

The Government of Alberta has long been a strong proponent of the use of native species for land reclamation and restoration projects. In 1973, the Department of Agriculture began an evaluation of native species suitable for reclamation of industrially disturbed lands (Vaartnou and Wheeler, 1975). That work eventually led to the creation of the Native Plants Program at the Alberta Environmental Centre (now InnoTech Alberta) in the late 1970s.

InnoTech Alberta sponsored two workshops in November 2016 to gather stakeholder input for the Business Case to redesign the Native Species Research Program (Small et al., 2016a). One of the recommendations from the Workshops was to:

Develop and maintain a list of existing prescribed native plant seed mixes to help growers identify opportunities and to drive work to provide improved mixes.

This report updates the first attempt (Powter et al., 2017) to inventory native grass seed mixes required or recommended for use in Alberta and those that are commercially available. The inventory was developed primarily through web-based searches and reaching out to researchers, land managers, industry and commercial seed suppliers. If another update is undertaken the next big source of seed mix information will be revegetation practitioners who develop and deploy seed mixes in various projects.

This report is intended to be a living document - updated periodically with input from the Native Plants Community.

1.1 REPORT SCOPE

The report focuses on native species seed mixes for use in revegetation projects (reclamation, restoration, naturalization and remediation) undertaken for or by government or industry. Mixes labeled agronomic, forage, tame forage, hay, pasture, lawn, turf, park, etc. are not included in this report. However, some of the mixes contain agronomic species - these may be present to provide a nurse/cover crop that will allow the native species to establish, or they may be present because the mix represents a transition to a fully native mix.

While the majority of seed mixes in the inventory are sourced from materials produced since 2010, there are mixes dating back as far as 1977 to provide some perspective and insights into the extent of progress in seed mix design.

Some of the commercial mixes reported here are marketed for both large-scale projects and smaller projects such as homes or acreages - readers should check with the vendor to determine availability and volumes.

The report is divided into sections based on seed mix type:

- Section 2 lists mixes required by various government agencies - for the purposes of this report it has been assumed that all mixes used in National Parks are Required as Parks

staff will authorize their use (this means that some of the mixes previously in the Operational or R&D sections have been moved here);

- Section 3 lists mixes that are recommended for use by various organizations;
- Section 4 lists proposed or deployed operational mixes;
- Section 5 lists mixes used in research and development projects; and,
- Section 6 lists commercial mixes.

A summary table of all of these mixes, as well as vendors who supply seed for individual species that are found in the mixes is available as an Excel file to allow for sorting and searches.

1.2 BUILDING A SEED MIX

The following factors must be considered when developing a seed mix (adapted from Alberta Energy Regulator, 2003; Alberta Sustainable Resource Development, 2006; Gabruch et al., nd; Golden Acre Seeds, nd; Hammermeister, 1998; Lowen and Walker, 1988; Matheus and Omtzigt, 2013; Native Plant Working Group, 2000; Pickseed, nd; Small et al., 2016a; Smreciu et al., 2003; Tannas, 2015a, b; Tannas and Webb, 2016; The City of Calgary, 2018; Town of Canmore, 2016; Wark et al. nd; Ziemkiewicz, 1983):

- Determine if natural recovery is an option (or landowner/regulatory expectation).
- Determine target vegetation (outcome).
 - The target can be site specific (i.e., match adjacent conditions) or regulatory (e.g., Wellsite Criteria).
 - The target may be a climax community or more likely an earlier stage along the recovery trajectory to a climax community.
 - Target vegetation communities and species should be determined based on a site-specific vegetation assessment.
 - Balance the goals for a site – e.g., erosion control (dense stands) vs. natural invasion (sparse stands).
- Identify the environmental conditions at the site and surrounding area
 - Soil, vegetation, litter/mulch.
 - Climate.
 - Level and type of disturbance, and any residual impacts.
- Identify land management practices for the site (e.g., grazing, fencing, access control, etc.)
- Review the characteristics of each species proposed for the mix.
 - Ensure that no species will overwhelm the others.
 - Consider grazing response (e.g., increaser, decreaser, invader) where applicable.
- Determine availability of desired species.
 - Seed suppliers need long lead times to produce new seed.

- Determine if alternative species are suitable (substitution).
- Assess the source and quality (purity, weeds) of desired species seed.
 - Ensure the seed lots and mix are weed free (obtain weed certificates).
- Calculate Pure Live Seed (PLS) for each species (as an alternative to % weight).
 $\% \text{ PLS} = \% \text{ germination} \times \% \text{ purity}$
 where $\% \text{ purity} = 100 - \% \text{ inert material}$.
 - Buy the seed lot with the highest PLS content as this reduces the volume of material handled when seeding.
- Determine appropriate seeding rate (ideally on a seeds (PLS)/m² basis).
 - Seeding rate can be modified based on climate (moisture), seeding method (drill seeding is preferred to broadcast), season and plant establishment factors.
 - Determine if minimum or maximum seeding rates have been set by regulators.
- Calculate the percentage of seeds for each species in the mix.
- Calculate operational seeding rate (kg/ha).
 - Determine if seed is coated or cleaned as that affects weight.
- Review the proposed seed mix with the landowner / land manager, and where required, obtain their approval.

Tannas and Webb (2016) provide formulas for calculating seeding rates and an example using a mix of rough fescue, western porcupine grass and June grass. Digital seed mix calculators are also available:

- Peace Forage Seeding Tool – Seed Mix Calculator – <http://www.peaceforagetool.ca/seed-mix-calculator>
- Alberta Agriculture and Forestry – Forage Seed Mixture Calculator – <http://www.agric.gov.ab.ca/app19/calc/forageseed/forageseedintro.jsp>
- Washington Department of Fish and Wildlife – Seed Mix Calculator – <https://smartmix.greencoverseed.com/>

1.2.1 Plant Characteristics

Plant characteristic information required for building seed mixes is available in several sources (Table 2).

Table 2. Sources for plant characteristics information required to build a seed mix.

Source	Plant Biology	Plant Ecology	Seed Weight	Grazing	Reclamation Suitability
Hardy BBT Limited, 1989	√	√	√	√	√
Smreciu et al., 2013	√	√	√	√	√
Pahl and Smreciu, 1998	√	√	√	√	√

Source	Plant Biology	Plant Ecology	Seed Weight	Grazing	Reclamation Suitability
Smreciu, 1993	√	√	√		√
Northstar Seed, 2017	√	√	√		√
Burton and Burton, 2003	√	√	√		√
Pickseed, nd *	√	√	√		
BrettYoung, 2017	√	√	√		
Matheus and Omtzigt, 2013		√	√		√
Dobb and Burton, 2013	√	√		√	√
Tannas and Webb, 2016		√	√	√	
Native Plant Working Group, 2000 *	√		√		√
Alberta Agriculture and Forestry, 2016	√			√	
Vaartnou and Wheeler, 1975		√			√
Hammermeister, 1998			√		
Wark et al., nd			√		
Tannas, 2015b			√		
Gabruch, nd			√		
Lancaster et al., 2017b				√	
Parks Canada, 2011	√				
Morgan et al., 1995	√				
Peace Forage Seeding Tool – Species Ratings (http://www.peaceforagetool.ca/species-ratings)		√			
Washington Department of Fish and Wildlife – Seed Mix Calculator - https://smartmix.greencoverseed.com/	√		√		

* Note: These documents also provide information on suitable substitutions for species in a mix.

In addition there are automated tools for selecting species for mixes based on their characteristics and site locations. For example, see the Wild About Flowers Plant Selection Tool at http://www.wildaboutflowers.ca/advanced_search_page.php

1.2.2 Cover Crops

Historically, cover crops for reclamation projects have been agricultural annual species intended to protect the newly seeded or planted site from erosion, allowing time for the desired plants to

establish (Native Plant Working Group, 2000). However, even when seeded at low rates, cover crops may compete with desired vegetation and may also attract cattle and wildlife (Lancaster et al., 2014; Native Plant Working Group, 2000; Woosaree and Hiltz, 2011). More recently, practitioners are looking to use native species for cover crops (Woosaree and Hiltz, 2011), with an emphasis on early successional perennial species. The City of Calgary (2018) provides guidance on the use of 10 cover crop species. Related cover crop recommendations are listed in this report when provided in the source documents.

1.3 REPORT NOTES

The following notes are provided to assist readers in interpreting the lists in this document:

- Where the common or scientific name is missing in the source document efforts have been made to infer the appropriate name; readers are encouraged to review the source documents and make their own interpretations.
- Older reference sources contain scientific names that have since been changed; this report uses the current names (based on Alberta Conservation Information Management System (ACIMS) plant nomenclature⁸); see the list of species names at the front of this report. Readers are encouraged to review the source documents and make their own interpretations.
- Where there are multiple spellings of common names in source documents (e.g., Wheat Grass vs. Wheatgrass) this report uses the spelling in ACIMS.
- Many mixes are described by species name and % in the source materials; this report assumes that % means wt %.
- Most mixes are described in terms of wt %, PLS/m², or PLS %; some mixes are simply species lists or are described in different units (e.g., Garbuch et al. (nd) describe a Loamy Range Site simple pasture mix in seeds/lb and PLS lb/acre); contact source material authors for more details.
- Some mixes include seeds that have been treated (e.g., GroKoted, Nutriccoat, Nutra, Ultracoat) – contact vendors to determine purpose and value of treatments.
- Some mixes list the majority of species and an associated wt% but also include species that can be added in very small amounts (e.g., The City of Calgary (2018) Open Forest Mix lists two species as “trace” – i.e., each form less than 1% by weight of the mix); the latter are listed in this report and also in the Excel file.
- Some sources provide lists of suitable species for various environments but do not provide specific seed mixes (e.g., Innovista, nd; Native Plant Working Group, 2000; Parks Canada, 2011; Town of Banff, 2018; Vaartnou and Wheeler, 1975) – these lists are not included in this report but do provide useful information when creating seed mixes.

⁸ <https://www.albertaparks.ca/media/6493459/list-of-elements-ab-vascular-plants.xlsx>

1.4 LIMITATIONS AND CAVEATS

Readers should be aware of the following limitations and caveats in using this report:

- Mention of a particular mix, species, cultivar or variety, wt% or PLS/m² value does not constitute endorsement by InnoTech Alberta.
- The list is not exhaustive – mixes are likely to have been missed; this can be corrected in later versions of this report.
- Wherever possible the authors have obtained the seed mixes from documents that are available online or in libraries so readers can assess the information for themselves. However, in an effort to provide the broadest possible list, there are many mixes in the report that come from non-published materials or documents provided through personal communications. Readers should contact the organizations or individuals providing the mixes for further details.
- Care should be taken in assessing the “nativeness” of the species listed in the mixes:
 - some of the listed species (e.g., *Festuca ovina*) may be considered introduced (Alberta Agriculture and Forestry, 2016; Town of Canmore, 2016a), some may be considered invasive (e.g., *Poa compressa*) and others undesirable (e.g., *Medicago sativa*).
 - sources of the seed in the mix are not always specified – they could be local, regional, provincial or extra-provincial – contact vendors for further details.
- Some mixes specify a variety or cultivar but most do not – check with vendors if the seed is common or not.
- Inclusion of a mix, or species in a commercial mix, or inclusion of a species in the commercial vendors section, does not necessarily imply that suitable volumes will be available when required – check with vendors.



2.0 REQUIRED SEED MIXES

Some government agencies mandate use of native species in reclamation projects. Examples of these are provided below.

2.1 ALBERTA TRANSPORTATION MIXES

Alberta Transportation's *Environmental Management System Manual* (Alberta Transportation, 2016; p. 75) requires consultants to follow Design Bulletin No. 25 *Grass Seed Mixtures used on Highway and Bridge Projects* (Alberta Infrastructure and Transportation, 2005) when an area to be seeded is larger than one hectare. The Bulletin divides the province into six regions (Figure 1), each with its own native species seed mix to be used when the adjacent land has native species communities (as determined by a vegetation assessment). Where the adjacent land is non-native two agronomic mixes are specified.

The six Alberta Transportation seed mixes are listed below.

Table 3. Alberta Transportation Zone 1 mixed wetland seed mix,

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	40
Fringed Brome	<i>Bromus ciliatus</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10

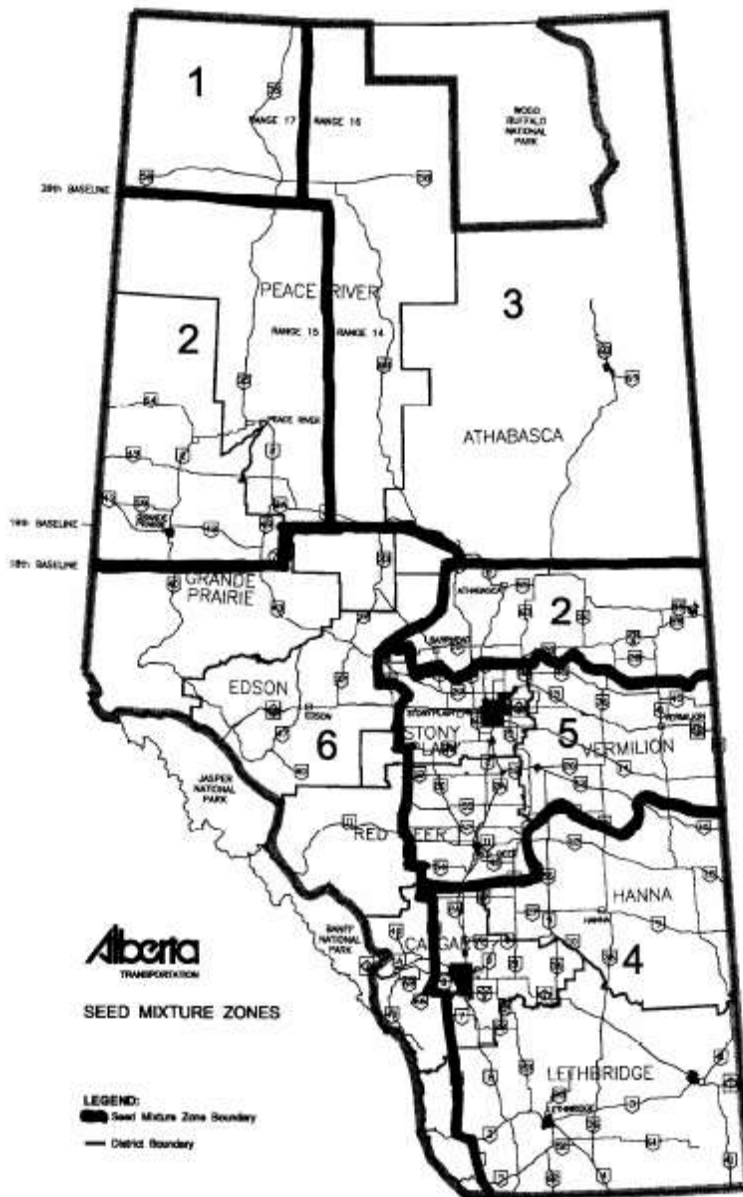


Figure 1. Alberta Transportation seed mix zones.

Table 4. Alberta Transportation Zone 2 dry mixedwood seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	35
Fringed Brome	<i>Bromus ciliatus</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15

Common Name	Scientific Name	Wt %
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10

Table 5. Alberta Transportation Zone 3 central mixedwood seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	35
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Rough Hair Grass	<i>Agrostis scabra</i>	10
Fringed Brome	<i>Bromus ciliatus</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	5

Table 6. Alberta Transportation Zone 4 mixedgrass and dry mixedgrass seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	30
Canada Wild Rye	<i>Elymus canadensis</i>	15
Mountain Brome	<i>Bromus marginatus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Alkali Grass	<i>Puccinellia distans</i>	10
Needle-and-Thread Grass	<i>Stipa comata</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5

Table 7. Alberta Transportation Zone 5 central parkland seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	25
Fringed Brome	<i>Bromus ciliatus</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10

Common Name	Scientific Name	Wt %
Indian Rice Grass	<i>Achnatherum hymenoides</i>	10
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5

Table 8. Alberta Transportation Zone 6 lower foothills seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	30
Smooth Wild Rye	<i>Elymus glaucus</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rough Hair Grass	<i>Agrostis scabra</i>	10
Fringed Brome ¹	<i>Bromus ciliatus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Mountain Rough Fescue	<i>Festuca campestris</i>	10

¹ Fringed brome must be coated.

2.2 CITY OF EDMONTON

The City of Edmonton's Design and Construction Standards (City of Edmonton, 2017) require use of native seed mixes for habitat restoration to fully re-establish a target level of ecosystem function and biodiversity as defined by the reference habitat. Native grass species can also be used when establishing landscapes with a natural aesthetic. Five seed mixes are prescribed (two native and three naturalization):

Table 9. City of Edmonton native seed mix – Peace River parkland.

Common Name	Latin Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	35
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	25
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
June Grass	<i>Koeleria macrantha</i>	5
Western Porcupine Grass	<i>Hesperostipa curtisetia</i>	5

Table 10. City of Edmonton native seed mix – central parkland.

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Sloughgrass	<i>Beckmannia syzigachne</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Alkali Bluegrass	<i>Poa secunda</i> ssp. <i>juncifolia</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Sandberg Bluegrass	<i>Poa secunda</i>	5

Table 11. City of Edmonton non-maintained naturalization landscaping – wet meadow seed mix.

Common Name	Scientific Name	Wt %
Fowl Bluegrass	<i>Poa palustris</i>	30
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	20
Giant Wild Rye	<i>Leymus cinereus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	10
Italian Ryegrass	<i>Lolium multiflorum</i>	5

Table 12. City of Edmonton non-maintained naturalization landscaping – dry meadow seed mix.

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	20
Rough Fescue	<i>Festuca campestris</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Streambank Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>riparius</i>	15
Green Needle Grass	<i>Nassella viridula</i>	10
Sheep Fescue	<i>Festuca ovina</i>	10

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	5

Table 13. City of Edmonton non-maintained naturalization landscaping – grassland wet seed mix.

For use in areas that experience spring flooding followed by dry conditions as the spring and summer progress.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Porter’s Brome	<i>Bromus porteri</i>	20
Slough Grass	<i>Beckmannia syzigachne</i>	10
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	10
Italian Ryegrass	<i>Lolium multiflorum</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5
Rough Hair Grass	<i>Agrostis scabra</i>	5

2.3 CITY OF LETHBRIDGE

The City of Lethbridge’s Construction Specifications (City of Lethbridge, 2014) require use of the following seed mix in land reclamation for road right of way and disturbed areas:

Table 14. City of Lethbridge dryland seed mixture.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	30
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Green Needle Grass	<i>Nassella viridula</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5

Note: Cover crop to be approved on a site-specific basis. Erosion and time of year that the seeding will occur will influence the seed variety used.

The document also provides lists of species potentially suitable for coulee restoration and for a wildflower mix but requires a site evaluation to formulate the appropriate mix for the environmental conditions.

2.4 EASTERN IRRIGATION DISTRICT

The Eastern Irrigation District requires the use of the following reclamation seed mix (Eastern Irrigation District, 2017).

Table 15. Eastern Irrigation District reclamation seed mix.

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Sandberg Bluegrass	<i>Poa secunda</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	10

Note: The mix was changed in 2014, replacing 10% Intermediate Wheatgrass (*Thinopyrum intermedium*) with 10% Slender Wheatgrass, as the latter is native to North America and has better grazing value (Eastern Irrigation District, 2014).

2.5 NATIONAL PARKS

Staff in the National Parks may specify seed mixes to be used by contractors or may use the same mixes for smaller projects they seed themselves. NOTE: research projects and operational mixes in National Parks are included in this section on the assumption that parks staff would have required/authorized their use.

2.5.1 Banff National Park

2.5.1.1 Banff National Park Mixes

Banff National Park historically had some general mixes, based on what was used in Jasper National Park (see Jasper National Park Historical Seed Mixes section below), but now use a local reference site for species selection, followed by screening through what is available on the market (Brian Yakiwchuk, Banff National Park, pers. comm.).

2.5.1.2 Banff National Park Operational Mixes

Trans Canada Highway Twinning

The following mix was proposed for use in disturbed areas associated with twinning of the Trans Canada Highway through Banff National Park (Hammer, 1996).

Table 16. Banff National Park Trans Canada Highway mix.

Common Name	Scientific Name
Fringed Brome	<i>Bromus ciliatus</i>
Tufted Hair Grass	<i>Deschampsia caespitosa</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
June Grass	<i>Koeleria macrantha</i>
Alpine Bluegrass	<i>Poa alpina</i>
Fowl Bluegrass	<i>Poa palustris</i>

Plus 5% Perennial Ryegrass (*Lolium perenne*) as cover crop.

Banff Airstrip Decommissioning

In their rehabilitation plan for the proposed Banff airstrip decommissioning project Highwood Environmental Management (2005b) recommended the following seed mix.

Table 17. Banff Airstrip mix.

Common Name	Scientific Name	Wt %
Durar Hard Fescue or Rocky Mountain Fescue	<i>Festuca trachyphylla</i> or <i>Festuca saximontana</i>	20
Reubens Canada Bluegrass	<i>Poa compressa</i>	20
Hairy Wild Rye	<i>Leymus innovatus</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Norlea Perennial Ryegrass	<i>Lolium perenne</i>	5
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Sodar Streambank Wheatgrass	<i>Elymus lanceolatus ssp. psammophilus</i>	5

Seed at 55 to 60 kg/ha.

LLYK Field Unit of Banff, Kootenay and Yoho National Parks

Avens Consulting Inc. (2016) recommended six mixes for various habitats for projects in the LLYK Field Unit of Banff, Kootenay and Yoho National Parks.

Table 18. Banff LLYK seed mix A.

This mix is good for dry to moist mid to high elevation sites above 1700 m, good for coarse soils (e.g. Hwy 93 N near Bow Summit).

Common Name	Scientific Name	Wt %
Alpine Bluegrass	<i>Poa alpina</i>	45
Spike Trisetum	<i>Trisetum spicatum</i>	45
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i> *	10

*Can substitute slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*).

Table 19. Banff LLYK seed mix B.

This mix is good for mesic to moist valley bottom sites 1200 to 1700m (e.g., Bow Valley).

Common Name	Scientific Name	Wt %
Rough Hair Grass	<i>Agrostis scabra</i>	40
Fowl Bluegrass	<i>Poa palustris</i>	40
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i> *	20

*Can substitute slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*).

Table 20. Banff LLYK seed mix D.

This mix is good for dry low elevation sites 1100 to 1700 m, steep backslopes on roadsides.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	45
June Grass	<i>Koeleria macrantha</i>	45
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i> *	10

*Can substitute slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*).

Table 21. Banff LLYK seed mix F.

This mix is good for wet areas and drainage areas with standing water during the growing season, 1200 to 2000 m+.

Common Name	Scientific Name	Wt %
Tufted hairgrass	<i>Deschampsia caespitosa</i>	50
Fowl bluegrass	<i>Poa palustris</i>	50

*Can substitute slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*).

2.5.2 Elk Island National Park

2.5.2.1 Elk Island National Park Mixes

Elk Island National Park uses five seed mixes for different ecological settings and disturbance types (Jonathan DeMoor, Parks Canada, pers. comm.). They also have lists of native grass, forb and shrub seed that are acceptable for use in the Park. Asterisks in the last three mixes indicate that seed may be hard to purchase or will need to be collected from local sources within the National Park; may substitute species identified already in the mix.

Table 22. Elk Island National Park simple seed mix for roadway and ditch projects.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	35
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
June Grass	<i>Koeleria macrantha</i>	5

Table 23. Elk Island National Park grassland restoration sites mix.

Common Name	Scientific Name	Wt %
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Hooker's Oat Grass	<i>Avenula hookeri</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Canada Wild Rye	<i>Elymus canadensis</i>	5
June Grass	<i>Koeleria macrantha</i>	5

Table 24. Elk Island National Park aspen-dominated forest restoration sites mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Hairy Wild Rye	<i>Leymus innovatus</i>	5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5
Bluejoint	<i>Calamagrostis canadensis</i>	5
Green Needle Grass	<i>Nassella viridula</i>	5
June Grass	<i>Koeleria macrantha</i>	5
White-Grained Mountain Rice Grass	<i>Oryzopsis asperifolia</i>	2*
Hooker's Oat Grass	<i>Avenula hookeri</i>	2*
Fringed Brome	<i>Bromus ciliatus</i>	2*
Sweetgrass	<i>Anthoxanthum hirtum</i>	2*
Purple Oat Grass	<i>Schizachne purpurascens</i>	2*

Table 25. Elk Island National Park coniferous/mixedwood-dominated forest restoration sites mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Hairy Wild Rye	<i>Leymus innovatus</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Bluejoint	<i>Calamagrostis canadensis</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
June Grass	<i>Koeleria macrantha</i>	5
White-Grained Mountain Rice Grass	<i>Oryzopsis asperifolia</i>	2*
Hooker's Oat Grass	<i>Avenula hookeri</i>	2*
Fringed Brome	<i>Bromus ciliatus</i>	2*
Sweetgrass	<i>Anthoxanthum hirtum</i>	2*
Purple Oat Grass	<i>Schizachne purpurascens</i>	2*

Table 26. Elk Island National Park riparian restoration sites mix.

Common Name	Scientific Name	Wt %
Fowl Bluegrass	<i>Poa palustris</i>	20
Bluejoint	<i>Calamagrostis canadensis</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Hairy Wild Rye	<i>Leymus innovatus</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Native Sedge Species	<i>Carex</i> spp.	20*

2.5.2.2 Elk Island National Park Research Mixes

Erichsen Arychuk Grass-forb Seed Mix

Sites at Eilerslie and Elk Island National Park were drill seeded in fall 1997 or spring 1998 to a mix of six native grasses, then broadcast seeded with ten native forb species commonly found in undisturbed aspen parkland ecosystems for which seed was available. The seed mix consisted of 70% grasses and 30% forbs by weight (each species had equal amounts of pure live seed (PLS) to give theoretically equal numbers of plants from each species). The 70:30 ratio of grasses to forbs represented percent cover and species number in Aspen Parkland.

Table 27. Erichsen Arychuk Elk Island grass-forb seed mix.

Common Name	Scientific Name	g/m ²
Northern Wheatgrass	<i>Elymus lanceolatus</i>	110.00
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	92.30
Wild Vetch	<i>Vicia americana</i>	87.30
Northern Rough Fescue	<i>Festuca altaica</i>	65.00
Green Needle Grass	<i>Nassella viridula</i>	57.00
Blanket Flower	<i>Gaillardia aristata</i>	23.66
Prairie Coneflower	<i>Ratibida columnifera</i>	16.26
Blue Grama Grass	<i>Bouteloua gracilis</i>	15.50
Wild Blue Flax	<i>Linum lewisii</i>	12.21
Purple Prairie Clover	<i>Dalea purpurea</i>	12.09
Low Goldenrod	<i>Solidago missouriensis</i>	7.96

Common Name	Scientific Name	g/m ²
June Grass	<i>Koeleria macrantha</i>	7.30
Smooth Aster	<i>Aster laevis</i>	7.24
Canada Goldenrod	<i>Solidago canadensis</i>	6.11
Wild Bergamot	<i>Monarda fistulosa</i>	4.34
Common Yarrow	<i>Achillea millefolium</i>	1.04
Total Forb Seed		178.21
Total Seed		525.30

Naeth and Wilkinson – Fire Fuel Break Management

Performance of seeded native grasses relative to non-native species in fire fuel breaks in aspen parkland in Elk Island National Park and in montane forest in Jasper National Park was assessed. The Elk Island sites were seeded in June 2004 at 25 kg/ha.

Table 28. Naeth and Wilkinson Elk Island fire break mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Fringed Brome	<i>Bromus ciliatus</i>	18
Green Needle Grass	<i>Nassella viridula</i>	15
Indian Rice Grass	<i>Achnatherum hymenoides</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
June Grass	<i>Koeleria macrantha</i>	7

2.5.3 Jasper National Park

2.5.3.1 Jasper National Park Historical Seed Mixes

In 2008 the following mixes were used for various environmental settings in Jasper National Park and were also used by Banff National Park.

Table 29. Jasper National Park mix 1A – open deciduous.

Common Name	Scientific Name	Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	13
Hairy Wild Rye	<i>Leymus innovatus</i>	13
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	13

Common Name	Scientific Name	Wt %
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	12
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
June Grass	<i>Koeleria macrantha</i>	9
Rough Hair Grass	<i>Agrostis scabra</i>	8
Alpine Bluegrass	<i>Poa alpina</i>	7
Spike Trisetum	<i>Trisetum spicatum</i>	5

Table 30. Jasper National Park mix 1B – open coniferous.

Common Name	Scientific Name	Wt %
Fringed Brome	<i>Bromus ciliatus</i>	13
Hairy Wild Rye	<i>Leymus innovatus</i>	13
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	13
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
June Grass	<i>Koeleria macrantha</i>	9
Blue Bunch Wheatgrass	<i>Pseudoroegneria spicata</i>	7
Bluebunch Fescue	<i>Festuca idahoensis</i>	7
Mountain Rough Fescue	<i>Festuca campestris</i>	7
Alpine Bluegrass	<i>Poa alpina</i>	6
Spike Trisetum	<i>Trisetum spicatum</i>	5

Table 31. Jasper National Park mix 1C – closed coniferous.

Common Name	Scientific Name	Wt %
Hairy Wild Rye	<i>Leymus innovatus</i>	26
Rocky Mountain Fescue	<i>Festuca saximontana</i>	17
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	13
Fringed Brome	<i>Bromus ciliatus</i>	12
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
June Grass	<i>Koeleria macrantha</i>	9
Alpine Bluegrass	<i>Poa alpina</i>	8

Common Name	Scientific Name	Wt %
Spike Trisetum	<i>Trisetum spicatum</i>	5

Table 32. Jasper National Park mix 1D – grasslands.

Common Name	Scientific Name	Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	13
Hairy Wild Rye	<i>Leymus innovatus</i>	13
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	13
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
June Grass	<i>Koeleria macrantha</i>	9
Alpine Blue Grass	<i>Poa alpina</i>	7
Spike Trisetum	<i>Trisetum spicatum</i>	5

Table 33. Jasper National Park mix 1E – riparian and wetlands.

Common Name	Scientific Name	Wt %
Hairy Wild Rye	<i>Leymus innovatus</i>	13
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	13
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	12
Fringed Brome	<i>Bromus ciliatus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
June Grass	<i>Koeleria macrantha</i>	9
Fowl Bluegrass	<i>Poa palustris</i>	8
Alpine Bluegrass	<i>Poa alpina</i>	7
Spike Trisetum	<i>Trisetum spicatum</i>	5

Table 34. Jasper National Park mix 2 – calcareous soils.

Common Name	Scientific Name	Wt %
Bluebunch Fescue	<i>Festuca idahoensis</i>	25
Green Needle Grass	<i>Nassella viridula</i>	20
Spike Trisetum	<i>Trisetum spicatum</i>	15

Common Name	Scientific Name	Wt %
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	15
June Grass	<i>Koeleria macrantha</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
High Wildrye	<i>Elymus violaceus</i>	5

Table 35. Jasper National Park mix 3 – cedar forest.

Common Name	Scientific Name	Wt %
Fringed Brome	<i>Bromus ciliatus</i>	45
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	20
Hairy Wild Rye	<i>Leymus innovatus</i>	20
Fowl Bluegrass	<i>Poa palustris</i>	15

Table 36. Jasper National Park mix 4 – non-attractant highway/roadway.

Common Name	Scientific Name	Wt %
Smooth Wildrye	<i>Elymus glaucus</i>	35
Rough Hair Grass	<i>Agrostis scabra</i>	25
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Spike Trisetum	<i>Trisetum spicatum</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Alpine Bluegrass	<i>Poa alpina</i>	5

2.5.3.2 Jasper National Park Current Seed Mixes

The following mixes are a general guide, and many sites may have more specific conditions and species requirements (John Stirrett-Wood, Parks Canada, Jasper National Park, pers. comm.) (see examples in the following sections).

Table 37. Jasper National Park montane / valley bottom / low elevation (1000 m – 1300 m ASL) – moist sites mix.

Common Name	Scientific Name	Wt %
Hairy Wild Rye	<i>Leymus innovatus</i>	50
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Tufted Hairgrass	<i>Deschampsia caespitosa</i>	25

Table 38. Jasper National Park montane / valley bottom / low elevation (1000 m – 1300 m ASL) – dry sites mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	50
June Grass	<i>Koeleria macrantha</i>	25
Richardson’s Needle Grass	<i>Achnatherum richardsonii</i>	25

Table 39. Jasper National Park montane / valley bottom / low elevation (1000 m – 1300 m ASL) – general sites mix.

Common Name	Scientific Name	Wt %
Hairy Wild Rye	<i>Leymus innovatus</i>	50
Western Wheatgrass	<i>Pascopyrum smithii</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25

Table 40. Jasper National Park sub-alpine / moderate or mid elevation (1300 m – 1800 m ASL) mix.

Common Name	Scientific Name	Wt %
Spike Trisetum	<i>Trisetum spicatum</i>	50
Alpine Bluegrass	<i>Poa alpina</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25

Table 41. Jasper National Park alpine / high elevation (1800 m – 2000 m ASL) mix.

Common Name	Scientific Name	Wt %
Alpine Bluegrass	<i>Poa alpina</i>	50
Arctic Bluegrass	<i>Poa arctica</i>	25
Spike Trisetum	<i>Trisetum spicatum</i>	25

2.5.3.3 Jasper National Park Operational Mixes

University of Alberta Revegetation Assessments

The University of Alberta conducted vegetation assessments of several reclamation projects in Jasper National Park that had been established by a variety of industries or Parks Canada (Sarah Wilkinson, University of Alberta, pers. comm.). Seed mixes for some of the projects were provided.

Table 42. Jasper Lake Dunes Pipeline Relocation Project – highway lands mix.

Common Name	Scientific Name
Fringed Brome	<i>Bromus ciliatus</i>
Tufted Hairgrass	<i>Deschampsia caespitosa</i>
Slender Wheatgrass	<i>Elymus trachycaulus</i>
High Wildrye	<i>Elymus violaceus</i>
Sheep Fescue	<i>Festuca ovina</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>

Table 43. Jasper Lake Dunes Pipeline Relocation Project – sand dune banks mix.

Common Name	Scientific Name
Tufted Hairgrass	<i>Deschampsia caespitosa</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
Green Needlegrass or Needle-and-Thread Grass	<i>Nassella viridula</i> or <i>Hesperostipa comata</i>
Spike Trisetum	<i>Trisetum spicatum</i>

Table 44. Jasper Lake Dunes Pipeline Relocation Project – upland forest mix.

Common Name	Scientific name
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus</i>
High Wildrye	<i>Elymus violaceus</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
Green Needle Grass or Needle-and-Thread Grass	<i>Nassella viridula</i> or <i>Hesperostipa comata</i>

Table 45. Mile 12 Pipeline Relocation Project – mix 1.

Common Name	Scientific Name
Fringed Brome	<i>Bromus ciliatus</i>
Tufted Hairgrass	<i>Deschampsia caespitosa</i>
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>
Adanac Slender Wheatgrass	<i>Elymus trachycaulus</i>
ARC Plateau Rocky Mountain Fescue	<i>Festuca saximontana</i>

Table 46. Mile 12 Pipeline Relocation Project – mix 2.

Common Name	Scientific Name
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
ARC Plateau Rocky Mountain Fescue	<i>Festuca saximontana</i>
Green Needle Grass	<i>Nassella viridula</i>
Alpine Bluegrass	<i>Poa alpina</i>

Table 47. Athabasca River Pipeline Removal mix.

Common Name	Scientific Name
Rocky Mountain Fescue	<i>Festuca saximontana</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus</i>
Mountain Brome	<i>Bromus marginatus</i>
Tufted Hairgrass or Mountain Rough Fescue	<i>Deschampsia caespitosa</i> or <i>Festuca campestris</i>

Table 48. Athabasca River Bank Armouring Project mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	30
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	20
Tufted Hairgrass	<i>Deschampsia caespitosa</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Mountain Rough Fescue	<i>Festuca campestris</i>	10
June Grass	<i>Koeleria macrantha</i>	10

Table 49. Pochontas Service Station Remediation Project mix.

Common Name	Scientific Name
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
Green Needle Grass	<i>Nassella viridula</i>
Western Wheatgrass	<i>Pascopyrum smithii</i>
Canada Bluegrass	<i>Poa compressa</i>

Table 50. Jasper Park Lodge Landfill Reclamation Project mix.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	25
High Wildrye	<i>Elymus violaceus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Alpine Bluegrass	<i>Poa alpina</i>	10
Mountain Brome	<i>Bromus marginatus</i>	10
Tufted Hairgrass	<i>Deschampsia caespitosa</i>	5

Table 51. Marmot Eagle Ridge Tower mix.

Common Name	Scientific Name	PLS%	PLS/m ²	kg/ha	Wt %
Nortran Tufted Hairgrass	<i>Deschampsia caespitosa</i>	72	2,500	3.2	12.6
Sheep Fescue	<i>Festuca ovina</i>	85	667	5.2	20.9
Rocky Mountain Fescue	<i>Festuca saximontana</i>	68	533	4.6	18.4
Mountaineer High Wildrye	<i>Elymus violaceus</i>	91	320	10.0	39.8
AEC Blueridge Alpine Bluegrass	<i>Poa alpina</i>	87	300	1.0	4.2
AEC Glacier Alpine Bluegrass	<i>Poa alpina</i>	87	300	1.0	4.2

Jasper Airstrip Decommissioning

In their rehabilitation plan for the proposed Jasper airstrip decommissioning project Highwood Environmental Management (2005a) recommended using two seed mixes – one for general use and one for spot seeding in areas with agronomic species.

Table 52. Jasper Airstrip – general mix.

Common Name	Scientific Name
Common Yarrow	<i>Achillea millefolium</i>
Small-leaved Everlasting	<i>Antennaria parvifolia</i>
Pasture Sagewort	<i>Artemisia frigida</i>
Ascending Purple Milk-vetch	<i>Astragalus laxmannii var. robustior</i>
Plains Reed Grass	<i>Calamagrostis montanensis</i>
Purple Reed Grass	<i>Calamagrostis purpurascens</i>
Harebell	<i>Campanula rotundifolia</i>

Common Name	Scientific Name
Low Sedge	<i>Carex duriuscula</i>
Hay Sedge	<i>Carex siccata</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Smooth Fleabane	<i>Erigeron glabellus</i>
Gaillardia	<i>Gaillardia aristata</i>
June Grass	<i>Koeleria macrantha</i>
Wild Blue Flax	<i>Linum lewisi</i>
Late Yellow Locoweed	<i>Oxytropis monticola</i>
Early Yellow Locoweed	<i>Oxytropis sericea</i>
Hooker's Cinquefoil	<i>Potentilla hookeriana</i>

Table 53. Jasper Airstrip – spot seeding mix.

Common Name	Scientific Name
Plains Reed Grass	<i>Calamagrostis montanaensis</i>
Purple Reed Grass	<i>Calamagrostis purpurascens</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
June Grass	<i>Koeleria macrantha</i>

2.5.3.4 Jasper National Park Research Mixes

Wishart - Montane Grassland Pipeline Revegetation Research

Wishart (1983) assessed the performance of three grass/forb/shrub seed mixes on the Trans Mountain Pipeline through Jasper National Park.

Table 54. Wishart montane pipeline mix 1.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	30
Hairy Wild Rye	<i>Leymus innovatus</i>	30
Alpine Bluegrass #1	<i>Poa alpina</i>	20
Northern Hedysarum	<i>Hedysarum boreale</i>	10
Creeping Juniper	<i>Juniperus horizontalis</i>	10

Table 55. Wishart montane pipeline mix 2.

Common Name	Scientific Name	Wt %
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	30
June Grass	<i>Koeleria macrantha</i>	20
Kentucky Bluegrass	<i>Poa pratensis</i>	20
Redtop	<i>Agrostis stolonifera</i>	10
Vetch	<i>Astragalus spp.</i>	10
Prickly Rose	<i>Rosa acicularis</i>	10

Table 56. Wishart montane pipeline mix 3.

Common Name	Scientific Name	Wt %
Wheatgrass	<i>Agropyron spp.</i>	30
Rocky Mountain Fescue	<i>Festuca saximontana</i>	30
Alpine Bluegrass #2	<i>Poa alpina</i>	20
Alpine Hedysarum	<i>Hedysarum alpinum</i>	10
Silverberry	<i>Elaeagnus commutata</i>	10

Naeth and Wilkinson – Fire Fuel Break Management

Performance of seeded native grasses relative to non-native species in fire fuel breaks in aspen parkland in Elk Island National Park and in montane forest in Jasper National Park was assessed. The Jasper sites were seeded in May 2004 at 25 kg/ha.

Table 57. Naeth and Wilkinson Jasper fire break mix.

Common Name	Scientific Name	Wt %
Hairy Wild Rye	<i>Leymus innovatus</i>	25
Fringed Brome	<i>Bromus ciliatus</i>	25
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Alpine Blue Grass	<i>Poa alpina</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10

2.5.4 Waterton Lakes National Park

Waterton Park staff tend to make a mix based on where seeding will occur and adjust for what is available so mixes change year to year and site to site. They also tend to also augment with plug plantings. Three recent projects were provided by Robert Sissons (Parks Canada, pers. comm.) as examples of seed mixes used in the Park.

2.5.4.1 Waterton Lakes Operational Mixes

Table 58. Waterton Lakes Redrock Parkway restoration mix – open fescue grassland.

Common Name	Scientific Name	Wt %
Foothills Rough Fescue	<i>Festuca campestris</i>	40
Bluebunch Fescue	<i>Festuca idahoensis</i>	20
Parry Oatgrass	<i>Danthonia parryi</i>	10
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	10
June Grass	<i>Koeleria macrantha</i>	7
Alkaline Bluegrass	<i>Poa juncifolia ssp. juncifolia</i>	3
Rocky Mountain Fescue	<i>Festuca saximontana</i>	3
Sticky Purple Geranium	<i>Geranium viscosissimum</i>	3
Early Yellow Locoweed	<i>Oxytropis sericea</i>	3
Yarrow	<i>Achillea millefolium</i>	1

Seed at 40 kg/ha.

Table 59. Waterton Lakes Redrock Parkway restoration mix – aspen / shrub community dry open stands.

Common Name	Scientific Name	Wt %
Smooth Wild Rye	<i>Elymus glaucus</i>	25
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	20
Foothills Rough Fescue	<i>Festuca campestris</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	15
Mountain Brome	<i>Bromus marginatus</i>	10
Sticky Purple Geranium	<i>Geranium viscosissimum</i>	2
Northern Bedstraw	<i>Galium boreale</i>	2
Western Meadow-rue	<i>Thalictrum occidentale</i>	2
American Vetch	<i>Vicia americana</i>	2
Wild Strawberry	<i>Fragaria virginiana</i>	2

Seed at 40 kg/ha.

Table 60. Waterton Lakes Redrock Parkway restoration mix – aspen / shrub community wet or closed stands.

Common Name	Scientific Name	Wt %
Bluejoint	<i>Calamagrostis canadensis</i>	40
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	40
Mountain Brome	<i>Bromus marginatus</i>	10
Sticky Purple Geranium	<i>Geranium viscosissimum</i>	2
Northern Bedstraw	<i>Galium boreale</i>	2
Meadow Rue	<i>Thalictrum occidentale</i>	2
American Vetch	<i>Vicia americana</i>	2
Wild Strawberry	<i>Fragaria virginiana</i>	2

Seed at 40 kg/ha.

Table 61. Waterton Lakes Bar U Ranch National Heritage Site restoration mix.

Common Name	Scientific Name	PLS Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	40
Bluebunch Fescue	<i>Festuca idahoensis</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> or <i>Elymus trachycaulus ssp. subsecundus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Alkaline Bluegrass	<i>Poa juncifolia ssp. juncifolia</i>	5

Table 62. Waterton Lakes Akamina Parkway mix.

Common Name	Scientific Name	Wt %
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	25
Pine Reed Grass	<i>Calamagrostis rubescens</i>	25
Bluejoint	<i>Calamagrostis montanensis</i>	20
June Grass	<i>Koeleria macrantha</i>	10
Smooth Wildrye	<i>Elymus glaucus</i>	10
Geyer's Sedge	<i>Carex geyeri</i>	10

2.5.4.2 Waterton Lakes National Park Research Mixes

Stover Wild-collected Seed Mix

Stover (2013) investigated the effectiveness of broadcast-seeding a wild-collected native species mix at three disturbed foothills fescue grassland sites in Waterton Lakes National Park undergoing restoration in 2011.

Table 63. Stover Waterton Lakes National Park wild-collected seed mix.

Common Name	Scientific Name	Seeding Rate (kg/ha)
Mountain Brome	<i>Bromus marginatus</i>	8.508
Bluebunch Fescue	<i>Festuca idahoensis</i>	1.4244
Parry Oatgrass	<i>Danthonia parryi</i>	1.212
Slender Wheatgrass	<i>Elymus trachycaulus</i>	0.84
Gaillardia	<i>Gaillardia aristata</i>	0.6352
Silky Lupine	<i>Lupinus sericeus</i>	0.52
Mountain Rough Fescue	<i>Festuca campestris</i>	0.4436
Columbia Needle Grass	<i>Achnatherum nelsonii ssp. dorei</i>	0.2912
Yellow Beardtongue	<i>Penstemon confertus</i>	0.2168
Subalpine Umbrellaplant	<i>Eriogonum umbellatum</i>	0.2
Cinquefoil	<i>Potentilla spp.</i>	0.182
Graceful Cinquefoil	<i>Potentilla gracilis</i>	0.12
Cut-leaved Anemone	<i>Anemone multifida</i>	0.1032
Smooth Blue Beardtongue	<i>Penstemon nitidus</i>	0.102
June Grass	<i>Koeleria macrantha</i>	0.0872
Wild Blue Flax	<i>Linum lewisii</i>	0.0576
Vetch	<i>Hedysarum spp.</i>	0.0484
Yellow False Dandelion	<i>Agoseris glauca</i>	0.0156
Sticky Purple Geranium	<i>Geranium viscosissimum</i>	0.0132
Three-flowered Avens	<i>Geum triflorum</i>	0.0088
Northern Locoweed	<i>Oxytropis campestris</i>	0.006
Western Meadow-Rue	<i>Thalictrum occidentale</i>	0.0012

2.6 SUFFIELD MILITARY BASE

Based on the advice of the Suffield Environmental Advisory Committee (SEAC), there was to be no seeding of any kind on the Suffield Military Base unless approved by SEAC. Where seeding was required the following native mix was to be used (Bohme, 1977).

Table 64. Suffield Block native grass seed mix (1977).

Common Name	Scientific Name	Rate (lb/acre)
Slender Wheatgrass	<i>Elymus trachycaulus</i>	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Northern Wheatgrass or Thickspike Wheatgrass	<i>Elymus lanceolatus</i> <i>Elymus macrourus</i>	5

2.7 TOWN OF CANMORE

The Town of Canmore's Construction and Landscaping Standards (Town of Canmore, 2016) provides two native grass mixes and one wildflower mix that must be used (Tables 9 – 11). The Construction and Landscaping Standards also state that the following species should not be used as substitutions into native mixes because they are either non-native or there is a high risk of them being non-native even if a registered variety:

- Rocky Mountain Fescue (*Festuca saximontana* – DNA proven native varieties not available)
- Sheep's Fescue (*Festuca ovina* – not native)
- Creeping Fescue (*Festuca rubra* – not native)
- Hard Fescue (*Festuca ovina*)

Table 65. Town of Canmore mowing tolerant native grass seed mixture – slopes, natural areas and non-maintained areas.

Common Name	Scientific Name	Wt % ¹
Bluebunch Fescue	<i>Festuca idahoensis</i>	35
Alpine Blue Grass	<i>Poa alpina</i>	20
Blue Grama	<i>Bouteloua gracilis</i>	15
Western Wheatgrass and/or Northern Wheatgrass	<i>Pascopyron smithii</i> <i>Elymus lanceolatus</i>	10
June Grass	<i>Koeleria macrantha</i>	10

¹ The mix also calls for 10% Manhattan III Perennial Ryegrass (*Lolium perenne*) as a nurse crop.

Table 66. Town of Canmore non-mowed native grass seed mixture – slopes, natural areas and non-maintained areas.

Common Name	Scientific Name	Wt % ¹
Bluebunch Fescue	<i>Festuca idahoensis</i>	25
Mountain Rough Fescue	<i>Festuca campestris</i>	15
June Grass	<i>Koeleria macrantha</i>	15
Alpine Blue Grass	<i>Poa alpina</i>	15
Western Wheatgrass and/or Northern Wheatgrass	<i>Pascopyron smithii</i> <i>Elymus lanceolatus</i>	10

¹ The mix also calls for

10% Manhattan III Perennial Ryegrass (*Lolium perenne*) as a nurse crop; and,

10% Optional species – use one or a number of the following species depending on site characteristics (Alkali Bluegrass – *Poa secunda* ssp. *juncifolia*, Parry’s Oat Grass – *Danthonia parryii*, Western Porcupine Grass – *Hesperostipa curtiseta*, Mountain Brome – *Bromus marginatus*, Mountain Timothy – *Phleum commutatum*, or Tufted Hair Grass – *Deschampsia caespitosa*).

Table 67. Town of Canmore wild flower mix – slopes, natural areas and non-maintained areas.

Common Name	Scientific Name	Wt %
Yarrow	<i>Achillea millefolium</i>	25
Blue flax	<i>Linum lewisii</i>	25
Gaillardia	<i>Gaillardia aristata</i>	25
Canada Milk Vetch	<i>Astragalus canadensis</i>	25



3.0 RECOMMENDED SEED MIXES

Many government agencies and other organizations recognize the value of using native species in reclamation, restoration, naturalization and remediation projects and strongly encourage their use (Alberta Energy Regulator, 2003, 2014; Alberta Environment and Parks, 2016a; EDA Collaborative Inc., 1994; Municipal District of Bighorn, nd; Special Areas Board, nd).

3.1 ALBERTA ENVIRONMENT AND PARKS

Alberta Environment and Parks staff have been recommending this mix (developed by InnoTech Alberta) for loam to silty loam soils in the greater Wainwright area (Patrick Porter, Alberta Environment and Parks, pers. comm.).

Table 68. AEP loam to silty soils native seed mix for Northern Fescue Grasslands.

Common Name	Scientific Name	PLS %
Plains Rough Fescue	<i>Festuca hallii</i>	40
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	7
June Grass	<i>Koeleria macrantha</i>	6
Northern Wheatgrass	<i>Elymus lanceolatus</i>	6
Rocky Mountain Fescue	<i>Festuca saximontana</i>	6
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	6
Green Needle Grass	<i>Nassella viridula</i>	5
Porter's Brome	<i>Bromus porteri</i>	5
Canada Wild Rye	<i>Elymus canadensis</i>	4

*NOTE: Other species can be added/substituted when available; reduce Plains Rough Fescue to 30-35% PLS and replace with:

- *Anthoxanthum hirtum* - Sweet Grass
- *Danthonia parryi* - Parry Oatgrass
- *Avenula hookeri* - Hooker's Oatgrass
- *Danthonia intermedia* - Intermediate Oatgrass
- *Agrostis scabra* - Rough Hair Grass
- *Deschampsia caespitosa* - Tufted Hairgrass
- *Puccinellia nuttalliana* - Nuttall's Salt-meadow Grass

3.2 DUCKS UNLIMITED CANADA

Ducks Unlimited Canada provides a mixed grass prairie mix suitable for Saskatchewan and southeastern Alberta (Garbuch et al., nd).

Table 69. Ducks Unlimited Canada loamy range site, simple pasture mix.

Common Name	Scientific Name	Seeds/lb.	PLS lb./acre
Western Wheatgrass	<i>Pascopyrum smithii</i>	110,000	2.0
Northern Wheatgrass	<i>Elymus lanceolatus</i>	154,000	1.0
Green Needle Grass	<i>Nassella viridula</i>	181,000	2.0
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	138,000	1.3
June Grass	<i>Koeleria macrantha</i>	2,000,000	0.1
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	135,000	0.3
Purple Prairie Clover	<i>Dalea purpurea</i>	300,000	0.1
		TOTAL	6.8

3.3 INNOTECH ALBERTA

Staff at InnoTech Alberta (and its predecessors Alberta Innovates – Technology Futures and Alberta Research Council) are occasionally requested for seed mix recommendations from government and industry and/or receive funding to develop seed mix recommendations as part of a research project. The following mixes have been recommended for a variety of uses.

3.3.1 Alberta Innovates – Technology Futures Recommended Delusion Lakes Wellsite Mix

In 2012 Alberta Innovates – Technology Futures recommended a seed mix for wellsites in the Delusion Lakes area based on an Alberta Sustainable Resource Development grazing land benchmark site (Woosaree and McKenzie, 2012).

Table 70. AITF Delusion Lakes wellsite mix.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	24
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	20
Sand Grass	<i>Calamovilfa longifolia</i>	15
Green Needle Grass	<i>Nasella viridula</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Porter’s Brome	<i>Bromus porteri</i>	6
June Grass	<i>Koeleria macrantha</i>	5

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	5
Blue Grama	<i>Bouteloua gracilis</i>	5

3.3.2 Alberta Innovates – Technology Futures Regional Seed Mixes

In 2014 Alberta Innovates – Technology Futures (AITF) prepared recommendations for revegetation practices to be applied in the natural regions and sub-regions of Alberta. The recommendations included operating practices and seed mixes, as well as alternate species to be used in the mixes as required.

Table 71. AITF seral *Festuca hallii* grassland mix.

Common Name	Scientific Name	PLS %
Plains Rough Fescue	<i>Festuca hallii</i>	30
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	13
Hooker’s Oat Grass	<i>Avenula hookeri</i>	11
June Grass	<i>Koeleria macrantha</i>	7
Rocky Mountain Fescue	<i>Festuca saximontana</i>	7
Green Needle Grass	<i>Nassella viridula</i>	6
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	3
Wild Vetch	<i>Vicia americana</i>	3

Table 72. AITF sub-seral *Festuca hallii* grassland mix.

Common Name	Scientific Name	PLS %
Plains Rough Fescue	<i>Festuca hallii</i>	15
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	15
Green Needle Grass	<i>Nassella viridula</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Hooker’s Oat Grass	<i>Avenula hookeri</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	8
June Grass	<i>Koeleria macrantha</i>	7
Rocky Mountain Fescue	<i>Festuca saximontana</i>	7

Common Name	Scientific Name	PLS %
Canada Milk Vetch	<i>Astragalus canadensis</i>	4
Wild Vetch	<i>Vicia americana</i>	4

Table 73. AITF northern fescue grasslands loam soils mix.

Common Name	Scientific Name	PLS %
Plains Rough Fescue	<i>Festuca hallii</i>	40
Porter's Brome	<i>Bromus porteri</i>	10
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	7
Northern Wheatgrass	<i>Elymus lanceolatus</i>	6
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	6
Rocky Mountain Fescue	<i>Festuca saximontana</i>	6
June Grass	<i>Koeleria macrantha</i>	6
Green Needle Grass	<i>Nassella viridula</i>	5
Canada Wild Rye	<i>Elymus canadensis</i>	4

Table 74. AITF mixed grass seed mix.

Common Name	Scientific Name	PLS %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Plains Reed Grass	<i>Calamagrostis montanensis</i>	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	5
Purple Prairie Clover	<i>Dalea purpurea</i>	5
Rocky Mountain Fescue	<i>Festuca saximontana</i>	5
Wild Vetch	<i>Vicia americana</i>	5

Table 75. AITF mixed grass depressions and wetlands (including saline sites) mix.

Common Name	Scientific Name	PLS %
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Alkali Blue Grass	<i>Poa juncifolia ssp. juncifolia</i>	10
Nuttall's' Alkali Grass	<i>Puccinellia nuttalliana</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	10
Sweet Grass	<i>Anthoxanthum hirtum</i>	10
Fowl Blue Grass	<i>Poa palustris</i>	10

Table 76. AITF dry mixed grass seed mix.

Common Name	Scientific Name	PLS %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Plains Reed Grass	<i>Calamagrostis montanensis</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Wild Vetch	<i>Vicia americana</i>	10
Green Needle Grass	<i>Nassella viridula</i>	5

Table 77. AITF dry mixed grass sandy soils (south) mix.

Common Name	Scientific Name	PLS %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
Indian Rice Grass	<i>Achnatherum hymenoides</i>	20
Sand Drop Seed	<i>Sporobolus cryptandrus</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sand Reed Grass	<i>Calamovilfa longifolia</i>	10

Common Name	Scientific Name	PLS %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	5
Wild Vetch	<i>Vicia americana</i>	5

Table 78. AITF foothills fescue seed mix.

Common Name	Scientific Name	PLS %
Mountain Rough Fescue	<i>Festuca campestris</i>	54
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Green Needle Grass	<i>Nassella viridula</i>	3
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	3
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	2
Northern Wheatgrass	<i>Elymus lanceolatus</i>	2
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	2
Parry's Oat Grass	<i>Danthonia parryi</i>	2
Western Wheatgrass	<i>Pascopyrum smithii</i>	2

Table 79. AITF parkland sandy soil mix.

Common Name	Scientific Name	PLS %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	15
Indian Rice Grass	<i>Achnatherum hymenoides</i>	15
Sand Drop Seed	<i>Sporobolus cryptandrus</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sand Reed Grass	<i>Calamovilfa longifolia</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	8
June Grass	<i>Koeleria macrantha</i>	7
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	5
Wild Vetch	<i>Vicia americana</i>	5

Table 80. AITF fescue grassland north sandy soil mix.

Common Name	Scientific Name	PLS %
Plains Rough Fescue	<i>Festuca hallii</i>	20
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Porter's Brome Grass	<i>Bromus porteri</i>	5
Sand Grass	<i>Calamovilfa longifolia</i>	5
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Green Needle Grass	<i>Nassella viridula</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Blue Grama	<i>Bouteloua gracilis</i>	5

Table 81. AITF Peace River parkland seed mix.

Common Name	Scientific Name	PLS %
Western Porcupine	<i>Hesperostipa curtisetata</i>	25
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Fringed Brome Grass	<i>Bromus ciliatus</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	8
Slender Wheatgrass	<i>Elymus trachycaulus</i>	7
Northern Wheatgrass	<i>Elymus lanceolatus</i>	7
Western Wheatgrass	<i>Pascopyrum smithii</i>	7
Green Needle Grass	<i>Nassella viridula</i>	7
Blue Grama	<i>Bouteloua gracilis</i>	5
Rough Hair Grass	<i>Agrostis scabra</i>	2
June Grass	<i>Koeleria macrantha</i>	2

3.3.3 Alberta Innovates – Technology Futures Wainwright Recommended Mix

In 2016, Alberta Innovates – Technology Futures recommended the following mix for use on high traffic areas on CFB Wainwright.

Table 82. Alberta Innovates – Technology Futures Wainwright recommended mix.

Common Name	Scientific Name	Wt %
Blue Grama	<i>Bouteloua gracilis</i>	50
Rocky Mountain Fescue	<i>Festuca saximontana</i>	30
June Grass	<i>Koeleria macrantha</i>	15
Ticklegrass	<i>Agrostis scabra</i>	5

Seeding rate of 3,000 seeds/m² (a heavy rate, approximately 22 lbs/acre).

3.3.4 InnoTech Alberta Recommended Saline Seed Mix

In 2016 InnoTech Alberta recommended the use of the following mix for saline areas in eastern Alberta.

Table 83. InnoTech Alberta recommended saline seed mix.

Common Name	Scientific Name	Wt %
Nuttall’s Salt-meadow Grass	<i>Puccinellia nuttaliana</i>	25
Fowl Bluegrass	<i>Poa palustris</i>	10
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	20
Ticklegrass	<i>Agrostis scabra</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	15

3.4 RECOVERY STRATEGIES

A series of recovery strategies have been developed by multi-stakeholder groups to support the intent of the Reclamation Criteria for Grasslands and to provide guidance for reclamation practitioners, contractors, landowners and Government of Alberta regulatory authorities (Gramineae Services Ltd., 2013). The strategies are not intended to be prescriptive, but rather strive to present options and pathways to enable selection of the most appropriate recovery strategy for the type of industrial disturbance on a site specific basis. The purpose is to provide the tactical expectations of what is required to reach the outcome of restoration over time.

The provincial government has also developed strategies for minimizing surface disturbances to reduce the area requiring recovery (Alberta Environment and Parks, 2016b, c; Alberta Sustainable Resource Development, 2010).

3.4.1 Dry Mixedgrass Natural Subregion Recovery Strategy

Gramineae Services Ltd. (2013) provided a series of example seed mixes that could be used to restore dry mixedgrass sites to specific target plant communities.

Table 84. Dry Mixedgrass recovery strategy seed mix for loamy, shallow to gravel and gravel range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	40
Blue Grama	<i>Bouteloua gracilis</i>	25
June Grass	<i>Koeleria macrantha</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 85. Dry Mixedgrass recovery strategy seed mix for blowout and clayey range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	16
Blue Grama	<i>Bouteloua gracilis</i>	12
Sandberg Bluegrass	<i>Poa secunda</i>	12
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10

Table 86. Dry Mixedgrass recovery strategy seed mix for sands, sandy and choppy sandhill range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	35
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	12
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Sand Grass	<i>Calamovilfa longifolia</i>	8

Table 87. Dry Mixedgrass recovery strategy seed mix for DMGA13 western porcupine grass – needle-and-thread – sand grass sites.

Common Name	Scientific Name	PLS Wt %
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	30
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	25
June Grass	<i>Koeleria macrantha</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	10
Sand Grass	<i>Calamovilfa longifolia</i>	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	5

3.4.2 Mixed Grass Natural Subregion Recovery Strategy

Neville et al. (2014) provided a series of example seed mixes that could be used to restore mixedgrass sites to specific target plant communities.

Table 88. Mixedgrass recovery strategy seed mix for Cypress upland on loamy, shallow to gravel, gravel and thin breaks range sites.

Common Name	Scientific Name	PLS Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	50
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	30
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5

Table 89. Mixedgrass recovery strategy seed mix for Cypress Upland: low elevation dry loamy and blowout range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	30
Plains Rough Fescue	<i>Festuca hallii</i>	25
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Sandberg Bluegrass	<i>Poa secunda</i>	10

Table 90. Mixedgrass recovery strategy seed mix for Cypress Upland: saline lowland range sites.

Common Name	Scientific Name	PLS Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Salt Grass	<i>Distichlis spicata</i>	25
Sandberg Bluegrass	<i>Poa secunda</i>	20
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>	15
June Grass	<i>Koeleria macrantha</i>	10

Table 91. Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: overflow range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	30
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
June Grass	<i>Koeleria macrantha</i>	10

Table 92. Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: loamy and thin breaks range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	30
Sandberg Bluegrass	<i>Poa secunda</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10

Table 93. Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: clayey and blowout range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	30
Blue Grama	<i>Bouteloua gracilis</i>	15

Bluebunch Fescue	<i>Festuca idahoensis</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sandberg Bluegrass	<i>Poa secunda</i>	10
June Grass	<i>Koeleria macrantha</i>	10

Table 94. Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: sandy range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	50
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sand Grass	<i>Calamovilfa longifolia</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Sandberg Bluegrass	<i>Poa secunda</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10

Table 95. Mixedgrass recovery strategy seed mix for Sweetgrass and Milk River Upland: saline lowland range sites.

Common Name	Scientific Name	PLS Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Salt Grass	<i>Distichlis spicata</i>	25
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
June Grass	<i>Koeleria macrantha</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15

Table 96. Mixedgrass recovery strategy seed mix for Lethbridge, Vulcan Plain: loamy range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	40
Blue Grama	<i>Bouteloua gracilis</i>	25
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	5

Common Name	Scientific Name	PLS Wt %
Sandberg Bluegrass	<i>Poa secunda</i>	5

Table 97. Mixedgrass recovery strategy seed mix for Lethbridge, Vulcan Plain: sandy and sands range sites.

Common Name	Scientific Name	PLS Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	35
Blue Grama	<i>Bouteloua gracilis</i>	30
June Grass	<i>Koeleria macrantha</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sand Grass	<i>Calamovilfa longifolia</i>	5

Table 98. Mixedgrass recovery strategy seed mix for Lethbridge, Vulcan Plain: saline lowland range sites.

Common Name	Scientific Name	PLS Wt %
Salt Grass	<i>Distichlis spicata</i>	40
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Fowl Bluegrass	<i>Poa palustris</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20

Table 99. Mixedgrass recovery strategy seed mix for Majorville Upland: loamy ecological range sites.

Common Name	Scientific Name	PLS Wt %
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	45
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5

3.4.3 Northern Fescue Natural Subregion Recovery Strategy

Lancaster et al. (2017a) provided four example seed mixes that could be used to restore northern fescue sites to specific target plant communities.

Table 100. Northern Fescue recovery strategy seed mix for plains rough fescue – sedge plant communities.

Common Name	Scientific Name	PLS Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	50
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	35
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5

Table 101. Northern Fescue recovery strategy seed mix for plains rough fescue – western porcupine grass communities.

Common Name	Scientific Name	PLS Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	38
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	30
June Grass	<i>Koeleria macrantha</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Canada Wild Rye	<i>Elymus canadensis</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	2

Table 102. Northern Fescue recovery strategy seed mix for blunt sedge – western porcupine grass communities.

Common Name	Scientific Name	PLS Wt %
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	35
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	25
Plains Rough Fescue	<i>Festuca hallii</i>	20
Blue Grama	<i>Bouteloua gracilis</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5

Table 103. Northern Fescue recovery strategy seed mix for sedge - western wheatgrass communities.

Common Name	Scientific Name	PLS Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	50
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	30
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5

3.4.4 Foothills Fescue, Foothills Parkland and Montane Natural Subregion Recovery Strategy

Lancaster et al. (2017b) provided a series of example seed mixes that could be used to restore Foothills Fescue, Foothills Parkland and Montane sites to specific target plant communities.

Table 104. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills fescue loamy 1; thin breaks 1 ecological range sites.

Common Name	Scientific Name	PLS Wt %
Parry's Oat Grass	<i>Danthonia parryi</i>	40
Mountain Rough Fescue	<i>Festuca campestris</i>	35
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5

Table 105. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills fescue loamy 2; shallow to gravel; gravel ecological range sites.

Common Name	Scientific Name	PLS Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	35
Bluebunch Fescue	<i>Festuca idahoensis</i>	15
Parry's Oat Grass	<i>Danthonia parryi</i>	20
June Grass	<i>Koeleria macrantha</i>	5
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	10

Common Name	Scientific Name	PLS Wt %
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	5

Table 106. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills fescue loamy 3; loamy 4; limy 1; clay ecological sites.

Common Name	Scientific Name	PLS Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Mountain Rough Fescue	<i>Festuca campestris</i>	30
Green Needle Grass	<i>Nassella viridula</i>	5
June Grass	<i>Koeleria macrantha</i>	10
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	5
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Table 107. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills parkland rich loamy ecological sites – Mountain Rough Fescue – Parry oatgrass communities.

Common Name	Scientific Name	PLS Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	40
Parry Oatgrass	<i>Danthonia parryi</i>	20
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 108. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for foothills parkland rich loamy ecological sites – Mountain Rough Fescue – Parry oatgrass communities.

Common Name	Scientific Name	PLS Wt %
Parry Oatgrass	<i>Danthonia parryi</i>	40
Mountain Rough Fescue	<i>Festuca campestris</i>	20

Common Name	Scientific Name	PLS Wt %
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 109. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane subxeric/medium bluebunch wheatgrass ecological sites.

Common Name	Scientific Name	PLS Wt %
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	30
June Grass	<i>Koeleria macrantha</i>	20
Mountain Rough Fescue	<i>Festuca campestris</i>	20
Fringed Brome	<i>Bromus ciliatus</i>	10
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10

Table 110. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane (c5) Parry oat grass – foothills fescue – Bluebunch Fescue communities.

Common Name	Scientific Name	PLS Wt %
Parry Oat Grass	<i>Danthonia parryi</i>	40
Mountain Rough Fescue	<i>Festuca campestris</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	10

Table 111. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane foothills fescue – intermediate oat grass communities.

Common Name	Scientific Name	PLS Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	50
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	10

Common Name	Scientific Name	PLS Wt %
Intermediate Oat Grass	<i>Danthonia intermedia</i>	5
Parry Oat Grass	<i>Danthonia parryi</i>	5
June Grass	<i>Koeleria macrantha</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 112. Foothills Fescue, Foothills Parkland and Montane recovery strategy seed mix for montane (cc1) foothills fescue – Bluebunch Fescue – Parry oat grass communities.

Common Name	Scientific Name	PLS Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	30
Parry Oat Grass	<i>Danthonia parryi</i>	30
Bluebunch Fescue	<i>Festuca idahoensis</i>	15
June Grass	<i>Koeleria macrantha</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus var. subsecundus</i>	10

3.5 SPECIAL AREAS BOARD

The Special Areas Board had a series of five recommended mixes for use in various soil types (Special Areas Board, 2009).

Table 113. Special Areas Board dry loamy soils mix.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
June Grass	<i>Koeleria macrantha</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Recommended seeding rate 10 lb/acre if drilled, 15 lb/acre if broadcast.

Table 114. Special Areas Board moist loamy soils mix.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20

Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Plains Rough Fescue	<i>Festuca hallii</i>	10
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	5

Recommended seeding rate 10 lb/acre if drilled, 15 lb/acre if broadcast.

Table 115. Special Areas Board sandy soils mix.

Common Name	Scientific Name	Wt %
Indian Rice Grass	<i>Achnatherum hymenoides</i>	25
Canada Wild Rye Grass	<i>Elymus canadensis</i>	20
Prairie Sand Reed	<i>Calamovilfa longifolia</i>	15
Sand Dropseed	<i>Sporobolus cryptandrus</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Recommended seeding rate 10 lb/acre if drilled, 15 lb/acre if broadcast.

Table 116. Special Areas Board solonetzic clay soils mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	35
June Grass	<i>Koeleria macrantha</i>	20
Blue Grama	<i>Bouteloua gracilis</i>	20
Green Needle Grass	<i>Nassella viridula</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Needle-and-Thread	<i>Hesperostipa comata</i>	5

Recommended seeding rate 10 lb/acre if drilled, 15 lb/acre if broadcast.

Table 117. Special Areas Board saline soils mix.

Common Name	Scientific Name	Wt %
Western wheatgrass	<i>Pascopyrum smithii</i>	25
Slender wheatgrass	<i>Elymus trachycaulus</i>	25
Alkali grass	<i>Puccinellia distans</i>	25
Tufted hair grass	<i>Deschampsia caespitosa</i>	25

Recommended seeding rate 10 lb/acre if drilled, 15 lb/acre if broadcast.

3.6 THE CITY OF CALGARY

The City of Calgary (2018) developed the City of Calgary Seed Mixes document to “provide detailed information and recommendations to inform restoration plans as per the *Habitat Restoration Project Framework* (The City of Calgary Parks, 2014) and provide necessary information and factors to consider during the design of the seed mix portion of the plan”. Thirty-eight example seed mixes that have shown to be successful in the Calgary area for a range of urban environment habitat types are provided (users are encouraged to read the habitat-type descriptions applicable to each mix in the source document).

Table 118. City of Calgary open riparian forest seed mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Bluebunch Fescue	<i>Festuca idahoensis</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10
Rough Hair Grass	<i>Agrostis scabra</i>	5
Blue Flax	<i>Linum lewisii</i>	3.75
Purple Prairie Clover	<i>Dalea purpurea</i>	3.75

Table 119. City of Calgary open forest seed mix.

Common Name	Scientific Name	Wt %
Mountain Brome	<i>Bromus marginatus</i>	20
Canada Wild Rye	<i>Elymus canadensis</i>	18
Sand Grass	<i>Calamovilfa longifolia</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	8

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	8
Canada Milkvetch	<i>Astragalus canadensis</i>	3
Blue Flax	<i>Linum lewisii</i>	2
Canada Goldenrod	<i>Solidago altissima / Solidago lepida</i>	2
Purple Prairie Clover	<i>Dalea purpurea</i>	1
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>	trace
Cream-Coloured Vetchling	<i>Lathyrus ochroleucus</i>	trace

Table 120. City of Calgary forest edge seed mix for sites containing remnant fescue stands.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	36
Green Needle Grass	<i>Nassella viridula</i>	20
Mountain (Foothills) Rough Fescue	<i>Festuca campestris</i>	13
Blue Flax	<i>Linum lewisii</i>	13
Prairie Sagewort (Sage)	<i>Artemisia ludoviciana</i>	9
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	4

Table 121. City of Calgary upland open forest seed mix.

Common Name	Scientific Name	Wt %
Mountain Brome	<i>Bromus marginatus</i>	16
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	16
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Green Needle Grass	<i>Nassella viridula</i>	8
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Canada Milkvetch	<i>Astragalus canadensis</i>	3
Purple Prairie Clover	<i>Dalea purpurea</i>	3

Common Name	Scientific Name	Wt %
Canada Goldenrod / Low Goldenrod (Mixed)	<i>Solidago spp.</i>	2
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>	1
Blue Flax	<i>Linum lewisii</i>	1

Table 122. City of Calgary open forest grass seed mix – high usage areas.

Common Name	Scientific Name	Wt %
Canada Wild Rye	<i>Elymus canadensis</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Fringed Brome	<i>Bromus ciliatus</i>	15
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
June Grass	<i>Koeleria macrantha</i>	5

Table 123. City of Calgary open forest forb seed mix – high usage areas.

Common Name	Scientific Name	Wt %
Canada Milkvetch	<i>Astragalus canadensis</i>	40
Blue Flax	<i>Linum lewisii</i>	15
Canada Goldenrod	<i>Solidago canadensis</i>	10
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	10
Smooth Aster	<i>Symphyotrichum laeve</i>	10
Wild Vetch	<i>Vicia americana</i>	8
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	7

Table 124. City of Calgary wetland peripheral low prairie zone seed mix.

Common Name	Scientific Name	Wt %
Canada Wild Rye	<i>Elymus canadensis</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10

Common Name	Scientific Name	Wt %
Rough Hair Grass	<i>Agrostis scabra</i>	7
Fowl Manna Grass	<i>Glyceria striata</i>	5
Canada Milkvetch	<i>Astragalus canadensis</i>	3
June Grass	<i>Koeleria macrantha</i>	3
Canada Goldenrod	<i>Solidago canadensis</i>	2

Table 125. City of Calgary open riparian area grass seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10
Rough Hair Grass	<i>Agrostis scabra</i>	5
June Grass	<i>Koeleria macrantha</i>	5

Table 126. City of Calgary sandy / gravelly river bank seed mix.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	40
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	25
Sand Grass	<i>Calamovilfa longifolia</i>	12
June Grass	<i>Koeleria macrantha</i>	8
Blue Flax	<i>Linum lewisii</i>	5
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	5
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	3
Smooth Aster	<i>Symphyotrichum laeve</i>	2

Table 127. City of Calgary saline wetland peripheral low prairie zone seed mix - natural.

Common Name	Scientific Name	Wt %
Salt Grass	<i>Distichlis spicata</i>	22
Rocky Mountain Fescue	<i>Festuca saximontana</i>	22

Common Name	Scientific Name	Wt %
Fowl Bluegrass	<i>Poa palustris</i>	15
Rough Hair Grass	<i>Agrostis scabra</i>	11
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
June Grass	<i>Koeleria macrantha</i>	3
Smooth Aster, Tufted White Prairie Aster, Shining Arnica, Low Goldenrod, Common Yarrow, Gaillardia, Purple Prairie Clover, Showy Locoweed	<i>Wildflowers*</i>	(5)
Alkali Grass	<i>Puccinellia nuttalliana**</i>	(10)
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus***</i>	(X)

*In this mix, the wildflower can be any native salt tolerant plants that can withstand fluctuating moisture levels, including both drought and saturation. Generally, wildflowers are added into the mix at approximately 5%. They are not included in the total here but if the decision is to include them, the other percentages by weight would be reduced proportionately. A few examples of native plant species that would be appropriate for this habitat type have been provided in the common names column. Although the list shows a few examples, it is not exhaustive of what species could be used in this situation.

**As mentioned, many of the species in this mix, especially alkali grass, are difficult to procure. Alkali grass, the *Puccinellia* species native to the Calgary area, is the most difficult to find in appropriate quantities for restoration work and as such, it is not included in the mix; however, a recommended percentage of 10 has been indicated if it is available. As with the other modifications, if a species is added, the other species can be reduced proportionately.

***This species has been intentionally left out as slender wheatgrass is tall and has the ability to shade out other species; however, it is aggressive and suitable for the habitat type and as such, may be added in at a small percentage. Also, in habitats that are prone to weed invasion, slender wheatgrass may be put in at a higher percentage to help mitigate invasive species colonization.

Table 128. City of Calgary saline wetland peripheral low prairie zone seed mix – anthropogenic.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus*</i>	15
Fowl Bluegrass	<i>Poa palustris</i>	15
Rough Hair Grass	<i>Agrostis scabra</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Salt Grass	<i>Distichlis spicata</i>	10

Common Name	Scientific Name	Wt %
Alkali Grass (May Be 'Fults' Cultivar)	<i>Puccinellia distans</i> ***	10
June Grass	<i>Koeleria macrantha</i>	5
Smooth Aster, Tufted White Prairie Aster, Shining Arnica, Low Goldenrod, Common Yarrow, Gaillardia, Purple Prairie Clover, Showy Locoweed	Wildflowers**	(5)

**Elymus trachycaulus ssp. trachycaulus* has been included in this mix as a non-natural saline peripheral low prairie zone likely has compromised ecological health. Although *Elymus trachycaulus ssp. trachycaulus* is very aggressive and may take over, it is not very long-lived (e.g., dies off after approximately 4 years). In this situation, coverage is more important than biodiversity and as such, there are no issues if slender wheatgrass dominates the site.

**Wildflowers may be native and the same species from the Saline Wetland Peripheral Low Prairie Zone Mix-Natural may be used; however, other aggressive non-native species may be preferred in this situation. Generally, the non-native wildflowers are more aggressive and are less prohibitive cost wise. Approximately 5% is recommended and if the restriction of using native plants is absent, non-native legumes would be an effective choice due to their competitiveness and soil conditioning qualities. Species such as alfalfa and sweet clover have not been recommended as they are very common in the Calgary area as weeds and likely will come in on their own.

***Although the native *Puccinellia nuttalliana* can be used, *P. distans* is much easier to procure and is commercially available as the more aggressive 'Fults' cultivar.

Table 129. City of Calgary colourful mesic grassland seed mix.

Common Name	Scientific Name	Wt %
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	14
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	14
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	14
Rocky Mountain Fescue	<i>Festuca saximontana</i>	14
Western Wheatgrass	<i>Pascopyrum smithii</i>	14
Fowl Bluegrass	<i>Poa palustris</i>	14
Rough Hair Grass	<i>Agrostis scabra</i>	8
Green Needle Grass	<i>Nassella viridula</i>	8
Canada Milkvetch	<i>Astragalus canadensis</i>	3
Purple Prairie Clover	<i>Dalea purpurea</i>	3
Blue Flax	<i>Linum lewisii</i>	3

Common Name	Scientific Name	Wt %
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>	1
White Cinquefoil	<i>Drymocallis arguta</i>	trace
Gaillardia	<i>Gaillardia aristata</i>	trace
Woolly Gromwell	<i>Lithospermum ruderales</i>	trace
Wild Bergamot	<i>Monarda fistulosa</i>	trace
Smooth Aster	<i>Symphyotrichum laeve</i>	trace

Table 130. City of Calgary aggressive native grassland seed mix.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Fowl Bluegrass	<i>Poa palustris</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Blue Flax	<i>Linum lewisii</i>	10

Table 131. City of Calgary aggressive soil building seed mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	65
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	12.5
Rocky Mountain Fescue	<i>Festuca saximontana</i>	12.5
June Grass	<i>Koeleria macrantha</i>	10

Table 132. City of Calgary aggressive seed mix for gravel and subsoil-soil building.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	75
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	12.5
Rocky Mountain Fescue	<i>Festuca saximontana</i>	12.5

Table 133. City of Calgary xeric prairie seed mix.

Common Name	Scientific Name	Wt %
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	25

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	6
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Purple Prairie Clover	<i>Dalea purpurea</i>	4
Small-Leaved Everlasting (Pussy Toes)	<i>Antennaria parvifolia</i>	3
Blue Flax	<i>Linum lewisii</i>	3
Creeping White Prairie Aster	<i>Symphyotrichum falcatum var. falcatum</i>	3
Smooth Aster	<i>Symphyotrichum laeve</i>	1

Table 134. City of Calgary coverage seed mix for silt deposition.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	53
Fowl Bluegrass	<i>Poa palustris</i>	42
Blue Flax	<i>Linum lewisii</i>	5

Table 135. City of Calgary boulevard grass cover seed mix.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	40
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Italian Ryegrass	<i>Lolium multiflorum</i>	15
AC Saltlander Green Wheatgrass	<i>Elymus hoffmannii (hybrid)</i>	10

Note: The document provides rationale for each species in this mix plus guidance on adjusting the wt% based on desired outcome and availability.

Table 136. City of Calgary early successional summer seed mix for boulevards.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	30
Blue Flax	<i>Linum lewisii</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Bird's-Foot Trefoil	<i>Lotus corniculatus</i>	10
Sheep's Fescue	<i>Festuca ovina</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Italian Ryegrass	<i>Lolium multiflorum</i>	5
Alkali Grass	<i>Puccinellia spp. (P. distans or P. nuttalliana)</i>	5

Table 137. City of Calgary boulevard seed mix for pollinators.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Blue Flax	<i>Linum lewisii</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Smooth Wildrye	<i>Elymus glaucus</i>	9
'Fults' alkali grass is generally the commercially available cultivar of <i>P. distans</i> . Eastern species is slender salt-meadow grass. Nuttall's salt-meadow grass is native Alberta species	<i>Puccinellia distans or Puccinellia nuttalliana</i>	8
Sainfoin	<i>Onobrychis viciifolia</i>	8
Aspen Sunflower	<i>Helianthella quinquenervis</i>	7
Bird's-Foot Trefoil	<i>Lotus corniculatus</i>	6
AC Saltlander Green Wheatgrass	<i>Elymus hoffmannii</i> (hybrid cultivar)	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	5
June Grass	<i>Koeleria macrantha</i>	4
Sandberg Bluegrass	<i>Poa secunda</i>	3
Safflower	<i>Carthamus tinctorius</i>	5 *

Common Name	Scientific Name	Wt %
Smooth Aster	<i>Symphyotrichum leave</i>	5**
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	
Low Goldenrod	<i>Solidago missouriensis</i>	
Gaillardia	<i>Gaillardia aristata</i>	
Common Blue-Eyed Grass	<i>Sisyrinchium montanum</i>	

Note: The document provides additional rationale for each species

* Likely not available

** Percentage as part of the total to account for limited availability of some species

Table 138. City of Calgary bioretention feature seed mix – meadow aesthetic.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Smooth (Blue) Wild Rye	<i>Elymus glaucus</i>	15
Fowl Bluegrass	<i>Poa palustris</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Rough Hair Grass	<i>Agrostis scabra</i>	5
Aspen Sunflower	<i>Helianthella quinquenervis</i>	3
Narrow-Leaved Sunflower	<i>Helianthus maximilianii</i>	3
Blue Flax	<i>Linum lewisii</i>	2
Common Yarrow	<i>Achillea millefolium</i>	2
Leafy Arnica	<i>Arnica chamissonis</i>	2
Low Goldenrod	<i>Solidago missouriensis</i>	2
Shining Arnica	<i>Arnica fulgens</i>	2
Canada Goldenrod	<i>Solidago canadensis</i>	1
Curly-Cup Gumweed	<i>Grindelia squarrosa</i>	1
Purple Prairie Clover	<i>Dalea purpurea</i>	1
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	1

Note: The document contains additional information to allow users to modify the mix based on height preferences, forb characteristics and availability.

Table 139. City of Calgary native bright seed mix.

Common Name	Scientific Name	Wt %
Blue Flax	<i>Linum lewisii</i>	25
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	25
Canada Milkvetch	<i>Astragalus canadensis</i>	16
Prairie Sagewort (Sage)	<i>Artemisia ludoviciana</i>	10
Canada Goldenrod	<i>Solidago canadensis</i>	5
Wild Vetch	<i>Vicia americana</i>	5
Cut-Leaved Anemone	<i>Anemone multifida</i>	2
Purple Prairie Clover	<i>Dalea purpurea</i>	2
White Cinquefoil	<i>Drymocallis arguta</i>	2
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>	2
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>	2
Wild Bergamot	<i>Monarda fistulosa</i>	2
Smooth Aster	<i>Symphyotrichum laeve</i>	2

Table 140. City of Calgary foothills (mountain) rough fescue grassland seed mix.

Common Name	Scientific Name	Wt %
Mountain (Foothills) Rough Fescue	<i>Festuca campestris</i>	40
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Blue Flax	<i>Linum lewisii</i>	(X) *

* Blue flax could be added to this mix to make it more aggressive but not significantly outcompete the mountain rough fescue. In this case, all of the other species should be reduced except for the mountain rough fescue.

Table 141. City of Calgary berm stabilization seed mix.

Common Name	Scientific Name	Wt %
Canada Wild Rye	<i>Elymus canadensis</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	30

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Green Needle Grass	<i>Nassella viridula</i>	(X) *

Green Needle Grass could be added in a situation that requires a very aggressive grass.

Table 142. City of Calgary xeric slope seed mix – graminoids only.

Common Name	Scientific Name	Wt %
Fringed Brome	<i>Bromus ciliatus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	10
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	8
Sand Grass	<i>Calamovilfa longifolia</i>	7
June Grass	<i>Koeleria macrantha</i>	5

Table 143. City of Calgary xeric slope seed mix – forbs only.

The forbs listed here have been grown specifically for Calgary based restoration projects and as such, can be produced at a quantity that is appropriate for parks-scale work; however, in this case percentage by weight is not listed as it will depend on availability.

Common Name	Scientific Name
Small-Leaved Everlasting (Pussy Toes)	<i>Antennaria parvifolia</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>
Northern Bedstraw	<i>Galium boreale</i>
Northern Hedysarum	<i>Hedysarum boreale</i>
Blue Flax	<i>Linum lewisii</i>
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>

Creeping White Prairie Aster	<i>Symphyotrichum falcatum</i> var. <i>falcatum</i>
Smooth Aster	<i>Symphyotrichum laeve</i>
Wild Vetch	<i>Vicia americana</i>

Table 144. City of Calgary dry slope seed mix – graminoids only.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Northern Wheatgrass	<i>Elymus lanceolatus</i>	22
Green Needle Grass	<i>Nassella viridula</i>	17
Fringed Brome	<i>Bromus ciliatus</i>	11
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	6
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5
June Grass	<i>Koeleria macrantha</i>	4
Blue Grama	<i>Bouteloua gracilis</i>	3
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	2

Table 145. City of Calgary dry slope seed mix – forbs only.

Common Name	Scientific Name	Wt %
Blue Flax	<i>Linum lewisii</i>	30
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	25
Purple Prairie Clover	<i>Dalea purpurea</i>	7
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>	7
Wild Bergamot	<i>Monarda fistulosa</i>	7
Smooth Aster	<i>Symphyotrichum laeve</i>	7
Wild Vetch	<i>Vicia americana</i>	7
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	5
Creeping White Prairie Aster	<i>Symphyotrichum falcatum</i> var. <i>falcatum</i>	5

Table 146. City of Calgary green roof forbs seed mix – thick soil profile.

Common Name	Scientific Name	Wt %
Aspen Sunflower	<i>Helianthella quinquenervis</i>	40
Blue Flax	<i>Linum lewisii</i>	25
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	10

Common Name	Scientific Name	Wt %
Cut Leaved Anemone	<i>Anemone multifida</i>	5
Purple Prairie Clover	<i>Dalea purpurea</i>	5
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>	5
Late Yellow Locoweed	<i>Oxytropis monticola</i>	5
Smooth Aster	<i>Symphyotrichum laeve</i>	5
Wild Vetch	<i>Vicia americana</i>	5
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	2
Creeping White Prairie Aster	<i>Symphyotrichum falcatum var. falcatum</i>	2
Prairie Sagewort (Sage)	<i>Artemisia ludoviciana</i>	1

Table 147. City of Calgary green roof forbs seed mix – thin inorganic medium.

Percentages are not provided – use available quantities.

Common Name	Scientific Name
Cut Leaved Anemone	<i>Anemone multifida</i>
Prairie Sagewort (Sage)	<i>Artemisia ludoviciana</i>
Harebell	<i>Campanula rotundifolia</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>
Blue Flax	<i>Linum lewisii</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Late Yellow Locoweed	<i>Oxytropis monticola</i>
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>
Creeping White Prairie Aster	<i>Symphyotrichum falcatum var. falcatum</i>
Smooth Aster	<i>Symphyotrichum laeve</i>
Wild Vetch	<i>Vicia americana</i>

Table 148. City of Calgary green roof grass seed mix – thin inorganic medium.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	50
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	35
June Grass	<i>Koeleria macrantha</i>	15

Table 149. City of Calgary xeric forbs seed mix – prairie naturalization.

Common Name	Scientific Name	Wt %
Low (Missouri) Goldenrod	<i>Solidago missouriensis</i>	58
Gaillardia (Blanket Flower)	<i>Gaillardia aristata</i>	22
Creeping White Prairie Aster	<i>Symphyotrichum falcatum</i> var. <i>falcatum</i>	11
Smooth Aster	<i>Symphyotrichum laeve</i>	9
Purple Prairie Clover	<i>Dalea purpurea</i>	(X) *
Blue Flax	<i>Linum lewisii</i>	(X) *
Wild Vetch	<i>Vicia americana</i>	(X) *

* Species added individually to site-specific areas.

Table 150. City of Calgary grass seed mix – prairie naturalization for meadow and shrub beds.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Bluebunch (Idaho) Fescue	<i>Festuca idahoensis</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Smooth (Blue) Wild Rye	<i>Elymus glaucus</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
June Grass	<i>Koeleria macrantha</i>	8
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	7

Table 151. City of Calgary mulched shrub bed naturalization seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	25
Blue Flax	<i>Linum lewisii</i>	20
Italian (Annual) Ryegrass	<i>Lolium multiflorum</i>	20
Canadian Milk Vetch	<i>Astragalus canadensis</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Purple Prairie Clover	<i>Dalea purpurea</i>	5

Common Name	Scientific Name	Wt %
Common Yarrow/Yarrow Cultivar	<i>Achillea millefolium</i>	*

* Seed or potted material.

Table 152. City of Calgary native seed mix for erosion control textiles.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
June Grass	<i>Koeleria macrantha</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Blue Flax	<i>Linum lewisii</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10

Table 153. City of Calgary fresh water riparian graminoid seed mix at or above 1:2 flood water surface elevation.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus*</i>	15
Fowl Manna Grass	<i>Glyceria striata</i>	15
Northern Reed Grass	<i>Calamagrostis stricta ssp. inexpansa**</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Wire (Baltic) Rush	<i>Juncus balticus</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10
Rough Hair Grass	<i>Agrostis scabra</i>	5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5

**Elymus trachycaulus ssp. trachycaulus* can be substituted for *Elymus trachycaulus ssp. subsecundus* to make the seed mix more aggressive. Adjustments should be made to ensure the taller *Elymus trachycaulus ssp. trachycaulus* does not out-compete the other species due to its competitive abilities and height.

**Narrow reed grass (*Calamagrostis stricta*) can be substituted for northern reed grass if northern reed grass is unavailable, although northern reed grass is more common in the Calgary area.

Table 154. City of Calgary fresh water riparian seed mix at or above 1:5 flood water surface elevation.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus*</i>	20
Rocky Mountain Fescue	<i>Festuca saximontana</i>	17
(Beardless) Bluebunch Wheatgrass	<i>Pseudoroegneria spicata ssp. inermis</i>	15
Bluebunch Fescue	<i>Festuca idahoensis</i>	12
Green Needle Grass	<i>Nassella viridula</i>	12
Indian Rice Grass	<i>Achnatherum hymenoides**</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
June Grass	<i>Koeleria macrantha</i>	6
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Purple Prairie Clover	<i>Dalea purpurea</i>	3

Sand grass can be added if desired and the area is sandy.

* *Elymus trachycaulus ssp. trachycaulus* can be substituted for *Elymus trachycaulus ssp. subsecundus* to make the seed mix more aggressive. Adjustments should be made to ensure the taller slender wheatgrass does not outcompete the other species due to its competitive abilities and taller height.

** Later successional due to hard seed coat so germination will take more than one year; difficult to handle; can be removed and other species increased proportionately; prefers colonizing sandy/silty areas; included to increase biodiversity.



4.0 OPERATIONAL SEED MIXES

The mixes in this section have been used or proposed for use in revegetation of a variety of disturbance types. They differ from the R&D mixes in Section 5 in that these are to be, or have been, deployed in an operational context rather than being tested in smaller areas.

4.1 ALBERTA CROPLAND CARBON CONVERSION PROTOCOL

McNeil (2014) listed two Dry Prairie seed mixes for use when converting cropland to native prairie for carbon credit purposes.

Table 155. Alberta Cropland Carbon Conversion Protocol simple seed mix.

Common Name	Scientific Name	Seeding Rate (PLS kg/ha)
Western Wheatgrass	<i>Pascopyrum smithii</i>	2.3
Northern Wheatgrass	<i>Elymus lanceolatus</i>	1.2
Green Needle Grass	<i>Nassella viridula</i>	2.3
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	1.5
June Grass	<i>Koeleria macrantha</i>	0.1
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	0.3
Purple Prairie Clover	<i>Dalea purpurea</i>	0.1
	TOTAL	7.9

Table 156. Alberta Cropland Carbon Conversion Protocol diverse seed mix.

Common Name	Scientific Name	Seeding Rate (PLS kg/ha)
Western Wheatgrass	<i>Pascopyrum smithii</i>	1.2
Northern Wheatgrass	<i>Elymus lanceolatus</i>	0.9
Green Needle Grass	<i>Nassella viridula</i>	1.8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	0.6
Canada Wild Rye	<i>Elymus canadensis</i>	0.1
Little Bluestem	<i>Schizachyrium scoparium</i>	1.2
Needle-and-Thread Grass	<i>Stipa comata</i>	0.9
June Grass	<i>Koeleria macrantha</i>	0.1
Blue Grama	<i>Bouteloua gracilis</i>	0.4
Sand Grass	<i>Calamovilfa longifolia</i>	0.4
Purple Prairie Clover	<i>Dalea purpurea</i>	0.2
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	0.1
Total		7.8

4.2 ALBERTA TRANSPORTATION SPRINGBANK OFF-STREAM RESERVOIR PROJECT

In their EIA for the Springbank Off-stream Reservoir Project in Rocky View County, Alberta Transportation proposed using the Alberta Transportation seed mix for Seed Mix Zone 6 – Lower Foothills as a starting point from which to develop suitable variations and allow diversification of communities in the project development area that are consistent with the end land uses (Alberta Transportation, 2017).

Table 157. Alberta Transportation Springbank Off-stream Reservoir Project seed mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	30
Smooth Wild Rye	<i>Elymus glaucus</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rough Hair Grass	<i>Agrostis scabra</i>	10
Fringed Brome ¹	<i>Bromus ciliatus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Mountain Rough Fescue	<i>Festuca campestris</i>	10

¹ Fringed brome must be coated.

4.3 ATCO HERITAGE NATIVE GRASSLAND

ATCO Gas, Fish Creek Provincial Park and Friends of Fish Creek seeded a site in the park to create a representative foothills fescue grassland (Friends of Fish Creek, 2018).

Table 158. ATCO Heritage Native Grassland mix.

Common Name	Scientific Name
Sand Grass	<i>Calamovilfa longifolia</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Plains Rough Fescue	<i>Festuca hallii</i>
Needle-and-Thread Grass	<i>Hesperostipa comata</i>
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>
June Grass	<i>Koeleria macrantha</i>

4.4 BENGA MINING LIMITED GRASSY MOUNTAIN COAL PROJECT

In their Environmental Impact Assessment (EIA), Benga Mining Limited proposed five seed mixes for their Grassy Mountain Coal Project near Crowsnest Pass (Benga Mining Limited, 2015).

Table 159. Benga Mining Limited direct placement mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	65
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	8
Ticklegrass	<i>Agrostis scabra</i>	2

Seeded at 50 kg/ha, no fertilizer.

Table 160. Benga Mining Limited grassland, open forest mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	40
Mountain Rough Fescue	<i>Festuca campestris</i>	15
Mountain Brome	<i>Bromus marginatus</i>	10
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Wild Vetch	<i>Vicia americana</i>	5
Richardson Needle Grass	<i>Achnatherum richardsonii</i>	5

Common Name	Scientific Name	Wt %
Columbia Needle Grass	<i>Achnatherum nelsonii ssp. dorei</i>	5

Seeded at 60 to 70 kg/ha.

Table 161. Benga Mining Limited closed conifer forest mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	40
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Mountain Rough Fescue	<i>Festuca campestris</i>	10
Fringed Brome	<i>Bromus ciliatus</i>	10
Wild Vetch	<i>Vicia americana</i>	5
Ticklegrass	<i>Agrostis scabra</i>	5

Seeded at 60 to 70 kg/ha.

Table 162. Benga Mining Limited mixed forest mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	40
Mountain Rough Fescue	<i>Festuca campestris</i>	10
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Fringed Brome	<i>Bromus ciliatus</i>	5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5
Ticklegrass	<i>Agrostis scabra</i>	5
Fowl Bluegrass	<i>Poa palustris</i>	5
Slough Grass	<i>Beckmannia syzigachne</i>	5
Wild Vetch	<i>Vicia americana</i>	3
American Alpine Sweetvetch	<i>Hedysarum alpinum</i>	2

Seeded at 60 to 70 kg/ha.

Table 163. Benga Mining Limited treed wetland mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	45

Common Name	Scientific Name	Wt %
Slough Grass	<i>Beckmannia syzigachne</i>	20
Fowl Bluegrass	<i>Poa palustris</i>	20
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	10
White Clover	<i>Trifolium repens</i>	5

Seeded at 60 to 70 kg/ha.

In response to a Supplemental Information Request from the provincial government, Benga Mining Limited provided revised seed mixes (Benga Mining Limited, 2018).

Table 164. Benga Mining Limited direct placement monoculture mix.

Common Name	Scientific Name	Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	60
Italian Ryegrass	<i>Lolium multiflorum</i>	40

Seeded at 15 to 35 kg/ha, no fertilizer.

Table 165. Benga Mining Limited mixed forest revised mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	40
Mountain Rough Fescue	<i>Festuca campestris</i>	10
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Fringed Brome	<i>Bromus ciliatus</i>	5
Ticklegrass	<i>Agrostis scabra</i>	5
Fowl Bluegrass	<i>Poa palustris</i>	5
Wild Vetch	<i>Vicia americana</i>	3
American Alpine Sweetvetch	<i>Hedysarum alpinum</i>	2

Seeded at 60 to 70 kg/ha.

Table 166. Benga Mining Limited treed wetland revised mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	45

Common Name	Scientific Name	Wt %
Fowl bluegrass	<i>Poa palustris</i>	25
Tufted hairgrass	<i>Deschampsia caespitosa</i>	20
Streambank wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	10

Seeded at 60 to 70 kg/ha.

4.5 BROOKS POWER PROJECT

In their EIA for the proposed Brooks Power Project, Fording Coal Limited (2002) provided a native species seed mix for areas of the mine that would not be cultivated.

Table 167. Brooks Power Project native mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
June Grass	<i>Koeleria macrantha</i>	5

4.6 COALSPUR VISTA MINE

In their Environmental Impact Assessment for the proposed Vista Coal Mine Project near Hinton, Coalspur Mines Ltd. (2012) proposed four mixes to be aerial seeded.

Table 168. Coalspur direct placement mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	65
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	8
Ticklegrass	<i>Agrostis scabra</i>	2

Seeded at 50 kg/ha.

Table 169. Coalspur forest mesic or drier mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	40
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15

Common Name	Scientific Name	Wt %
Dutch White Clover	<i>Trifolium repens</i>	8
Alpine Bluegrass	<i>Poa alpina</i>	8
Mountain Brome	<i>Bromus marginatus</i>	7
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	6
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	4
Rough Fescue	<i>Festuca campestris</i>	3
Wild Vetch	<i>Vicia americana</i>	2
Ticklegrass	<i>Agrostis scabra</i>	2

Seeded at 60 to 70 kg/ha.

Table 170. Coalspur forest subhygric or wetter mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	40
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Tufted Wheatgrass	<i>Deschampsia caespitosa</i>	8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	7
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	7
Dutch White Clover	<i>Trifolium repens</i>	6
Fowl Bluegrass	<i>Poa palustris</i>	4
Slough Grass	<i>Beckmannia syzigachne</i>	4
Canada Milkvetch	<i>Astragalus canadensis</i>	2
Ticklegrass	<i>Agrostis scabra</i>	2

Seeded at 60 to 70 kg/ha.

Table 171. Coalspur steep, watercourse sensitive mix.

Common Name	Scientific Name	Wt %
Italian Ryegrass	<i>Lolium multiflorum</i>	45
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	29
Boreal Red Fescue	<i>Festuca rubra</i>	8
Dutch White Clover	<i>Trifolium repens</i>	7

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	6
Alpine Bluegrass	<i>Poa alpina</i>	5

Seeded at 70 to 80 kg/ha.

4.7 COAL VALLEY RESOURCES INC. ROBB TREND COAL MINE

Coal Valley Resources Inc. (CVRI) identified three reclamation seed mixes in their Robb Trend Project EIA: one is a mix of native species with a strong component of agronomics; the two others reported here are the Lower Foothills Native Mix and the Wetland Mix. The mine is located near Edson.

Table 172. CVRI lower foothills native mix.

Common Name	Scientific Name	Wt %
Fringed Brome	<i>Bromus ciliatus</i>	18
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
Canada Bluegrass	<i>Poa compressa</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Hairy Wild Rye	<i>Leymus innovatus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Mountain Timothy	<i>Phleum commutatum</i>	7
Spike Trisetum	<i>Trisetum spicatum</i>	5

Seeded at 60 kg/ha

Table 173. CVRI wetland mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	20
Hairy Wild Rye	<i>Leymus innovatus</i>	15
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	10
Annual Rye Grass	<i>Lolium multiflorum</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10
Canada Bluegrass	<i>Poa compressa</i>	5

Seeded at 60 kg/ha.

4.8 ENBRIDGE LINE 3 REPLACEMENT

In addition to a non-native seed mix for non-gravelled, disturbed, upland areas within the facilities (i.e., excluding wet or saline areas), Enbridge specified a native seed mix for wet or saline non-gravelled disturbed areas (Enbridge Pipelines Inc., 2014).

Table 174. Enbridge Line 3 Seed Mix B for wet or saline non-gravelled disturbed areas.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> <i>Elymus trachycaulus ssp. subsecundus</i>	25
June Grass	<i>Koeleria macrantha</i>	20
Slough Grass	<i>Beckmannia syzigachne</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
Fowl Bluegrass	<i>Poa palustris</i>	15
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>	10

Broadcast at 12 to 14 kg/ha or drill at 10 to 12 kg/ha.

4.9 ENCANA CFB SUFFIELD

The following example seed mixes are provided in the Environmental Impact Statement report for Encana's Shallow Gas Infill Development. Each mix identifies preferred and alternate varieties and/or species.

Table 175. EnCana CFB Suffield wetland margins mix.

Common Name	Scientific Name	seeds/g	PLS	est%	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	1250	91	5	682	34	6.0	59.9	90
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	32	8	1.1	10.9	16
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	353	86	25	32	8	1.1	10.5	16
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	2022	53	12	201	24	1.9	18.7	28
Totals	N/A	4	N/A	N/A	946.8	74.2	10.0	100	150

Table 176. EnCana CFB Suffield sandy soil mix.

Common Name	Scientific Name	seeds /g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	344	92	25	16	4	0.5	8.1	51
Northern Wheatgrass	<i>Elymus lanceolatus</i>	345	92	25	12	3	0.4	6.0	38
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	30	7	2	0.3	4.8	30
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	24	6	0.8	13.1	82
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	353	86	25	16	4	0.5	8.4	53
Goshen Sand Grass	<i>Calamovilfa longifolia</i>	603	82	10	34	3	0.7	11.0	69
Green Needle Grass	<i>Nassella viridula</i>	398	88	10	40	4	1.1	18.2	114
Indian Rice Grass	<i>Achnatherum hymenoides</i>	518	86	10	50	5	1.1	17.9	112
Sheep Fescue	<i>Festuca ovina</i>	1498	88	15	67	10	0.5	8.1	51
June Grass	<i>Koeleria macrantha</i>	3300	80	15	74	11	0.3	4.5	28
Totals	N/A	10	N/A	N/A	339	52	6	100	627

Note: Choose 4 to 5 species from this list for a final mix and change combinations frequently across sites.

Table 177. EnCana CFB Suffield solonetzic soil mix.

Common Name	Scientific Name	seeds /g	PLS	est%	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	30	7	2	0.3	4.0	29.94
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	24	6	0.8	11.0	81.91

Common Name	Scientific Name	seeds /g	PLS	est%	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Adanac Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	353	86	25	16	4	0.5	7.1	52.70
Streambank Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>riparius</i>	344	92	25	68	17	2.1	28.8	214.86
Northern Wheatgrass	<i>Elymus lanceolatus</i>	345	92	25	24	6	0.8	10.1	75.61
Green Needle Grass	<i>Nassella viridula</i>	398	81	10	40	4	1.2	16.6	124.08
Sheep Fescue	<i>Festuca ovina</i>	1498	88	15	67	10	0.5	6.8	50.57
June Grass	<i>Koeleria macrantha</i>	3300	80	10	100	10	0.4	5.1	37.88
Alkali Bluegrass	<i>Poa secunda</i> ssp. <i>juncifolia</i>	2022	53	12	83	10	0.8	10.4	77.76
Totals	N/A	9	N/A	N/A	429	69	7.5	100	745.33

Note: Choose 4 to 5 species from this list for a final mix and change combinations frequently across sites.

4.10 EXPRESS PIPELINE

Express Pipeline is a 24 inch crude oil pipeline that extends from Kinder Morgan's tank farm near Hardisty, Alberta, south 434 km to cross the US border at Wildhorse, Alberta. Portions of the RoW cross native prairie in the Central Parkland, Northern Fescue, Mixedgrass and Dry Mixedgrass Natural Subregions of Alberta. Five seed mixes were developed for the project based on detailed vegetation inventories (Gramineae Services Ltd. et al., 2008; Kestrel Research Inc. and Gramineae Services Ltd., 2011).

Table 178. Express Seed Mix 1 - aspen parkland.

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Streambank Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>riparius</i>	344	92	25	28	7	0.9	5.8	124
Northern Wheatgrass	<i>Elymus lanceolatus</i>	345	97	25	27	7	0.8	5.3	113

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	25	20	5	0.9	5.9	126
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	20	5	0.7	4.4	96
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	353	86	25	28	7	0.9	6	129
Newfield Green Needle Grass	<i>Nassella viridula</i>	398	95	10	172	17	4.5	29.6	636
June Grass – Prairie Seeds	<i>Koeleria macrantha</i>	3300	90	10	200	20	0.7	4.4	94
Sheep Fescue	<i>Festuca ovina</i>	1498	88	5	120	6	0.9	5.9	127
Roes Plains Rough Fescue	<i>Festuca hallii</i>	386	77	20	150	30	5	32.8	704
Totals		9	N/A	N/A	764	104	15	100	2,149

Table 179. Express Seed Mix 2 - rough fescue - mixedgrass transition prairie.

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	344	92	25	60	15	1.9	16.3	664
Northern Wheatgrass	<i>Elymus lanceolatus</i>	345	92	25	24	6	0.8	6.5	265
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	25	24	6	1.1	9.3	377
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	20	5	0.7	5.9	239

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Adanac Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	353	86	25	28	7	0.9	7.9	323
Blight Green Needle Grass	<i>Nassella viridula</i>	398	88	10	43	4	1.2	10.4	425
Indian Rice Grass	<i>Achnatherum hymenoides</i>	518	86	10	50	5	1.1	9.7	393
Gillespie June Grass	<i>Koeleria macrantha</i>	3300	84	10	71	7	0.3	2.2	89
Roes Plains Rough Fescue	<i>Festuca hallii</i>	386	77	10	25	3	0.8	7.3	296
Petherbridge Rough Fescue	<i>Festuca hallii</i>	386	77	10	85	8	2.9	24.6	1000
Totals		10	N/A	N/A	429	66	12	100	4,069

Table 180. Express Seed Mix 3 – dry mixedgrass prairie sandy soils.

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Streambank Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>riparius</i>	344	92	25	26	6	0.8	5.4	324
Northern Wheatgrass	<i>Elymus lanceolatus</i>	345	92	25	24	6	0.8	5.1	302
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	25	24	6	1.1	7.2	431
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	16	4	0.5	3.7	218
Adanac Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	353	85	25	24	6	0.8	5.3	316
ND 95 Sand Grass	<i>Calamovilfa longifolia</i>	603	61	10	42	4	1.1	7.6	455
Goshen Sand Grass	<i>Calamovilfa longifolia</i>	603	82	10	34	3	0.7	4.6	277

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Blight Green Needle Grass	<i>Nassella viridula</i>	398	88	10	40	4	1.1	7.7	457
Indian Rice Grass	<i>Achnatherum hymenoides</i>	518	86	10	200	20	4.5	30.1	1796
Sheep Fescue	<i>Festuca ovina</i>	1498	88	5	200	10	1.5	10.2	607
Canada Bluegrass	<i>Poa compressa</i>	5555	80	2	500	10	1.1	7.5	450
June Grass – Prairie Seeds	<i>Koeleria macrantha</i>	3300	80	5	221	11	0.8	5.6	335
Totals		12	N/A	N/A	1351	91	15	100	5,968

Table 181. Express Seed Mix 4 - dry mixedgrass prairie solonetzic soils.

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	25	20	5	0.9	7.8	737
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	18	5	0.6	5.4	515
Adanac Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	353	86	25	25	6	0.8	7.1	676
Streambank Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>riparius</i>	344	92	25	61	15	1.9	16.7	1589
Northern Wheatgrass	<i>Elymus lanceolatus</i>	345	92	25	24	6	0.8	6.5	620
Green Needle Grass – MB	<i>Nassella viridula</i>	398	88	10	40	4	1.1	9.9	937
Green Needle Grass – AB	<i>Nassella viridula</i>	398	81	10	40	4	1.2	10.7	1017

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Sheep Fescue	<i>Festuca ovina</i>	1498	88	5	200	10	1.5	13.1	1244
June Grass – Prairie Seeds	<i>Koeleria macrantha</i>	3300	80	5	200	10	0.8	6.5	621
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	2022	53	5	200	10	1.9	16.1	1530
Totals		10	N/A	N/A	829	75	12	100	9486

Table 182. Express Seed Mix 5 – prairie wetlands.

Common Name	Scientific Name	seeds/g	PLS	est %	PLS/m ²	plt/m ²	kg/ha	%/wt	total kg
Western Wheatgrass	<i>Pascopyrum smithii</i>	242	92	25	48	12	2.2	14.8	129
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	353	83	25	28	7	1.0	6.6	57
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	353	86	25	28	7	0.9	6.3	55
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	1250	91	5	682	34	6.0	41.3	360
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	2022	53	5	482	24	4.5	31.0	270
Totals		5	N/A	N/A	1268	84.2	14.5	100	872

4.11 GRANDE CACHE COAL

In their 2001 Environmental Impact Assessment for the Grande Cache Coal Project, Grande Cache Coal Company (GCC, 2001) proposed initial seeding of their mountain coal mine with a grass/legume mixture that would be in place for at least three years and up to five years before it is supplemented with tree and shrub cover.

Table 183. GCC mix.

Common Name	Scientific Name	Wt %
Highlander Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25

Common Name	Scientific Name	Wt %
Mountaineer Broadglumed Wheatgrass	<i>Elymus violaceus</i>	25
PS Alfalfa	<i>Medicago sativa</i>	15
Alpine Bluegrass	<i>Poa alpina</i>	10
Alpine Fescue	<i>Festuca brachyphylla</i>	10
Sheep Fescue or Rough Fescue	<i>Festuca ovina</i> or <i>Festuca campestris</i>	10
Wild Vetch	<i>Astragalus spp.</i>	5

4.12 LUSCAR LTD. SHEERNESS MINE

In the “current state of knowledge on native species use” section in the Brooks Power Project EIA mentioned above the authors noted that the following seed mixes were recommended for use in Luscar Ltd.’s Sheerness Mine near Hanna (Luscar Ltd., 1996).

Table 184. Sheerness Mine sandy soil mix.

Common Name	Scientific Name	Wt %
Pubescent Wheatgrass	<i>Thinopyrum intermedium</i>	50
Sand Grass	<i>Calamovilfa longifolia</i>	15
Indian Rice Grass	<i>Achnatherum hymenoides</i>	15
Sand Dropseed	<i>Sporobolus cryptandrus</i>	15
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	15

Table 185. Sheerness Mine loamy soil mix.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Tall Fescue	<i>Lolium arundinaceum</i>	10

Table 186. Sheerness Mine solonetzic soil mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	60

Common Name	Scientific Name	Wt %
Blue Grama or June Grass	<i>Bouteloua gracilis</i> or <i>Koeleria macrantha</i>	30
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 187. Sheerness Mine saline soil mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus</i>	25
Alkali Grass	<i>Puccinellia distans</i>	25
Awnless Wildrye	<i>Elymus curvatus</i>	25

4.13 MEG ENERGY CORP. - MAY RIVER IN-SITU PROJECT

In their 2017 Environmental Impact Assessment for the proposed May River in-situ project, MEG Energy provided the following native seed mix for use on soil stockpiles and bare areas (MEG Energy Corp., 2017).

Table 188. MEG Energy Corp. native seed mix suitable for soil stockpiles and bare areas.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Agropyron trachycaulum ssp. subsecundus</i>	25
Porter's Brome or Fringed Brome	<i>Bromus porteri</i> or <i>Bromus ciliatus</i>	25
Canada Wild Rye	<i>Elymus canadensis</i>	20
Tufted Hair grass	<i>Deschampsia caespitosa</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Rough Hair Grass	<i>Agrostis scabra</i>	5

4.14 MANYBERRIES GRASSLAND RESTORATION

In 2008 MULTISAR, a project managed by the Alberta Conservation Association, Alberta Environment and Sustainable Resource Development, and the Prairie Conservation Forum, collaborated with a private landowner to restore 57 ha of native grasslands near Manyberries, using a seed mixture matching the local native plant community (Downey et al., 2013).

Table 189. Manyberries grassland restoration mix.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	27
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Blue Grama	<i>Bouteloua gracilis</i>	20
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	17
June Grass	<i>Koeleria macrantha</i>	16

4.15 NORTHERN FESCUE PIPELINE RECLAMATION

Rangeland health and plant community characteristics were assessed on pipelines 3 and 22 years after reclamation near Oyen and Neutral Hills (Alta Rangeland Services Ltd. reported in Lancaster et al., 2014).

Table 190. Northern Fescue pipeline 3-year reclamation mix 1.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	31
Green Needle Grass	<i>Nassella viridula</i>	27
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	26
Northern Wheatgrass	<i>Elymus lanceolatus</i>	11
June Grass	<i>Koeleria macrantha</i>	5

Table 191. Northern Fescue pipeline 3-year reclamation mix 2.

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	30.5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Plains Rough Fescue	<i>Festuca hallii</i>	10.5
Western Wheatgrass	<i>Pascopyrum smithii</i>	10.5
June Grass	<i>Koeleria macrantha</i>	4.5
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	4

Table 192. Northern Fescue pipeline 3-year reclamation mix 3.

Common Name	Scientific Name	Wt %
Western Wheat Grass	<i>Pascopyrum smithii</i>	20

Common Name	Scientific Name	Wt %
Slender Wheat Grass	<i>Elymus trachycaulus</i>	20
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	10
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	10
Sweet Grass	<i>Anthoxanthum hirtum</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10

Table 193. Northern Fescue pipeline 22-year reclamation mix.

Common Name	Scientific Name	Wt %
Sodar Streambank Wheatgrass	<i>Elymus lanceolatus ssp. psammophilus</i>	35
Durar Hard Fescue	<i>Festuca trachyphylla</i>	20
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Orbit Tall Wheatgrass	<i>Thinopyrum elongatum</i>	15
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5

4.16 PEACE RIVER REMOTE SUMP

A remote sump northeast of Peace River associated with a wellsite in the northwest Boreal region was seeded in 2010 with a native grass seed mix and later deep ripped and planted with trees (Amanda Schoonmaker, NAIT Centre for Boreal Research, pers. comm).

Table 194. Peace River remote sump reclamation grass mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	30
Canada Wildrye	<i>Elymus canadensis</i>	20
Fringed Brome	<i>Bromus ciliatus</i>	20
Perennial Ryegrass	<i>Lolium perenne</i>	10
Rough Hair Grass	<i>Agrostis scabra</i>	10
Tufted Hairgrass	<i>Deschampsia caespitosa</i>	10

4.17 SUNCOR ENERGY INC.

Suncor's operational use of seeding has changed over the years.

4.17.1 Suncor Tailings Sand Slopes

Tuttle (1991) described Suncor's tailings sand slope hydroseeding mix, which included eight species combined with hydromulch, tackifier and starter fertilizer.

Table 195. Suncor tailings sand slope hydroseeding mix.

Common Name	Scientific Name	Wt %
High Wildrye	<i>Elymus violaceus</i>	48
Sheep Fescue	<i>Festuca ovina</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	9
Meadow Barley	<i>Hordeum brachyantherum</i>	9
Red Top	<i>Agrostis stolonifera</i>	5
Alsike Clover	<i>Trifolium hybridum</i>	5
Kentucky Bluegrass	<i>Poa pratensis</i>	4

4.17.2 Suncor Erosion Control

The current mix is now used at all operations only when erosion is occurring; previously it had been used as a default on all sites (Tanya Richens, Suncor Energy Inc., pers. comm.).

Table 196. Suncor erosion control mix.

Common Name	Scientific Name	Wt %
Oats	<i>Avena sativa</i>	37.5
Slender Wheatgrass	<i>Elymus trachycaulus</i>	16.9
Rocky Mountain Fescue	<i>Festuca saximontana</i>	13.8
Fringed Brome Grass	<i>Bromus ciliatus</i>	9.3
Spike Trisetum	<i>Trisetum spicatum</i>	7.5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	6.2
Canada Wild Rye	<i>Elymus canadensis</i>	4.4
June Grass	<i>Koeleria macrantha</i>	4.4

4.18 SYNGENTA OPERATION POLLINATOR

Syngenta Canada’s Operation Pollinator mix for golf courses has been seeded at Connaught Golf Club in Medicine Hat and Springbank Links Golf Club in Calgary⁹ (Paul Hoekstra, Syngenta Canada Inc., pers. comm.).

Table 197. Syngenta Operation Pollinator western Canada golf course mix.

Common Name	Scientific Name	Wt %
Lance-leaved Tickseed	<i>Coreopsis lanceolata</i>	17.88
Gaillardia	<i>Gaillardia aristata</i>	17.33
Lewis Flax	<i>Linum lewisii</i>	17.33
Beeplant	<i>Cleome serrulata</i>	16.73
Purple Prairie Clover	<i>Dalea purpurea</i>	9.56
Northern Hedysarum	<i>Hedysarum boreale</i>	8.37
Black-eyed Susan	<i>Rudbeckia hirta</i>	2.39
False Sunflower	<i>Heliopsis helianthoides</i>	2.39
Prairie Coneflower	<i>Ratibida columnifera</i>	2.39
Common Tickseed	<i>Coreopsis tinctoria</i>	1.20
Giant Hyssop	<i>Agastache foeniculum</i>	1.20
New England Aster	<i>Symphotrichum novae-angliae</i>	1.20
Yellow Evening Primrose	<i>Oenothera biennis</i>	1.20
Golden Aster	<i>Heterotheca villosa</i>	0.83

4.19 TOWN OF HIGH RIVER FLOOD MITIGATION

After the 2013 Alberta floods, native seed mixes were used to naturalize the landscapes around ponds and lakes within the Town of High River to create a buffer that limits erosion, reduces silt loading in ponds, promotes wild life habitat and improves water quality by creating a natural filter system to oxygenate the water (Kim Unger, Town of High River, pers. comm.).

Table 198. Town of High River dike mix.

Common Name	Scientific Name	PLS %
Bluebunch Fescue	<i>Festuca idahoensis</i>	45.9
June Grass	<i>Koeleria macrantha</i>	11.6
Blue Grama	<i>Bouteloua gracilis</i>	8.6

⁹ See <https://www.syngenta.ca/commitments/operation-pollinator> for more information on the Program.

Common Name	Scientific Name	PLS %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	7.9
Mountain Rough Fescue	<i>Festuca campestris</i>	7.7
Western Wheatgrass	<i>Pascopyrum smithii</i>	7.5
Alpine Bluegrass	<i>Poa alpina</i>	4.1
Sandberg Bluegrass	<i>Poa secunda</i>	3.9
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	2.8

NOTE: Seeded at 20.9 kg PLS/ha.

Table 199. Town of High River naturalized area wet meadow mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	45
Prairie Cord Grass	<i>Spartina pectinata</i>	18
Canada Wild Rye	<i>Elymus canadensis</i>	10
Fowl Manna Grass	<i>Glyceria striata</i>	9
Fowl Bluegrass	<i>Poa palustris</i>	8
Tufted hairgrass	<i>Deschampsia caespitosa</i>	7
Slough Grass	<i>Beckmannia syzigachne</i>	3

NOTE: This mix should yield 2,000 PLS/m² using mechanical seeding at an application rate of 18.0 kg/ha.

Table 200. Town of High River naturalized area riparian mix.

Common Name	Scientific Name	Wt %
Giant Wild Rye	<i>Leymus cinereus</i>	40
Slender Wheatgrass	<i>Elymus trachycaulus</i>	24
Western Wheatgrass	<i>Pascopyrum smithii</i>	24
Canada Wild Rye	<i>Elymus canadensis</i>	7
Tufted hairgrass	<i>Deschampsia caespitosa</i>	2
Fowl Manna Grass	<i>Glyceria striata</i>	1
Slough Grass	<i>Beckmannia syzigachne</i>	1

NOTE: This mix should yield 1,500 PLS/m² using mechanical seeding at an application rate of 47.0 kg/ha.

Table 201. Town of High River naturalized area upland mix.

Common Name	Scientific Name	Wt %
Bluebunch Fescue	<i>Festuca idahoensis</i>	51.6
Sandberg Bluegrass	<i>Poa secunda</i>	14.7
Mountain Rough Fescue	<i>Festuca campestris</i>	8.2
Northern Wheatgrass	<i>Elymus lanceolatus</i>	6.5
Western Wheatgrass	<i>Pascopyrum smithii</i>	6.3
Canada Wild Rye	<i>Elymus canadensis</i>	5.4
Slender Wheatgrass	<i>Elymus trachycaulus</i>	4.6
June Grass	<i>Koeleria macrantha</i>	1.5
Green Needle Grass	<i>Nassella viridula</i>	1.3

NOTE: This mix should yield 2,000 PLS/m² using mechanical seeding at an application rate of 45.7 kg/ha.

4.20 TRANSCANADA KEYSTONE PIPELINE GP LTD. KEYSTONE PIPELINE

Six seed mixes were proposed for the Alberta portion of the Keystone pipeline, based on comments from Alberta Sustainable Resource Development, Special Areas Board and Environment Canada Canadian Wildlife Service (TransCanada Keystone Pipeline GP Ltd., 2008). Hooker's oat grass and sweet grass are to be used if available. Primary method of application is drill seeding with an application rate of 10 kg/ha. Broadcast seeding may be used on steep slopes, with an application rate of 15 kg/ha.

Table 202. Keystone seral *Festuca hallii* grassland mix.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Hooker's Oat Grass	<i>Avenula hookeri</i>	15
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	2
Wild Vetch	<i>Vicia americana</i>	2
June Grass	<i>Koeleria macrantha</i>	1

Table 203. Keystone sub-seral *Festuca hallii* grassland mix.

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	24
Plains Rough Fescue	<i>Festuca hallii</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	10
June Grass	<i>Koeleria macrantha</i>	2
Canada Milk Vetch	<i>Astragalus canadensis</i>	2
Wild Vetch	<i>Vicia americana</i>	2

Table 204. Keystone depression and wetland (including saline sites) mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	10
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	10
Sweet Grass	<i>Anthoxanthum hirtum</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10

Table 205. Keystone sandy soils (north) mix.

Common Name	Scientific Name	Wt %
Indian Rice Grass	<i>Achnatherum hymenoides</i>	25
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
Plains Rough Fescue	<i>Festuca hallii</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Sand Grass	<i>Calamovilfa longifolia</i>	5

Common Name	Scientific Name	Wt %
Sweet Grass	<i>Anthoxanthum hirtum</i>	3
Canada Milk Vetch	<i>Astragalus canadensis</i>	1
Wild Vetch	<i>Vicia americana</i>	1

Note: Canada wild rye was listed twice at 10% and 5%.

Table 206. Keystone sandy soils (south) mix.

Common Name	Scientific Name	Wt %
Indian Rice Grass	<i>Achnatherum hymenoides</i>	25
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
Canada Wild Rye	<i>Elymus canadensis</i>	18
Sand Drop Seed	<i>Sporobolus cryptandrus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Sand Grass	<i>Calamovilfa longifolia</i>	5
Canada Milk Vetch	<i>Astragalus canadensis</i>	1
Wild Vetch	<i>Vicia americana</i>	1

Table 207. Keystone mixed grass and dry mixed grass mix.

Common Name	Scientific Name	Wt %
Needle-and-Thread	<i>Hesperostipa comata</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Plains Reed Grass	<i>Calamagrostis montanensis</i>	10
June Grass	<i>Koeleria macrantha</i>	3
Canada Milk Vetch	<i>Astragalus canadensis</i>	1
Wild Vetch	<i>Vicia americana</i>	1

4.21 TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT

Natural regeneration of Trans Mountain Pipeline (Trans Mountain) disturbances is the preferred method of revegetation where appropriate but seeding will occur on sites susceptible to wind and water erosion and weed establishment. Seed mixes have been designed for specific pipeline segments (Trans Mountain ULC, 2016).

Table 208. Trans Mountain dry or moist soil mix or native erosion control mix CP-1.

This mix is used in several areas.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> or <i>Elymus trachycaulus ssp. subsecundus</i>	25
Fringed Brome ultracoat	<i>Bromus ciliatus</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Pincher Brand Smooth Wildrye ultracoat	<i>Elymus glaucus</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
June Grass	<i>Koeleria macrantha</i>	10

Table 209. Trans Mountain wet soil mix CP-2.

This mix is used in the Edmonton/Acheson area.

Common Name	Scientific Name	Wt %
Canada Wildrye	<i>Elymus canadensis</i>	25
Slough Grass	<i>Beckmannia syzigachne</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> or <i>Elymus trachycaulus ssp. subsecundus</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15

Table 210. Trans Mountain wet soil mix DMW-2.

This mix is used in the Smithfield area.

Common Name	Scientific Name	Wt %
Slough Grass	<i>Beckmannia syzigachne</i>	35
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> or <i>Elymus trachycaulus ssp. subsecundus</i>	20

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10

Table 211. Trans Mountain wet soil mix CMW-2.

This mix is used in the Lobstick area.

Common Name	Scientific Name	Wt %
Canada Wild Rye	<i>Elymus canadensis</i>	30
Slough Grass	<i>Beckmannia syzigachne</i>	20
Fringed Brome	<i>Bromus ciliatus</i>	20
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
June Grass	<i>Koeleria macrantha</i>	10

Table 212. Trans Mountain general dry or moist soils or native erosion control mix LF-1.

This mix is used in the Niton and Drinnan areas.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Fringed Brome	<i>Bromus ciliatus</i>	25
Canada Wild Rye	<i>Elymus canadensis</i>	20
Mountain Rough Fescue	<i>Festuca campestris</i>	15
June Grass	<i>Koeleria macrantha</i>	15

Table 213. Trans Mountain wet soil mix LF-2.

This mix is used in the Niton and Drinnan areas.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	30
Fowl Bluegrass	<i>Poa palustris</i>	20
Slough Grass	<i>Beckmannia syzigachne</i>	20
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
June Grass	<i>Koeleria macrantha</i>	15

Table 214. Trans Mountain general dry or moist soils or native erosion control mix M-1.
This mix is used in the Pedley and Entrance areas.

Common Name	Scientific Name	Wt %
Fringed Brome	<i>Bromus ciliatus</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Pincher Brand Smooth Wild Rye	<i>Elymus glaucus</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	15
June Grass	<i>Koeleria macrantha</i>	10

Table 215. Trans Mountain wet soil mix M-2.
This mix is used in the Pedley and Entrance areas.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> or <i>Elymus trachycaulus ssp. subsecundus</i>	30
Pincher Brand Smooth Wildrye	<i>Elymus glaucus</i>	25
Fringed Brome	<i>Bromus ciliatus</i>	20
Rough Hair Grass	<i>Agrostis scabra</i>	10
Spike Trisetum	<i>Trisetum spicatum</i>	10
Bluejoint	<i>Calamagrostis canadensis</i>	5



5.0 RESEARCH AND DEVELOPMENT SEED MIXES

5.1 INNO TECH ALBERTA

InnoTech Alberta and its predecessor organizations have evaluated native species performance using a variety of mixes in several research projects.

5.1.1 AltaLink Transmission Line Right-of-Way

A 3-year dune revegetation and stabilization study was designed to test soil management and vegetation establishment techniques on the AltaLink transmission line right-of-way (RoW), in the Central Parkland Subregion near Metiskow (McKenzie et al., 2016).

Table 216. InnoTech Alberta AltaLink Hansman Lake seed mix.

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	36
Rocky Mountain Fescue	<i>Festuca saximontana</i>	35
Canada Wild Rye	<i>Elymus canadensis</i>	20
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5
Sand Dropseed	<i>Sporobolus cryptandrus</i>	2
Sweetgrass	<i>Anthoxanthum hirtum</i>	2

5.1.2 Imaginea Wellsite Enhanced Reclamation and Remediation Demonstration

A demonstration trial was designed and established at three Imaginea Energy Corp. wellsites (1 active water injection well and 2 reclaimed) within the Dry Mixedgrass Natural Subregion of Alberta (Small et al., 2016b). One site was impacted by a salt water release; the other two had been reclaimed but revegetation had been unsuccessful. Biochar and plant growth promoting rhizobacteria (PGPR) were evaluated as tools to enhance revegetation on those sites.

Table 217. InnoTech Alberta Imaginea wellsite 1 seed mix.

Common Name	Scientific Name	PLS (%)	1000 Seed Weight (g)	Weight Required (kg)	Germination (%)	PLS Weight (kg)	Source - Purity
Western Wheatgrass	<i>Pascopyrum smithii</i>	20	3.04	17.64	92	19.05	BY - 0.1% ergot
Blue Grama	<i>Bouteloua gracilis</i>	18	0.46	2.40	96	2.50	GMS - Clean

Common Name	Scientific Name	PLS (%)	1000 Seed Weight (g)	Weight Required (kg)	Germination (%)	PLS Weight (kg)	Source - Purity
S2 June Grass	<i>Koeleria macrantha</i>	18	0.38	1.98	80	2.38	IA - Clean
Sandberg Bluegrass	<i>Poa secunda</i>	18	0.28	1.46	94	1.55	BY - Clean
Northern Wheatgrass	<i>Elymus lanceolatus</i>	12	2.19	7.62	93	8.16	BY - Clean
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	7	4.91	9.97	90	10.97	GMS - Clean
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	7	3.31	6.72	92	7.26	BY - Clean
Total		100					

This seed mix was approved by Alberta Energy Regulator staff as it is located on public land.

PLS = Pure Live Seed; BY = BrettYoung Seeds; GMS = Gold Metal Seeds; IA = InnoTech Alberta Breeder Seed

Clean = no weed seeds (ergot)

Wellsite 2 and the spill site were seeded to the Eastern Irrigation District mix.

5.1.3 ARC Research Projects

The following mixes were used in projects for which there is no formal report available to cite. Information was provided by InnoTech Alberta staff.

5.1.3.1 Alberta Research Council Northern Fescue Wellsite Revegetation

In 1996 and 1977, the Alberta Research Council (ARC) established plots to assess the performance of three native seed mixes and natural recovery in revegetation of wellsites on mesic and sandy sites in the Municipal District of Provost, County of Paintearth and Special Area #2.

Table 218. ARC northern fescue mesic wellsite modified reclamation mix.

Common Name	Scientific Name	PLS/m ²
Plains Rough Fescue	<i>Festuca hallii</i>	400
Adanac / Highlander Slender Wheatgrass Revenue Slender Wheatgrass ¹	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i> <i>Elymus trachycaulus</i>	200

¹ varieties at a ratio of 1:1:1

Table 219. ARC northern fescue mesic wellsite simple mix.

Common Name	Scientific Name	PLS/m ²
Plains Rough Fescue	<i>Festuca hallii</i>	400
Green Needle Grass	<i>Nassella viridula</i>	100
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	45
June Grass	<i>Koeleria macrantha</i>	30
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	25

Table 220. ARC northern fescue mesic wellsite diverse mix.

Common Name	Scientific Name	PLS/m ²
Plains Rough Fescue	<i>Festuca hallii</i>	400
Green Needle Grass	<i>Nassella viridula</i>	50
Adanac / Highlander Slender Wheatgrass Revenue Slender Wheatgrass ¹	<i>Elymus trachycaulus ssp. trachycaulus</i> <i>Elymus trachycaulus</i>	40
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	25
Critana Northern Wheatgrass ² Sodar Streambank Wheatgrass	<i>Elymus lanceolatus</i> <i>Elymus lanceolatus ssp. psammophilus</i>	20
June Grass	<i>Koeleria macrantha</i>	15
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	6
Golden Aster	<i>Heterotheca villosa</i>	10
Wild Vetch	<i>Vicia americana</i>	8
Yarrow	<i>Achillea millefolium</i>	2
Cut-leaved Anemone	<i>Anemone multifida</i>	2
Smooth Fleabane	<i>Erigeron glabellus</i>	2
Blanket Flower	<i>Gaillardia aristata</i>	2
Sweetvetch	<i>Hedysarum spp.</i>	2
Slender Blue Beardtongue	<i>Penstemon procerus</i>	2
Graceful Cinquefoil	<i>Potentilla gracilis</i>	2
Stiff Goldenrod	<i>Solidago rigida</i>	2

¹ varieties at a ratio of 1:1:1

² varieties at a ratio of 1:1

Table 221. ARC northern fescue sandy wellsite modified reclamation mix.

Common Name	Scientific Name	PLS/m ²
Sand Grass	<i>Calamovilfa longifolia</i>	125
Canada Wildrye	<i>Elymus canadensis</i>	375

Table 222. ARC northern fescue sandy wellsite simple mix.

Common Name	Scientific Name	PLS/m ²
Sand Grass	<i>Calamovilfa longifolia</i>	130
Green Needle Grass	<i>Nassella viridula</i>	105
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	105
Plains Rough Fescue	<i>Festuca hallii</i>	80
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	80

Table 223. ARC northern fescue sandy wellsite diverse mix.

Common Name	Scientific Name	PLS/m ²
Sand Grass	<i>Calamovilfa longifolia</i>	125
Plains Rough Fescue	<i>Festuca hallii</i>	75
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	40
Green Needle Grass	<i>Nassella viridula</i>	25
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Canada Wildrye	<i>Elymus canadensis</i>	25
Indian Rice Grass	<i>Achnatherum hymenoides</i>	25
June Grass	<i>Koeleria macrantha</i>	35
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	35
Critana Northern Wheatgrass ¹	<i>Elymus lanceolatus</i>	35
Sodar Streambank Wheatgrass	<i>Elymus lanceolatus ssp. psammophilus</i>	
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Ascending Purple Milk Vetch	<i>Astragalus laxmannii var. robustior</i>	11.4
Early Yellow Locoweed	<i>Oxytropis sericea</i>	10.1
Wild Vetch	<i>Vicia americana</i>	1.8
Purple Prairie Clover	<i>Dalea purpurea</i>	1.5
Wild Licorice	<i>Glycyrrhiza lepidota</i>	0.2
Golden Bean	<i>Thermopsis rhombifolia</i>	0.1

¹ varieties at a ratio of 1:1

5.1.3.2 Alberta Research Council Sandy Soil Wellsite Reclamation

In May 2002, ARC conducted an evaluation trial of an indigenous native seed mix, composed of species common and adapted to the sandy soils southeast of Edgerton. The species included in the seed mix were based on their dominance in the plant community of the sandy uplands of the Central Parkland Subregion and seed availability. The performance of this mix was compared against the mix used by the wellsite operator.

Table 224. ARC sandy soil wellsite mix.

Common Name	Scientific Name	PLS/m ²
Blue Grama	<i>Bouteloua gracilis</i>	50
Sand Grass	<i>Calamovilfa longifolia</i>	50
Canada Wild Rye	<i>Elymus canadensis</i>	50
Rocky Mountain Fescue	<i>Festuca saximontana</i>	50
June Grass	<i>Koeleria macrantha</i>	50
Indian Rice Grass	<i>Achnatherum hymenoides</i>	50
Sand Dropseed	<i>Sporobolus cryptandrus</i>	50
Sand Nut Grass	<i>Cyperus schweinitzii</i>	25
Purple Oatgrass	<i>Schizachne purpurascens</i>	25
Common Yarrow	<i>Achillea millefolium</i>	10
Blanket Flower	<i>Gaillardia aristata</i>	10
Golden Aster	<i>Heterotheca villosa</i>	10
Wild Blue Flax	<i>Linum lewisii</i>	10
Lilac-Flowered Beardtongue	<i>Penstemon gracilis</i>	10
Slender Blue Beardtongue	<i>Penstemon procerus</i>	10
White Prairie Clover	<i>Petalostemon candidum</i>	10
Prairie Coneflower	<i>Ratibida columnifera</i>	10
Low Goldenrod	<i>Solidago missouriensis</i>	10
Stiff Goldenrod	<i>Solidago rigida</i>	10

The total seeding rate was 500 pure live seeds (PLS)/m², which equated to a seeding rate of 9.9 kg/ha.

Table 225. ARC sandy soil wellsite – operator mix.

Common Name	Scientific name	% PLS
Indian Rice Grass	<i>Achnatherum hymenoides</i>	25
Sand Grass	<i>Calamovilfa longifolia</i>	25
Canada Wild Rye	<i>Elymus canadensis</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Plains Rough Fescue	<i>Festuca hallii</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	5

Seeded at 16 kg/ha.

5.1.3.3 Alberta Research Council Fescue Prairie Pipeline Reclamation

In 2004 ARC established plots on a pipeline to compare native seed mixes (ARC- and contractor-supplied), natural recovery and a mix of seeds swathed from the area.

Table 226. ARC fescue prairie pipeline – ARC seed mix.

Common Name	Scientific Name	Wt %
Rough Fescue	<i>Festuca hallii</i>	30
Blue Grama	<i>Bouteloua gracilis</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Canada Wildrye	<i>Elymus canadensis</i>	10
Porter's Brome	<i>Bromus anomalus</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	2.5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	2.5
Sedge	<i>Carex sp.</i>	1
Prairie Coneflower	<i>Ratibida columnifera</i>	1
Yarrow	<i>Achillea millefolium</i>	1
Low Goldenrod	<i>Solidago missouriensis</i>	1
Yellow Evening Primrose	<i>Oenothera biennis</i>	1

Table 227. ARC fescue prairie pipeline – contractor seed mix.

Common Name	Scientific Name	Wt %
Rough Fescue	<i>Festuca hallii</i>	50
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	10
Northern Wheatgrass or Slender Wheatgrass	<i>Elymus lanceolatus</i> or <i>Elymus trachycaulus ssp. subsecundus</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	5
June Grass or Blue Grama	<i>Koeleria macrantha</i> or <i>Bouteloua gracilis</i>	5

5.1.3.4 Alberta Research Council Dilberry Gravel Pit

In 2008, a gravel pit near Dilberry Lake Provincial Park was seeded to mix of species found to naturally occur near the site.

Table 228. ARC Dilberry gravel pit mix.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Blue Grama	<i>Bouteloua gracilis</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	5-10
Porter's Brome	<i>Bromus porteri</i>	8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus</i>	5
Common Yarrow	<i>Achillea millefolium</i>	1
Sun-loving Sedge	<i>Carex pensylvanica</i>	1
Blanket Flower	<i>Gaillardia aristata</i>	1
Hookers Oat Grass	<i>Avenula hookeri</i>	1
Golden Aster	<i>Heterotheca villosa</i>	1
Mealy Primrose	<i>Primula incana</i>	1
Low Goldenrod	<i>Solidago missouriensis</i>	1

Common Name	Scientific Name	Wt %
Spear Grass	<i>Hesperostipa comata</i>	1

5.1.3.5 Alberta Research Council Fort Saskatchewan Roadside and Green Space Mixes

Two seed mixes for Fort Saskatchewan roadsides and green spaces were designed and trialed in 2008.

Table 229. ARC low growing, drought tolerant seed mix for coarse Fort Saskatchewan roadside soils.

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	35
Rocky Mountain Fescue	<i>Festuca saximontana</i>	35
Blue Grama	<i>Bouteloua gracilis</i>	28
Early Yellow Locoweed	<i>Oxytropis sericea</i>	2

Table 230. ARC Fort Saskatchewan green space mix.

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	25
Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Fringed Brome	<i>Bromus anomalus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	12
Blue Grama	<i>Bouteloua gracilis</i>	10
Hairy Wild Rye	<i>Leymus innovatus</i>	5
Green Needle Grass	<i>Nassella viridula</i>	3
Western Yarrow	<i>Achillea millefolium</i>	2
Hooker's Oatgrass	<i>Avenula hookeri</i>	1
Rigid Goldenrod	<i>Solidago rigida</i>	1

5.1.3.6 Alberta Research Council Spill Site Phytoremediation Forage Reclamation Mix

In 2008, two wellsites north of Wainwright with evident spills were seeded to the following mix.

Table 231. ARC spill site mix.

Common Name	Scientific Name	Wt %
Canada Wild Rye	<i>Elymus canadensis</i>	20

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Porter's Brome	<i>Bromus porteri</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Alkali Grass	<i>Puccinellia nuttalliana</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10
Canada Milk Vetch	<i>Astragalus canadensis</i>	5

5.1.3.7 Alberta Research Council Rumsey Wellsite Revegetation

In 2008 and 2009, three wellsites in the Rumsey Parkland received herbicide applications to kill the non-native plant communities and reseeded to two native species mixes.

Table 232. ARC Rumsey wellsite mix 1.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	54
Blue Grama	<i>Bouteloua gracilis</i>	15
June Grass	<i>Koeleria macrantha</i>	15
Green Needle Grass	<i>Nassella viridula</i>	5
Yarrow	<i>Achillea millefolium</i>	3
Low Goldenrod	<i>Solidago missouriensis</i>	2
Western Porcupine Grass	<i>Hesperostipa curtisetia</i>	2
Hooker's Oat Grass	<i>Avenula hookeri</i>	1.5
Slender Wheatgrass	<i>Elymus trachycaulus</i>	1
Sedge	<i>Carex spp</i>	1
Northern Wheatgrass	<i>Elymus lanceolatus</i>	0.5

Table 233. ARC Rumsey wellsite mix 2.

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	15.5
Blue Grama	<i>Bouteloua gracilis</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15

Common Name	Scientific Name	Wt %
Plains Rough Fescue (collection 2)	<i>Festuca hallii</i>	14.5
Rocky Mountain Fescue	<i>Festuca saximontana</i>	12.5
Plains Rough Fescue	<i>Festuca hallii</i>	10.5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Green Needle Grass	<i>Nassella viridula</i>	5
Yarrow	<i>Achillea millefolium</i>	3
Low Goldenrod	<i>Solidago missouriensis</i>	2.5
Sedge	<i>Carex spp.</i>	1
Hookers Oat Grass	<i>Avenula hookeri</i>	0.5

5.1.4 AITF Research Projects

The following mixes were used in projects for which there is no formal report available to cite. Information was provided by InnoTech Alberta staff.

5.1.4.1 Alberta Innovates – Technology Futures Foothills Fescue Pipeline Revegetation

In fall of 2010, Alberta Innovates – Technology Futures (AITF) seeded two sites along a pipeline right-of-way near the town of Longview. The seed mix consisted of the major grass species of the Rough Fescue – Bluebunch Fescue – Parry Oat grass plant community.

Table 234. AITF foothills fescue mix.

Common Name	Scientific Name	Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	57
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Hairy Wild Rye	<i>Leymus innovatus</i>	10
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Richardson Needle Grass	<i>Achnatherum richardsonii</i>	3

5.1.4.2 Alberta Innovates – Technology Futures Foothills Fescue Wellsite Reclamation

In fall of 2011, a study area was located on a wellsite near Del Bonita. The Foothills Fescue Rangeland Plant Community Guide was consulted to design the seed mix for a Northern and Western Wheatgrass – green needle grass plant community with the addition of Parry’s oatgrass (*Danthonia parryi*) and Bluebunch Fescue (*Festuca idahoensis*) to favour many other late seral

foothills fescue plant communities. Wheatgrasses and early colonizers were restricted in percentages and emphasis was placed on plant community diversity.

Table 235. AITF foothills fescue wellsite mix.

Common Name	Scientific Name	PLS %
Mountain Rough Fescue	<i>Festuca campestris</i>	41
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	8
Western Wheatgrass	<i>Pascopyrum smithii</i>	4
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	6
Parry's Oatgrass	<i>Danthonia parryi</i>	5
Green Needle Grass	<i>Nassella viridula</i>	5
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	6
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	5
Cultivated Oats	<i>Avena sativa</i>	10

5.1.4.3 Alberta Innovates – Technology Futures Oil Sands Tailings Sand Stabilization

In 2011, AITF evaluated a mix of native species and oats (as a nurse crop) for stabilization of oil sands tailings sand (Woosaree and Hiltz, 2009).

Table 236. AITF oil sands tailings stabilization mix.

Common Name	Scientific Name	Wt %
Oats	<i>Avena sativa</i>	37.5
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	16.9
Rocky Mountain Fescue	<i>Festuca saximontana</i>	13.8
Fringed Brome Grass	<i>Bromus ciliatus</i>	9.3
Spike Trisetum	<i>Trisetum spicatum</i>	7.5
Nortran Tufted Hair Grass	<i>Deschampsia caespitosa</i>	6.2
ARC Centennial Canada Wild Rye	<i>Elymus canadensis</i>	4.4
June Grass	<i>Koeleria macrantha</i>	4.4

Fringe brome grass and June grass were treated with a seed treatment fungicide for the control of seed rot and damping off diseases.

5.1.4.4 Alberta Innovates – Technology Futures Pollinator Mix

In 2016, AITF evaluated the following forb mix to be seeded into forage crops in the Lethbridge area at a rate of 320 seeds/m² to support pollinators (the mix was also seeded at InnoTech Alberta’s Vegreville facility).

Table 237. AITF pollinator mix.

Common Name	Scientific Name	Wt %
Smooth Blue Aster	<i>Symphyotrichum laeve</i>	20
Wild Bergamot	<i>Monarda fistulosa</i>	20
Giant Hyssop	<i>Agastache foeniculum</i>	20
Common Annual Sunflower	<i>Helianthus annuus</i>	20
Common Yarrow	<i>Achillea millefolium</i>	20

5.2 UNIVERSITY OF ALBERTA

5.2.1 Bush – Native Seed Mixes for Diversity

Ten seed mixes were planted near Vegreville in 1994; two “standard-of-the-day” seed mixes provided by industry (NOVA Gas Transmission Ltd. and Ducks Unlimited) and eight seed mixes designed for this study (Bush, 1998). The seed mixes were designed to test varying levels and types of grass, forb and legume diversity. Many of the species used had not been previously tested for reclamation. Howat (2001) conducted follow-up assessments of the seeding treatments.

Table 238. Bush grass mix 1.

Common Name	Scientific Name	PLS/m ²
Porter’s Brome	<i>Bromus porteri</i>	57.9
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	51.8
Plains Rough Fescue	<i>Festuca hallii</i>	18.7
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	14.7
Western Wheatgrass	<i>Pascopyrum smithii</i>	6.3

Table 239. Bush grass mix 2.

Common Name	Scientific Name	PLS/m ²
Porter’s Brome	<i>Bromus porteri</i>	42.2
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	37.9

Common Name	Scientific Name	PLS/m²
Fowl Bluegrass	<i>Poa palustris</i>	25.3
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	19.8
June Grass	<i>Koeleria macrantha</i>	16.1
Plains Rough Fescue	<i>Festuca hallii</i>	13.8
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	12.8
Green Needle Grass	<i>Nassella viridula</i>	5.1
Western Wheatgrass	<i>Pascopyrum smithii</i>	4.3
Fringed Brome	<i>Bromus ciliatus</i>	3
Blue Grama	<i>Bouteloua gracilis</i>	0.4

Table 240. Bush forbs mix 1.

Common Name	Scientific Name	PLS/m²
Porter's Brome	<i>Bromus porteri</i>	42.2
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	38.1
Plains Rough Fescue	<i>Festuca hallii</i>	13.8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	10.8
Western Wheatgrass	<i>Pascopyrum smithii</i>	4.4
Slender Blue Beardtongue	<i>Penstemon procerus</i>	2.8
Yarrow	<i>Achillea millefolium</i>	1.6
Western Dock	<i>Rumex occidentalis</i>	1.5
Wild Bergamot	<i>Monarda fistulosa</i>	0.4
Yellow Evening Primrose	<i>Oenothera biennis</i>	0.3

Table 241. Bush legume mix 1.

Common Name	Scientific Name	PLS/m²
Porter's Brome	<i>Bromus porteri</i>	42.2
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	37.9
Plains Rough Fescue	<i>Festuca hallii</i>	13.8
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	10.8

Common Name	Scientific Name	PLS/m ²
Reflexed Locoweed	<i>Oxytropis deflexa</i>	6.5
Western Wheatgrass	<i>Pascopyrum smithii</i>	4.3
Showy Locoweed	<i>Oxytropis splendens</i>	1.7
Yarrow	<i>Achillea millefolium</i>	1.1
Wild Bergamot	<i>Monarda fistulosa</i>	0.4
Yellow Evening Primrose	<i>Oenothera biennis</i>	0.3

Table 242. Bush NOVA mix.

Common Name	Scientific Name	PLS/m ²
Sheep Fescue	<i>Festuca ovina</i>	31.8
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	28.5
Mountain Rough Fescue	<i>Festuca campestris</i>	25.0
Red Fescue	<i>Festuca rubra</i>	19.4
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	19.4
June Grass	<i>Koeleria macrantha</i>	16.1
Alpine Bluegrass	<i>Poa alpina</i>	15.8
Western Wheatgrass	<i>Pascopyrum smithii</i>	8.8
Green Needle Grass	<i>Nassella viridula</i>	4.5

Table 243. Bush grass mix 3.

Common Name	Scientific Name	PLS/m ²
Porter's Brome	<i>Bromus porteri</i>	73.2
Western Porcupine Grass	<i>Hesperostipa curisetata</i>	37.9
Plains Rough Fescue	<i>Festuca hallii</i>	29.0
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	10.7
Western Wheatgrass	<i>Pascopyrum smithii</i>	4.6

Table 244. Bush grass mix 4.

Common Name	Scientific Name	PLS/m ²
Porter's Brome	<i>Bromus porteri</i>	58.1
Fowl Bluegrass	<i>Poa palustris</i>	36.7

Common Name	Scientific Name	PLS/m²
June Grass	<i>Koeleria macrantha</i>	24.1
Plains Rough Fescue	<i>Festuca hallii</i>	24.0
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	23.7
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	15.7
Green Needle Grass	<i>Nassella viridula</i>	7.6
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	6.3
Western Wheatgrass	<i>Pascopyrum smithii</i>	2.7
Fringed Brome	<i>Bromus ciliatus</i>	1.5
Blue Grama	<i>Bouteloua gracilis</i>	0.2

Table 245. Bush forbs mix 2.

Common Name	Scientific Name	PLS/m²
Porter's Brome	<i>Bromus porteri</i>	57.9
Plains Rough Fescue	<i>Festuca hallii</i>	23.9
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	23.7
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	6.7
Slender Blue Beardtongue	<i>Penstemon procerus</i>	4.0
Western Wheatgrass	<i>Pascopyrum smithii</i>	2.8
Western Dock	<i>Rumex occidentalis</i>	1.1
Yarrow	<i>Achillea millefolium</i>	0.6
Wild Bergamot	<i>Monarda fistulosa</i>	0.2
Yellow Evening Primrose	<i>Oenothera biennis</i>	0.3

Table 246. Bush legume mix 2.

Common Name	Scientific Name	PLS/m²
Porter's Brome	<i>Bromus porteri</i>	58.1
Plains Rough Fescue	<i>Festuca hallii</i>	24.0
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	23.7
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus and Elymus trachycaulus ssp. trachycaulus</i>	6.8

Common Name	Scientific Name	PLS/m ²
Reflexed Locoweed	<i>Oxytropis deflexa</i>	3.2
Western Wheatgrass	<i>Pascopyrum smithii</i>	2.7
Showy Locoweed	<i>Oxytropis splendens</i>	2.6
Yarrow	<i>Achillea millefolium</i>	0.6
Yellow Evening Primrose	<i>Oenothera biennis</i>	0.3
Wild Bergamot	<i>Monarda fistulosa</i>	0.2

Table 247. Bush Ducks Unlimited Canada mix.

Common Name	Scientific Name	PLS/m ²
Northern Wheatgrass	<i>Elymus lanceolatus</i>	18.6
Western Wheatgrass	<i>Pascopyrum smithii</i>	13.1
Green Needle Grass	<i>Nassella viridula</i>	11.5
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i> and <i>Elymus trachycaulus ssp. trachycaulus</i>	5.6
Tall Wheatgrass	<i>Thinopyrum elongatum</i>	4.1
Alfalfa	<i>Medicago sativa</i>	2.4

5.2.2 Cartier – Calcareous Soil Reclamation Mix

A seed mix designed by Parks Canada staff was tested on calcareous soils along the TMX-Anchor Loop pipeline in Jasper National Park (Cartier, 2010).

Table 248. Cartier – Calcareous soil reclamation mix.

Common Name	Scientific Name	Wt %
Green needle grass	<i>Nassella viridula</i>	20
Spike trisetum	<i>Trisetum spicatum</i>	15
Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	15
June grass	<i>Koeleria macrantha</i>	15
Violet wheatgrass	<i>Agropyron violaceum</i>	5
Slender wheatgrass	<i>Elymus trachycaulus</i> or, <i>Elymus trachycaulus ssp. subsecundus</i>	5

5.2.3 Cohen-Fernandez – Limestone Quarry Revegetation

A seed mix consisting of 5 grasses and one forb was seeded in fall 2007 and spring 2008 on a limestone quarry at Exshaw (Cohen-Fernandez, 2012). The native plant species were chosen for their potential adaptability to quarry site conditions due to their tolerance to dry slopes, rocky or gravelly sites, alkaline soils and grazing. A nitrogen fixing forb was included to increase available soil nitrogen. The species, except *Bromus* and *Vicia*, had been previously tested on limestone quarry material in the greenhouse.

Table 249. Cohen-Fernandez limestone quarry seed mix.

Common Name	Scientific Name	Wt %
Alpine Blue Grass	<i>Poa alpina</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Hairy Wild Rye	<i>Leymus innovatus</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Sentinel Spike Trisetum	<i>Trisetum spicatum</i>	15
Mountain Brome Grass	<i>Bromus marginatus</i>	10
Wild Vetch	<i>Vicia americana</i>	10

5.2.4 deBertoli – Oil Sands Forb Mix

deBertoli (2018) seeded a forb mix on an oil sands overburden waste area to evaluate plant community development and aspen seedling establishment in response to different combinations of coversoil types and experimental plant establishment treatments.

Table 250. deBertoli oil sands forb mix.

Common Name	Scientific Name	Grams/25 m ² Quadrat	Seeds/25 m ² Quadrat	Seed Mix Composition (by Number of Seeds)
Yarrow	<i>Achillea millefolium</i>	0.080	684	23.35%
Bunchberry	<i>Cornus canadensis</i>	0.188	463	15.81%
Purple-stemmed Aster	<i>Symphyotrichum puniceum</i>	0.120	411	14.04%
Blue Columbine	<i>Aquilegia brevistyla</i>	0.375	334	11.42%
Common Fireweed	<i>Chamerion angustifolium</i>	2.50	275	9.40%
Northern Bedstraw	<i>Galium boreale</i>	0.113	275	9.40%
Canada Goldenrod	<i>Solidago canadensis</i>	0.023	210	7.18%
Tall Larkspur	<i>Delphinium glaucum</i>	0.113	128	4.39%

Common Name	Scientific Name	Grams/25 m ² Quadrat	Seeds/25 m ² Quadrat	Seed Mix Composition (by Number of Seeds)
Showy Aster	<i>Eurybia conspicua</i>	0.045	94	3.21%
Early Blue Violet	<i>Viola adunca</i>	0.025	27	0.91%
Lindley's Aster	<i>Symphyotrichum ciliolatum</i>	0.003	16	0.53%
Wild Vetch	<i>Vicia americana</i>	0.158	11	0.37%

5.2.5 Desserud and Naeth – *Festuca hallii* Recovery

Desserud and Naeth (2013) evaluated the recovery of *Festuca hallii* by comparing monoculture seeding to mixes of native grass species seeded in 2007 on plots in central Alberta (additional information in Desserud (2011)).

Table 251. Desserud and Naeth Ellerslie and Byemoor native mix.

Common Name	Scientific Name	Wt %	kg/ha	PLS %	PLS seeds/m ²
Green Needle Grass	<i>Nassella viridula</i>	40	2.7	45	48
June Grass	<i>Koeleria macrantha</i>	35	2.3	99	801
Rough Fescue	<i>Festuca hallii</i>	20	1.3	95	113
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	3	0.2	95	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	2	0.1	67	2

Table 252. Desserud and Naeth Drumheller native mix.

Common Name	Scientific Name	Wt %	kg/ha	PLS %	PLS seeds/m ²
Blue Grama	<i>Bouteloua gracilis</i>	30	2.0	70	256
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	25	1.7	45	19
Rough Fescue	<i>Festuca hallii</i>	20	1.3	95	113
June Grass	<i>Koeleria macrantha</i>	20	1.3	99	457
Slender Wheatgrass	<i>Elymus trachycaulus</i>	3	0.2	95	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	2	0.1	67	2

5.2.6 Fluker – Impacts of Soil Nutrient Levels and Interspecific Competition

Three native species were compared to three introduced species to determine if they have higher survivability and biomass on low nutrient soils at Ellerslie and the Genessee coal mine (Fluker, 1998). The species were seeded in 1996 alone and in six mixes – only the pure native mix and the six-species mix are reported here.

Table 253. Fluker native mix.

Common Name	Scientific Name	g/m ²
Wild Vetch	<i>Vicia americana</i>	2.70
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>	0.45
Green Needle Grass	<i>Nassella viridula</i>	0.20

Table 254. Fluker native-introduced mix.

Common Name	Scientific Name	g/m ²
Wild Vetch	<i>Vicia americana</i>	1.35
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>	0.23
Magna Smooth Brome	<i>Bromus inermis</i>	0.22
Green Needle Grass	<i>Nassella viridula</i>	0.10
Aurora Alsike Clover	<i>Trifolium hybridum</i>	0.05
Climax Timothy	<i>Phleum pretense</i>	0.03

5.2.7 Hammermeister et al. – Native Prairie Wellsite Reclamation

Three seed mixes (a low diversity seed mix commonly used by industry, a simple mix of species more typically dominant in native prairie, and a diverse seed mix) were compared to an unseeded treatment located in the Dry Mixed Grass Natural Subregion near Medicine Hat, Brooks and Bow Island in 1996 (Hammermeister et al., 2003; more information may be found Hammermeister, 2001; further analysis of the sites was carried out by Soulodre, 2001).

Table 255. Hammermeister et al. dry mixed grass low diversity industry mix.

Common Name	Scientific Name	PLS %
Western Wheatgrass	<i>Pascopyrum smithii</i>	50
Northern Wheatgrass	<i>Elymus lanceolatus</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Green Needle Grass	<i>Nassella viridula</i>	5

Table 256. Hammermeister et al. dry mixed grass simple mix.

Common Name	Scientific Name	PLS %
Blue Grama	<i>Bouteloua gracilis</i>	30
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	30
June Grass	<i>Koeleria macrantha</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 257. Hammermeister et al. dry mixed grass diverse mix.

Common Name	Scientific Name	PLS %
Blue Grama	<i>Bouteloua gracilis</i>	22
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	22
Western Wheatgrass	<i>Pascopyrum smithii</i>	7
Northern Wheatgrass	<i>Elymus lanceolatus</i>	7
Slender Wheatgrass	<i>Elymus trachycaulus</i>	7
Green Needle Grass	<i>Nassella viridula</i>	7
June Grass	<i>Koeleria macrantha</i>	7
Indian Rice Grass	<i>Achnatherum hymenoides</i>	7
Canada Wild Rye	<i>Elymus canadensis</i>	3
Wild Vetch	<i>Vicia americana</i>	1.85
Prairie Coneflower	<i>Ratibida columnifera</i>	1.33
Common Yarrow	<i>Achillea millefolium</i>	1.25
Broom Weed	<i>Gutierrezia sarothrae</i>	1.17
Purple Prairie Clover	<i>Dalea purpurea</i>	1.17
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	1.08
Missouri Goldenrod	<i>Solidago missouriensis</i>	1.08
Ascending Purple Milk Vetch	<i>Astragalus laxmannii</i> var. <i>robustior</i>	1.00
Blanket Flower	<i>Gaillardia aristata</i>	0.33
White Prairie Clover	<i>Dalea candida</i>	0.33
Three-Flowered Avens	<i>Geum triflorum</i>	0.33
Northern Hedysarum	<i>Hedysarum</i> spp.	0.03
Golden Bean	<i>Thermopsis rhombifolia</i>	0.03

5.2.8 Naeth et al. – Pipeline Rangeland Revegetation

In 1986, NOVA Gas Transmission Ltd. (NGTL) initiated a long-term revegetation monitoring program to assess revegetation efforts on two pipelines in native rangelands in southeastern and southwestern Alberta (Naeth et al. 1997). The Milo Lateral runs through the Dry Mixed Grass and Mixed Grass Ecoregions – four sites were established and seeded to a native mix or a non-native mix or both. The Porcupine Hills Lateral runs through the Aspen Parkland, Montane and Fescue Grassland Ecoregions – four sites were established.

Table 258. Naeth et al. Milo Lateral native seed mix.

Common Name	Scientific Name	Wt %
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>	25
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Nuttall's Alkali Grass	<i>Puccinellia nuttaliana</i>	25
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	17
Reubens Canada Bluegrass	<i>Poa compressa</i>	8

Table 259. Naeth et al. Porcupine Hills Lateral seed mix.

Common Name	Scientific Name	Wt %
Sodar Streambank Wheatgrass	<i>Elymus lanceolatus ssp. psammophilus</i>	45
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Rough Fescue	<i>Festuca hallii</i>	14
Revenue Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Rangelander Alfalfa	<i>Medicago sativa</i>	5
Durar Hard Fescue	<i>Festuca trachyphylla</i>	3
Covar Sheep Fescue	<i>Festuca ovina</i>	3
June Grass	<i>Koeleria macrantha</i>	3
Reubens Canada Bluegrass	<i>Poa compressa</i>	2

5.2.9 Pelech – Native vs. Introduced Comparison

Pelech (1997) assessed the performance of nine plant species mixes (four native, four introduced and one mixed) seeded in 1995 at the Lacombe Research Centre.

Table 260. Pelech native pasture mix.

Common Name	Scientific Name
Porter's Brome	<i>Bromus porteri</i>

Common Name	Scientific Name
Purple Prairie Clover	<i>Dalea purpureum</i>
Parry Oat Grass	<i>Danthonia parryi</i>
Slender Wheatgrass	<i>Elymus trachycaulus</i>
Plains Rough Fescue	<i>Festuca hallii</i>
June Grass	<i>Koeleria macrantha</i>

Table 261. Pelech native hay mix.

Common Name	Scientific Name
Porter's Brome	<i>Bromus porteri</i>
Tufted Hair Grass	<i>Deschampsia caespitosa</i>
Mountain Rough Fescue	<i>Festuca campestris</i>
Green Needle Grass	<i>Nassella viridula</i>
Western Wheatgrass	<i>Pascopyrum smithii</i>
Wild Vetch	<i>Vicia americana</i>

Table 262. Pelech native mix.

Common Name	Scientific Name
Porter's Brome	<i>Bromus porteri</i>
Parry Oat Grass	<i>Danthonia parryi</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Bluebunch Fescue	<i>Festuca idahoensis</i>
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>
Wild Vetch	<i>Vicia americana</i>

Table 263. Pelech alternate native mix.

Common Name	Scientific Name
Porter's Brome	<i>Bromus porteri</i>
Purple Prairie Clover	<i>Dalea purpureum</i>
Plains Rough Fescue	<i>Festuca hallii</i>
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>
June Grass	<i>Koeleria macrantha</i>
Western Wheatgrass	<i>Pascopyrum smithii</i>

5.2.10 Pitchford – Aspen Parkland

Pitchford (2000) evaluated spring (1997) and fall (1998) seeding of four native species mixes at Ellerslie and Elk Island National Park.

Table 264. Pitchford – Aspen Parkland mix 1.

Common Name	Scientific Name
Blue Grama	<i>Bouteloua gracilis</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
Plains Rough Fescue	<i>Festuca hallii</i>
June Grass	<i>Koeleria macrantha</i>
Green Needle Grass	<i>Nassella viridula</i>

Table 265. Pitchford – Aspen Parkland mix 2.

Common Name	Scientific Name
Red Top	<i>Agrostis stolonifera</i>
Blue Grama	<i>Bouteloua gracilis</i>
Mountain Brome Grass	<i>Bromus marginatus</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
Plains Rough Fescue	<i>Festuca hallii</i>
Sheep Fescue	<i>Festuca ovina</i>
June Grass	<i>Koeleria macrantha</i>
Green Needle Grass	<i>Nassella viridula</i>
Fowl Bluegrass	<i>Poa palustris</i>

Table 266. Pitchford – Aspen Parkland mix 1 plus.

Common Name	Scientific Name
Yarrow	<i>Achillea millefolium</i>
Blue Grama	<i>Bouteloua gracilis</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>

Common Name	Scientific Name
Plains Rough Fescue	<i>Festuca hallii</i>
Blanket Flower	<i>Gaillardia aristata</i>
June Grass	<i>Koeleria macrantha</i>
Wild Blue Flax	<i>Linum lewisii</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Green Needle Grass	<i>Nassella viridula</i>
Prairie Coneflower	<i>Ratibida columnifera</i>
Canada Goldenrod	<i>Solidago canadensis</i>
Low Goldenrod	<i>Solidago missouriensis</i>
Smooth Aster	<i>Symphyotrichum laeve</i>
Wild Vetch	<i>Vicia americana</i>

Note – this appears to be the same mix (site?) as the Erichsen Arychuk grass-forb seed mix described above (with the exception of *Festuca altaica* / *Festuca hallii*).

Table 267. Pitchford – Aspen Parkland mix 2 plus.

Common Name	Scientific Name
Yarrow	<i>Achillea millefolium</i>
Red Top	<i>Agrostis stolonifera</i>
Blue Grama	<i>Bouteloua gracilis</i>
Mountain Brome Grass	<i>Bromus marginatus</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
Plains Rough Fescue	<i>Festuca hallii</i>
Sheep Fescue	<i>Festuca ovina</i>
Blanket Flower	<i>Gaillardia aristata</i>
June Grass	<i>Koeleria macrantha</i>
Wild Blue Flax	<i>Linum lewisii</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Green Needle Grass	<i>Nassella viridula</i>
Fowl Bluegrass	<i>Poa palustris</i>

Common Name	Scientific Name
Prairie Coneflower	<i>Ratibida columnifera</i>
Canada Goldenrod	<i>Solidago canadensis</i>
Low Goldenrod	<i>Solidago missouriensis</i>
Smooth Aster	<i>Symphyotrichum laeve</i>
Wild Vetch	<i>Vicia americana</i>

5.2.11 Rojas – City of Edmonton Naturalization

Rojas (2016) evaluated selected native forb species performance in a naturalized area in the City of Edmonton (Terwillegar Recreation Centre) based on survival, health and growth. Short grass and tall grass mixes were seeded in 2014.

Table 268. Rojas – Short grass native seed mix.

Common Name	Scientific Name	Wt %
Spike Trisetum	<i>Trisetum spicatum</i>	30
Mountainview June Grass	<i>Koeleria macrantha</i>	25
Plateau Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Glacier Alpine Blue Grass	<i>Poa alpina</i>	20

Seeded at 150 kg/ha.

Table 269. Rojas – Tall grass native seed mix.

Common Name	Scientific Name	Wt %
Rough Fescue	<i>Festuca hallii</i>	30
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Hooker's Oat Grass	<i>Avenula hookeri</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10

Seeded at 35 kg/ha.

5.2.12 Salisbury – Boreal Forest Pipeline Revegetation

In the winter of 2000 Salisbury (2004) broadcast seeded a mix of species selected by Alliance Pipeline Ltd. as suitable for the Whitecourt area based on its previous use at similar locations and compared the results to a natural recovery area.

Table 270. Salisbury Alliance Pipeline mix.

Common Name	Scientific Name	Wt %
Fowl Bluegrass	<i>Poa palustris</i>	20
Rocky Mountain Fescue	<i>Festuca ovina</i>	15
Fringed Brome	<i>Bromus ciliatus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Hairy Wild Rye	<i>Leymus innovatus</i>	5
White-grained Mountain Rice Grass	<i>Oryzopsis asperifolia</i>	5

5.2.13 Sherritt – *Festuca hallii* and *Festuca campestris* Revegetation

Sherritt (2012) evaluated whether *Festuca hallii* (plains rough fescue) and *Festuca campestris* (Mountain Rough Fescue) could be restored by seeding as a monoculture versus seeding in a mix with closely associated species following gas well site disturbances. The *Festuca hallii* plots were located in the Rumsey Block; the *F. campestris* plots were located west of Stavely. Both sites were seeded in 2008.

Table 271. Sherritt *Festuca hallii* mix.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	30
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	30
June Grass	<i>Koeleria macrantha</i>	20
Hooker's Oat Grass	<i>Avenula hookeri</i>	20

Table 272. Sherritt *Festuca campestris* mix.

Common Name	Scientific Name	Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	30
Parry Oatgrass	<i>Danthonia parryi</i>	30

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	20
Bluebunch Fescue	<i>Festuca idahoensis</i>	20

5.2.14 Turner – Fort Saskatchewan Phosphogypsum Stack Reclamation

Turner (2013) seeded four species and a mixture in plots with varying soil cap depths on a phosphogypsum stack at Fort Saskatchewan. No information was provided on the ratios of the species in the mix.

Table 273. Turner phosphogypsum stack seed mix.

Common Name	Scientific Name
Redtop	<i>Agrostis stolonifera</i>
Tufted Hair Grass	<i>Deschampsia caespitosa</i>
Slender Wheatgrass	<i>Elymus trachycaulus</i>
Sheep Fescue	<i>Festuca ovina</i>
Alsike Clover	<i>Trifolium hybridum</i>

5.2.15 Wruck – Parkland Pipeline Seeding vs. Natural Recovery

Wruck (2004) compared shallow topsoil stripping versus conventional stripping combined with erosion control techniques (cover cropping and straw crimping) and seeding native species versus natural recovery were evaluated in reclamation of a pipeline right-of-way in sandhills of the Alberta Aspen Parkland. Plots were seeded to the Alliance Pipeline Mix #7 at a rate of 9 kg/ha in fall of 1999. Wruck noted the following problems occurred with the planned seed mix (shown in Table 155): *Festuca rubra* was seeded instead of *Festuca hallii*; the Sheep Fescue may have been *Festuca saximontana* (based on its appearance in the seeded plots but not the natural recovery ones).

Table 274. Wruck Alliance Pipeline sandy soil mix.

Common Name	Scientific Name	Wt %
Sheep Fescue	<i>Festuca ovina</i>	25
Plains Rough Fescue	<i>Festuca hallii</i>	25
Green Needle Grass	<i>Nassella viridula</i>	15
Indian Rice Grass	<i>Achnatherum hymenoides</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

5.3 OTHER RESEARCHERS

5.3.1 Baxter and Woosaree Fire Resistant Species

In 2005, FPInnovations launched a multi-year study to determine whether a less-flammable, herbaceous species could replace the flammable grasses that typically colonize linear rights-of-way (Baxter and Woosaree, 2013). Individual species, as well as an agronomic and a native mix, were tested at Vegreville, and then the three best native species were tested in mixes.

Table 275. Baxter and Woosaree Vegreville flammability mix.

Common Name	Scientific Name	Wt %
Nortran Tufted Hairgrass	<i>Deschampsia caespitosa</i>	27
AEC Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Fringed Bromegrass Nutra	<i>Bromus ciliatus</i>	22
Fowl Bluegrass Nutricoat	<i>Poa palustris</i>	14
Slough Grass	<i>Beckmannia syzigachne</i>	12

Table 276. Baxter and Woosaree Chisolm flammability mix #1.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	70
Yarrow	<i>Achillea millefolium</i>	30

Table 277. Baxter and Woosaree Chisolm flammability mix #2.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	70
White Clover	<i>Trifolium repens</i>	30

Table 278. Baxter and Woosaree Chisolm flammability mix #3.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	60
Yarrow	<i>Achillea millefolium</i>	20
White Clover	<i>Trifolium repens</i>	20

5.3.2 McGregor – Native Rhizomatous Grass Species

McGregor (2013) evaluated the establishment of three species of native perennial rhizomatous grasses (*Calamagrostis canadensis*, *Calamovilfa longifolia*, and *Anthoxanthum hirtum*) at sites in Caroline and Cochrane with and without competition in the form of a seeded native species mix.

Table 279. McGregor – Native rhizomatous grass species competition mix.

Common Name	Scientific Name	Wt %
Idaho Fescue	<i>Festuca idahoensis</i>	25
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Mountain Rough Fescue	<i>Festuca campestris</i>	15
Blue Grama Grass	<i>Bouteloua gracilis</i>	10
Green Needle Grass	<i>Nassella viridula</i>	10

5.3.3 Russell – Mountain Coal Mine Overburden

Russell Ecological Consultants (1986) established four trials on overburden at Cadomin and Adanac to evaluate the effects and interactions of four native grass seed mixtures and five companion crop treatments.

Table 280. Russell Overburden mixture 1.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	68
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Alpine Bluegrass	<i>Poa alpina</i>	9
Inland Bluegrass	<i>Poa interior</i>	8

Seeded at 46 kg/ha.

Table 281. Russell Overburden mixture 2.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	35
Thickspike Wheatgrass	<i>Elymus macrourus</i>	33
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	29
June Grass	<i>Koeleria macrantha</i>	3

Seeded at 107 kg/ha.

Table 282. Russell Overburden mixture 3.

Common Name	Scientific Name	Wt %
Thickspike Wheatgrass	<i>Elymus macrourus</i>	66
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	19
Alpine Bluegrass	<i>Poa alpina</i>	8
Spike Trisetum	<i>Trisetum spicatum</i>	7

Seeded at 53 kg/ha.

Table 283. Russell Overburden mixture 4.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	40
Spike Trisetum	<i>Trisetum spicatum</i>	22
Inland Bluegrass	<i>Poa interior</i>	22
June Grass	<i>Koeleria macrantha</i>	16

Seeded at 7 kg/ha.

5.3.4 Woosaree and Otfinowski – Northern Fescue and Central Parkland Wellsites

Woosaree and Otfinowski (2018) used three mixes (reclamation, simple and diverse) to direct seed two wellsites in the Northern Fescue (Brownfield Hills and Neutral Hills) and one in the Central Parkland (Hand Hills) natural subregions. Sites were seeded in 1997 and the results were compared to both an undisturbed control and to natural recovery.

Table 284. Woosaree and Otfinowski reclamation mix.

Common Name	Scientific Name	PLS/m ²
Plains Rough Fescue	<i>Festuca hallii</i>	400
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	200

Table 285. Woosaree and Otfinowski simple mix.

Common Name	Scientific Name	PLS/m ²
Plains Rough Fescue	<i>Festuca hallii</i>	400
Green Needle Grass	<i>Nassella viridula</i>	100
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	45
June Grass	<i>Koeleria macrantha</i>	30
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	25

Table 286. Woosaree and Otfinowski diverse mix.

Common Name	Scientific Name	PLS/m ²
Plains Rough Fescue	<i>Festuca hallii</i>	400
Green Needle Grass	<i>Nassella viridula</i>	50
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	40
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	25
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	20
June Grass	<i>Koeleria macrantha</i>	15
Wester Wheatgrass	<i>Pascopyrum smithii</i>	10
Golden Aster	<i>Heterotheca villosa</i>	10
Wild Vetch	<i>Vicia americana</i>	8
Rocky Mountain Fescue	<i>Festuca saximontana</i>	6
Yarrow	<i>Achillea millefolium</i>	2
Cut-leaved Anemone	<i>Anemone multifida</i>	2
Smooth Fleabane	<i>Erigeron glabellus</i>	2
Gaillardia	<i>Gaillardia aristata</i>	2
Sweetvetch	<i>Hedysarum spp.</i>	2
Slender Blue Beardtongue	<i>Penstemon procerus</i>	2
Graceful Cinquefoil	<i>Potentilla gracilis</i>	2
Stiff Goldenrod	<i>Solidago rigida</i>	2



6.0 COMMERCIAL SEED MIXES

The Alberta Native Plant Council maintains a listing of native plant material sources (Alberta Native Plant Council, 2016). Readers should also consult the Canadian Seed Institute's Registered Seed Establishments list¹⁰.

Readers should contact vendors to determine ecological variety, source locality, species availability and volumes.

6.1 BRETTYOUNG SEEDS

BrettYoung Seeds offers five regional mixes (Corey Mandrusiak and Sandra Hull, BrettYoung, pers. comm.).

Table 287. BrettYoung Boreal Forest Natural Region mix.

Common Name	Scientific Name	Wt %
Fringed Brome (ultracoat)	<i>Bromus ciliatus</i>	20
June Grass (ultracoat)	<i>Koeleria macrantha</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Sloughgrass	<i>Beckmannia syzigachne</i>	10

Table 288. BrettYoung Foothills Natural Region mix.

Common Name	Scientific Name	Wt %
Tufted Hairgrass	<i>Deschampsia caespitosa</i>	20
June Grass (ultracoat)	<i>Koeleria macrantha</i>	15
Mountain Brome	<i>Bromus marginatus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Sloughgrass	<i>Beckmannia syzigachne</i>	15

¹⁰ See <https://csi-ics.com/registered-seed-establishments-rses>

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Mountain Rough Fescue	<i>Festuca campestris</i>	10

Table 289. BrettYoung Grassland Natural Region mix.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Blue Grama (ultracoat)	<i>Bouteloua gracilis</i>	15
Bluebunch Fescue	<i>Festuca idahoensis</i>	15
June Grass (ultracoat)	<i>Koeleria macrantha</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sandberg Bluegrass	<i>Poa secunda</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Table 290. BrettYoung Parkland Natural Region mix.

Common Name	Scientific Name	Wt %
Fringed Brome (ultracoat)	<i>Bromus ciliatus</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	20
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Green Needle Grass	<i>Nassella viridula</i>	10
June Grass (ultracoat)	<i>Koeleria macrantha</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Table 291. BrettYoung Rocky Mountain Natural Region mix.

Common Name	Scientific Name	Wt %
Bluebunch Fescue	<i>Festuca idahoensis</i>	20
Alpine Bluegrass	<i>Poa alpina</i>	15
June Grass (ultracoat)	<i>Koeleria macrantha</i>	15
Mountain Brome	<i>Bromus marginatus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Common Name	Scientific Name	Wt %
Mountain Rough Fescue	<i>Festuca campestris</i>	10

6.2 GOLD MEDAL SEEDS LTD.

Gold Metal Seeds Ltd.¹¹ (GMSL; 2017a,b,c,d,e) offers a suite of native species seed mixes for a variety of uses.

6.2.1 Alberta Hiways Grass Seed Mixtures

GMSL offers mixes for each of the six Alberta Transportation seed zones (see section 2.1; Gold Metal Seeds Ltd., 2017a).

Table 292. GMSL Zone 1 wetland mixed wood native mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	40
Fringed Bromegrass	<i>Bromus ciliatus</i>	15
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10

Table 293. GMSL Zone 2 wetland mixed wood native mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	35
Fringed Bromegrass	<i>Bromus ciliatus</i>	20
Northern Wheatgrass	<i>Deschampsia caespitosa</i>	15
Tufted Hair Grass	<i>Elymus lanceolatus</i>	10
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	10

Table 294. GMSL Zone 3 central mixed wood native mix (with ticklegrass).

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	30

¹¹ See <http://www.goldmedalseeds.ca/index.html>

Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Rough Hair Grass	<i>Agrostis scabra</i>	15
Fringed Bromegrass	<i>Bromus ciliatus</i>	10
Canada Wild Rye	<i>Elymus canadensis</i>	10
Tufted Hair Grass	<i>Elymus lanceolatus</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	5

Table 295. GMSL Zone 3 central mixed wood native mix (without ticklegrass).

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	35
Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Fringed Bromegrass	<i>Bromus ciliatus</i>	15
Canada Wild Rye	<i>Elymus canadensis</i>	10
Tufted Hair Grass	<i>Elymus lanceolatus</i>	10
Fowl Bluegrass	<i>Poa palustris</i>	5

Table 296. GMSL Zone 4 mixed grass & dry mixed grass mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	30
Canada Wild Rye	<i>Elymus canadensis</i>	15
Mountain Bromegrass	<i>Bromus marginatus</i>	15
Northern Wheatgrass	<i>Deschampsia caespitosa</i>	10
Alkali Grass	<i>Puccinellia distans</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5

Table 297. GMSL Zone 5 central parkland mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25
Fringed Bromegrass	<i>Bromus ciliatus</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Alkali Grass	<i>Puccinellia distans</i>	10

Common Name	Scientific Name	Wt %
Canada Wild Rye	<i>Elymus canadensis</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5

Table 298. GMSL Zone 6 lower foothills mix (with Rough Hair Grass).

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	30
Smooth Wild Rye	<i>Elymus glaucus</i>	20
Rough Hair Grass	<i>Agrostis scabra</i>	10
Fringed Bromegrass	<i>Bromus ciliatus</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Mountain Rough Fescue	<i>Festuca campestris</i>	10

Table 299. GMSL Zone 6 lower foothills mix (without Rough Hair Grass).

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	30
Smooth Wild Rye	<i>Elymus glaucus</i>	25
Fringed Bromegrass	<i>Bromus ciliatus</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	10
Mountain Rough Fescue	<i>Festuca campestris</i>	10

6.2.2 Forage and Reclamation Mixtures

GMSL offers several mixes for forage and reclamation seeding (Gold Metal Seeds Ltd., 2017b).

Table 300. GMSL EID reclamation mixture.

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15

Common Name	Scientific Name	Wt %
Blue Grama	<i>Bouteloua gracilis</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	10
Sandberg Bluegrass	<i>Poa secunda</i>	10

Table 301. GMSL EID prairie mixture.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Pubescent Wheatgrass	<i>Thinopyrum intermedium</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Italian Ryegrass	<i>Lolium multiflorum</i>	10
Sheep Fescue	<i>Festuca ovina</i>	5

Table 302. GMSL SNC native fescue mixture.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Green Needle Grass	<i>Nassella viridula</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Rough Fescue	<i>Festuca hallii</i>	5
June Grass	<i>Koeleria macrantha</i>	5

Table 303. GMSL Crown mixture.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	30
Northern Wheatgrass	<i>Elymus lanceolatus</i>	30
Green Needle Grass	<i>Nassella viridula</i>	25
Blue Grama	<i>Bouteloua gracilis</i>	15

6.2.3 Suffield Cluster Mixtures

GMSL offers 5 native Suffield cluster mixtures (Gold Metal Seeds Ltd., 2017c).

Table 304. GMSL Suffield cluster 2 mixture.

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	45
Blue Grama	<i>Bouteloua gracilis</i>	25
June Grass	<i>Koeleria macrantha</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Sand Grass	<i>Calamovilfa longifolia</i>	5
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5

Table 305. GMSL Suffield cluster 3 mixture.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	40
Sand Grass	<i>Calamovilfa longifolia</i>	30
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	10
June Grass	<i>Koeleria macrantha</i>	5
Blue Grama	<i>Bouteloua gracilis</i>	5

Table 306. GMSL Suffield cluster 4 mixture.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	45
June Grass	<i>Koeleria macrantha</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Sand Grass	<i>Calamovilfa longifolia</i>	5
Saltgrass	<i>Distichlis spicata</i>	5
Green Needle Grass	<i>Nassella viridula</i>	5

Table 307. GMSL Suffield cluster 5 mixture.

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	30
June Grass	<i>Koeleria macrantha</i>	20

Common Name	Scientific Name	Wt %
Blue Grama	<i>Bouteloua gracilis</i>	20
Green Needle Grass	<i>Nassella viridula</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Saltgrass	<i>Distichlis spicata</i>	5

Table 308. GMSL Suffield cluster 6 mixture.

Common Name	Scientific Name	Wt %
Blue Grama	<i>Bouteloua gracilis</i>	35
June Grass	<i>Koeleria macrantha</i> =	20
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	20
Saltgrass	<i>Distichlis spicata</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5

6.2.4 Special Areas Native Grass Seed Mixes

GMSL offers nine seed mixes for use in Special Areas Board land. All mixes are seeded at 12 to 15 lbs/acre.

Table 309. GMSL Special Areas loamy mix 1 (Brown Soil Zone – Dry Mixedgrass).

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	70
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Northern Wheatgrass	<i>Elymus lanceolatus</i>	9
Blue Grama	<i>Bouteloua gracilis</i>	5
June Grass	<i>Koeleria macrantha</i>	1

Table 310. GMSL Special Areas solonetzic mix 1 (Brown Soil Zone – Dry Mixedgrass).

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	45
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	35
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10

Common Name	Scientific Name	Wt %
Sandberg Bluegrass	<i>Poa secunda</i>	5
Blue Grama	<i>Bouteloua gracilis</i>	3
June Grass	<i>Koeleria macrantha</i>	2

Table 311. GMSL Special Areas sandy mix 1 (Brown Soil Zone – Dry Mixedgrass).

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	50
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Sand Grass	<i>Calamovilfa longifolia</i>	8
Blue Grama	<i>Bouteloua gracilis</i>	1
June Grass	<i>Koeleria macrantha</i>	1

Table 312. GMSL Special Areas loamy mix 2 (Dark Brown Soil Zone – Mixedgrass).

Common Name	Scientific Name	Wt %
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	60
Northern Wheatgrass	<i>Elymus lanceolatus</i>	18
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
June Grass	<i>Koeleria macrantha</i>	1
Blue Grama	<i>Bouteloua gracilis</i>	1

Table 313. GMSL Special Areas solonetzic mix 2 (Dark Brown Soil Zone – Northern Fescue).

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	35
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	25
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Western Porcupine	<i>Hesperostipa curtisetata</i>	12
Plains Rough Fescue	<i>Festuca hallii</i>	5
June Grass	<i>Koeleria macrantha</i>	2
Sandberg Bluegrass	<i>Poa secunda</i>	1

Table 314. GMSL Special Areas sandy mix 2 (Dark Brown Sol Zone – Northern Fescue).

Common Name	Scientific Name	Wt %
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	55
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Western Porcupine	<i>Hesperostipa curtisetata</i>	15
Sand Grass	<i>Calamovilfa longifolia</i>	7
June Grass	<i>Koeleria macrantha</i>	1
Sandberg Bluegrass	<i>Poa secunda</i>	1
Blue Grama	<i>Bouteloua gracilis</i>	1

Table 315. GMSL Special Areas loamy mix 3 (Dark Brown Soil Zone – Northern Fescue).

Common Name	Scientific Name	Wt %
Western Porcupine	<i>Hesperostipa curtisetata</i>	55
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Plains Rough Fescue	<i>Festuca hallii</i>	12
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	12
Western Wheatgrass	<i>Pascopyrum smithii</i>	5
June Grass	<i>Koeleria macrantha</i>	1

Table 316. GMSL Special Areas sandy mix 3 (Dark Brown Soil Zone – Central Parkland).

Common Name	Scientific Name	Wt %
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	80
Plains Rough Fescue	<i>Festuca hallii</i>	10
Sand Grass	<i>Calamovilfa longifolia</i>	8
June Grass	<i>Koeleria macrantha</i>	1
Blue Grama	<i>Bouteloua gracilis</i>	1

Table 317. GMSL Special Areas saline mix (all soil zones).

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	40
Salt Grass	<i>Distichlis spicata</i>	20
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	18
Northern Wheatgrass	<i>Elymus lanceolatus</i>	12

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	8
June Grass	<i>Koeleria macrantha</i>	1
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	1

6.3 GPEC GREEN PATCH ENVIRONMENTAL CONSULTING LTD.

GPEC (Green Patch Environmental Consulting Ltd., nd) has native species mixes available (see list below) as well as seed for individual species (see section 7.2). Only species are listed in the mixes – no information was available online about the ratio of seeds for each species.

Table 318. GPEC alpine blend.

Common Name	Scientific Name
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
High Wildrye	<i>Elymus violaceus</i>
Rough Fescue	<i>Festuca hallii</i>
Rocky Mountain Fescue or Bluebunch Fescue	<i>Festuca saximontana</i> or <i>Festuca idahoensis</i>
Hairy Wild Rye or Smooth Wild Rye	<i>Leymus innovatus</i> or <i>Elymus glaucus</i>
Glacier Alpine Bluegrass	<i>Poa alpina</i>
Sentinel Spike Trisetum	<i>Trisetum spicatum</i>

Table 319. GPEC upper foothills blend.

Common Name	Scientific Name
Fringed Brome or Porter's Brome	<i>Bromus ciliatus</i> or <i>Bromus porteri</i>
Nortran Tufted Hair Grass	<i>Deschampsia caespitosa</i>
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>
Butte Alpine Fescue or Bluebunch Fescue	<i>Festuca brachyphylla</i> or <i>Festuca idahoensis</i>
June Grass	<i>Koeleria macrantha</i>
Hairy Wild Rye or Smooth Wild Rye	<i>Leymus innovatus</i> or <i>Elymus glaucus</i>

Table 320. GPEC lower foothills blend.

Common Name	Scientific Name
Fringed Brome or Porter's Brome	<i>Bromus ciliatus</i> or <i>Bromus porteri</i>
Nortran Tufted Hair Grass	<i>Deschampsia caespitosa</i>
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>
Rough Fescue	<i>Festuca hallii</i>
Hairy Wild Rye or Smooth Wild Rye	<i>Leymus innovatus</i> or <i>Elymus glaucus</i>
Fowl Bluegrass	<i>Poa palustris</i>

Table 321. GPEC central blend.

Common Name	Scientific Name
Slough Grass	<i>Beckmannia syzigachne</i>
Fringed Brome or Porter's Brome	<i>Bromus ciliatus</i> or <i>Bromus porteri</i>
Nortran Tufted Hair Grass	<i>Deschampsia caespitosa</i>
Elbee Northern Wheatgrass	<i>Elymus lanceolatus</i>
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>
June Grass	<i>Koeleria macrantha</i>
Wild Rye or Smooth Wild Rye	<i>Leymus innovatus</i> or <i>Elymus glaucus</i>
Fowl Blue Grass	<i>Poa palustris</i>

Table 322. GPEC central parkland blend.

Common Name	Scientific Name
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>
Adanac Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>
Rough Fescue	<i>Festuca hallii</i>
Butte Alpine Fescue or Bluebunch Fescue	<i>Festuca brachyphylla</i> or <i>Festuca idahoensis</i>
June Grass	<i>Koeleria macrantha</i>

Common Name	Scientific Name
Green Needle Grass	<i>Nassella viridula</i>
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>

Table 323. GPEC mixed grasses blend.

Common Name	Scientific Name
Northern Wheatgrass	<i>Elymus lanceolatus</i>
Hillcrest Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>
Adanac Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>
Needle-and-Thread Grass	<i>Hesperostipa comata</i>
June Grass	<i>Koeleria macrantha</i>
Green Needle Grass	<i>Nassella viridula</i>
Walsh Western Wheatgrass	<i>Pascopyrum smithii</i>

6.4 HANNAS SEEDS

Hannas Seeds provides species lists for seven recommended native grass seed mixes in their Spring 2017 price list (Hannas Seeds, 2017). They also have mixes tailored to the Alberta Transportation requirements (Alberta Infrastructure and Transportation, 2005).

Table 324. Hannas natural blend.

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Blue Grama	<i>Bouteloua gracilis</i>	10
Rough Fescue	<i>Festuca hallii</i>	10

Table 325. Hannas native "A" blend.

Common Name	Scientific Name	Wt %
Sheep Fescue	<i>Festuca ovina</i>	35
Slender Wheatgrass	<i>Elymus trachycaulus</i>	35
Alkali Grass	<i>Puccinellia distans</i>	5
Blue Grama	<i>Bouteloua gracilis</i>	5

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	5
Indian Rice Grass	<i>Achnatherum hymenoides</i>	5
Northern Wheatgrass	<i>Elymus lanceolatus</i>	5
Western Wheatgrass	<i>Pascopyrum smithii</i>	5

Table 326. Hannas dry loamy blend.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Green Needle Grass	<i>Nassella viridula</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
June Grass	<i>Koeleria macrantha</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Table 327. Hannas moist loamy blend.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	25
Green Needle Grass	<i>Nassella viridula</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	20
Rough Fescue	<i>Festuca hallii</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Table 328. Hannas sandy blend.

Common Name	Scientific Name	Wt %
Indian Rice Grass	<i>Achnatherum hymenoides</i>	25
Canada Wild Rye	<i>Elymus canadensis</i>	20
Sand Grass	<i>Calamovilfa longifolia</i>	15
Green Needle Grass	<i>Nassella viridula</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Sand Dropseed	<i>Sporobolus cryptandrus</i>	10

Table 329. Hannas solonetzic clay blend.

Common Name	Scientific Name	Wt %
Western Wheatgrass	<i>Pascopyrum smithii</i>	35
Blue Grama	<i>Bouteloua gracilis</i>	20
June Grass	<i>Koeleria macrantha</i>	20
Green Needle Grass	<i>Nassella viridula</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Table 330. Hannas saline blend.

Common Name	Scientific Name	Wt %
Alkali Grass	<i>Puccinellia distans</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus</i>	25
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	25
Western Wheatgrass	<i>Pascopyrum smithii</i>	25

6.5 NORTHSTAR SEED

Northstar Seed offers six seed blends (Northstar Seed, 2017).

Table 331. Northstar foothills native blend.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	30
Mountain Rough Fescue	<i>Festuca campestris</i>	25
Mountain Brome	<i>Bromus marginatus</i>	15
June Grass	<i>Koeleria macrantha</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	10
Alpine Blue Grass	<i>Poa alpina</i>	10

Table 332. Northstar north/central parkland native blend.

Common Name	Scientific Name	Wt %
Northern Wheatgrass	<i>Elymus lanceolatus</i>	20
Canada Wild Rye	<i>Elymus canadensis</i>	20
Fringed Brome	<i>Bromus ciliatus</i>	15

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Green Needle Grass	<i>Nassella viridula</i>	10
June Grass	<i>Koeleria macrantha</i>	5

Table 333. Northstar southern prairie native blend.

Common Name	Scientific Name	Wt %
Plains Rough Fescue	<i>Festuca hallii</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
June Grass	<i>Koeleria macrantha</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	10
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	5

Table 334. Northstar sandy soils native blend.

Common Name	Scientific Name	Wt %
Sand Grass	<i>Calamovilfa longifolia</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Blue Grama	<i>Bouteloua gracilis</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Indian Rice Grass	<i>Achnatherum hymenoides</i>	15
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	10

Table 335. Northstar wetland native blend.

Common Name	Scientific Name	Wt %
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	20
Fowl Bluegrass	<i>Poa palustris</i>	20
Canada Wild Rye	<i>Elymus canadensis</i>	20
Slough Grass	<i>Beckmannia syzigachne</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus</i>	15
Rough Hair Grass	<i>Agrostis scabra</i>	10

Table 336. Northstar slope stabilization native blend.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	40
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Canada Wild Rye	<i>Elymus canadensis</i>	20

6.6 PICKSEED

Pickseed has 15 reclamation mixtures divided amongst five natural regions in Alberta (Pickseed, 2017a) as well as five native grass blends for the prairie-wide region (Pickseed, 2017b).

6.6.1 Foothills Natural Region

Table 337. Pickseed lower foothills blend.

Common Name	Scientific Name	Wt %
Mountain Brome	<i>Bromus marginatus</i>	30
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	25
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	5
Rocky Mountain Fescue	<i>Festuca saximontana</i>	5
Slough Grass	<i>Beckmannia syzigachne</i>	3
Fowl Bluegrass	<i>Poa palustris</i>	2
Rough Hair Grass	<i>Agrostis scabra</i>	2
June Grass	<i>Koeleria macrantha</i>	2
Spike Trisetum	<i>Trisetum spicatum</i>	1

Table 338. Pickseed lower foothills (sandy slopes) blend.

Common Name	Scientific Name	Wt %
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	35
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	35
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
June Grass	<i>Koeleria macrantha</i>	5
Spike Trisetum	<i>Trisetum spicatum</i>	3

Common Name	Scientific Name	Wt %
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	2

Table 339. Pickseed upper foothills blend.

Common Name	Scientific Name	Wt %
Mountain Brome	<i>Bromus marginatus</i>	23
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Fowl Bluegrass	<i>Poa palustris</i>	2
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	2
Alpine Bluegrass	<i>Poa alpina</i>	5
June Grass	<i>Koeleria macrantha</i>	3
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	15
Sloughgrass	<i>Beckmannia syzigachne</i>	5
High Wildrye	<i>Elymus violaceus</i>	15

6.6.2 Boreal Forest Natural Region

Table 340. Pickseed central mixedwood blend.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Bromus marginatus</i>	34
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	35
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	3
June Grass	<i>Koeleria macrantha</i>	3
Rough Hair Grass	<i>Agrostis scabra</i>	2
Spike Trisetum	<i>Trisetum spicatum</i>	5
Fowl Bluegrass	<i>Poa palustris</i>	3

Table 341. Pickseed central mixedwood with Italian Ryegrass blend.

Common Name	Scientific Name	Wt %
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	25
Canada Wild Rye	<i>Elymus canadensis</i>	20

Common Name	Scientific Name	Wt %
Fowl Bluegrass	<i>Poa palustris</i>	16
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	13
Italian Ryegrass	<i>Lolium multiflorum</i>	9
June Grass	<i>Koeleria macrantha</i>	2

Table 342. Pickseed dry mixedwood blend.

Common Name	Scientific Name	Wt %
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	30
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	20
Streambank Wheatgrass	<i>Elymus lanceolatus ssp. riparius</i>	17
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	8
Slough Grass	<i>Beckmannia syzigachne</i>	5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	3
Fowl Bluegrass	<i>Poa palustris</i>	2

Table 343. Pickseed boreal highlands blend.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	32
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	32
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Fowl Bluegrass	<i>Poa palustris</i>	5
Slough Grass	<i>Beckmannia syzigachne</i>	5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	3
June Grass	<i>Koeleria macrantha</i>	3
Spike Trisetum	<i>Trisetum spicatum</i>	3
Rough Hair Grass	<i>Agrostis scabra</i>	2

6.6.3 Rocky Mountain Natural Region

Table 344. Pickseed subalpine subregion blend.

Common Name	Scientific Name	Wt %
Mountain Brome	<i>Bromus marginatus</i>	28
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	25
Fringed Brome – GroKoted	<i>Bromus ciliatus</i>	15
Bluebunch Fescue	<i>Festuca idahoensis</i>	8
Rocky Mountain Fescue	<i>Festuca saximontana</i>	7
June Grass	<i>Koeleria macrantha</i>	5
Alpine Bluegrass	<i>Poa alpina</i>	5
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	3
Fowl Bluegrass	<i>Poa palustris</i>	2
Spike Trisetum	<i>Trisetum spicatum</i>	2

Table 345. Pickseed alpine subregion blend.

Common Name	Scientific Name	Wt %
Alpine Bluegrass	<i>Poa alpina</i>	43
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	35
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Spike Trisetum	<i>Trisetum spicatum</i>	2

6.6.4 Parkland Natural Region

Table 346. Pickseed Peace River parkland blend.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	35
Highlander Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
June Grass	<i>Koeleria macrantha</i>	5
Western Porcupine Grass	<i>Hesperostipa curtisetata</i>	5

Table 347. Pickseed central parkland blend.

Common Name	Scientific Name	Wt %
Green Needle Grass	<i>Nassella viridula</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Sandberg Bluegrass	<i>Poa secunda</i>	5

Table 348. Pickseed foothills parkland blend.

Common Name	Scientific Name	Wt %
Fringed Brome	<i>Bromus ciliatus</i>	20
Mountain Brome	<i>Bromus marginatus</i>	20
Highlander Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	20
Rocky Mountain Fescue	<i>Festuca saximontana</i>	15
Bluebunch Fescue	<i>Festuca idahoensis</i>	5

6.6.5 Grassland Natural Region

Table 349. Pickseed dry mixedgrass / mixed grass prairie blend.

Common Name	Scientific Name	Wt %
Highlander Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	25
Green Needle Grass	<i>Nassella viridula</i>	20
Northern Wheatgrass	<i>Elymus lanceolatus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Purple Prairie Clover	<i>Dalea purpurea</i>	10
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	5
Sandberg Bluegrass	<i>Poa secunda</i>	5

Common Name	Scientific Name	Wt %
June Grass	<i>Koeleria macrantha</i>	5

Table 350. Pickseed foothills fescue blend.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20
Rocky Mountain Fescue	<i>Festuca saximontana</i>	17
Highlander Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Purple Prairie Clover	<i>Dalea purpurea</i>	5
June Grass	<i>Koeleria macrantha</i>	3

Table 351. Pickseed northern fescue blend.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	15
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	5
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Sandberg Bluegrass	<i>Poa secunda</i>	5

6.6.6 Native Grass Blends

Table 352. Pickseed aspen parkland blend.

Common Name	Scientific Name	Wt %
Fringed Bromegrass	<i>Bromus ciliatus</i>	20
Green Needle Grass	<i>Nassella viridula</i>	20

Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Sloughgrass	<i>Beckmannia syzigachne</i>	5
Bluebunch Fescue	<i>Festuca idahoensis</i>	5
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	5
June Grass	<i>Koeleria macrantha</i>	5

Table 353. Pickseed moist mixed grassland blend.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	20
Rocky Mountain Fescue	<i>Festuca saximontana</i>	20
Western Wheatgrass	<i>Pascopyrum smithii</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
Slough Grass	<i>Beckmannia syzigachne</i>	5
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	5
June Grass	<i>Koeleria macrantha</i>	5
Purple Prairie Clover	<i>Dalea purpurea</i>	5

Table 354. Pickseed mixed grassland blend.

Common Name	Scientific Name	Wt %
Sheep Fescue	<i>Festuca ovina</i>	25
Green Needle Grass	<i>Nassella viridula</i>	15
Needle-and-Thread Grass	<i>Hesperostipa comata ssp. comata</i>	10
Indian Rice Grass	<i>Achnatherum hymenoides</i>	10
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Northern Wheatgrass	<i>Elymus lanceolatus</i>	10
Alkali Grass	<i>Puccinellia distans</i>	10
Blue Grama	<i>Bouteloua gracilis</i>	5
June Grass	<i>Koeleria macrantha</i>	5

Table 355. Pickseed grassland wet blend.

Common Name	Scientific Name	Wt %
Mountain Brome	<i>Bromus marginatus</i>	25
High Wildrye	<i>Elymus violaceus</i>	25
Sheep Fescue	<i>Festuca ovina</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	12
Fowl Bluegrass	<i>Poa palustris</i>	5
Slough Grass	<i>Beckmannia syzigachne</i>	5
June Grass	<i>Koeleria macrantha</i>	3
Spike Trisetum	<i>Trisetum spicatum</i>	3
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	3
Canada Bluegrass	<i>Poa compressa</i>	2
Rough Hair Grass	<i>Agrostis scabra</i>	2

Table 356. Pickseed cypress upland blend.

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	25
Mountain Brome	<i>Bromus marginatus</i>	20
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	15
Green Needle Grass	<i>Nassella viridula</i>	15
Western Wheatgrass	<i>Pascopyrum smithii</i>	10
Bluebunch Fescue	<i>Festuca idahoensis</i>	10
June Grass	<i>Koeleria macrantha</i>	3
Canada Bluegrass	<i>Poa compressa</i>	2

6.7 SEABORN SEEDS INC.

Seaborn Seeds Inc. (2013) supplies a green native mix.

Table 357. Seaborn Seeds Inc. green native mix.

Common Name	Scientific Name	Wt %
Slender Wheatgrass	<i>Elymus trachycaulus</i>	20
Tufted Hair Grass	<i>Deschampsia caespitosa</i>	12
Alpine Bluegrass	<i>Poa alpina</i>	10

Common Name	Scientific Name	Wt %
Rocky Mountain Fescue	<i>Festuca saximontana</i>	10
Sheep Fescue	<i>Festuca ovina</i>	10
Mountain Brome	<i>Bromus marginatus</i>	9
Italian Ryegrass	<i>Lolium multiflorum</i>	6
Canada Bluegrass	<i>Poa compressa</i>	6
Mountain Timothy	<i>Phleum commutatum</i>	5
Hair Bentgrass	<i>Agrostis scabra</i>	3
Fowl Bluegrass	<i>Poa palustris</i>	3
Fowl Manna Grass	<i>Glyceria striata</i>	3
Fringed Brome	<i>Bromus ciliatus</i>	3

6.8 WILD ABOUT FLOWERS

Wild about Flowers (2017a, b) has twelve seed mixes available for varying environmental setting and purposes.

Table 358. Wild about Flowers prairie meadow native grass seed mix.

Common Name	Scientific Name
Rough Hair Grass	<i>Agrostis scabra</i>
Blue Grama	<i>Bouteloua gracilis</i>
Rough Fescue	<i>Festuca hallii</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
Needle-and-Thread Grass	<i>Hesperostipa comata</i>
June Grass	<i>Koeleria macrantha</i>

In the source document, Wild About Flowers provides several batches for each of the wildflower mixes listed below - contact the supplier to determine which species are in the current batch.

Table 359. Wild about Flowers short grass wildflower meadow mix.

Common Name	Scientific Name
Blue Sheep Fescue	<i>Festuca ovina</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
June Grass	<i>Koeleria macrantha</i>
Alpine Bluegrass	<i>Poa alpina</i>

Common Name	Scientific Name
Cut-leaved Anemone	<i>Anemone multifida</i>
Prairie Crocus	<i>Anemone patens</i>
Alpine Everlasting	<i>Antennaria aprica</i>
Harebell	<i>Campanula rotundifolia</i>
Purple Prairie Clover	<i>Dalea purpurea</i>
Smooth Fleabane	<i>Erigeron glabellus</i>
Three-flowered Avens	<i>Geum triflorum</i>
Golden Aster	<i>Heterotheca villosa</i>
Dotted Blazingstar	<i>Liatris punctata</i>
Alpine Forget-me-not	<i>Myosotis asiatica</i>
Late Yellow Locoweed	<i>Oxytropis monticola</i>
Early Yellow Locoweed	<i>Oxytropis sericea</i>
Showy Locoweed	<i>Oxytropis splendens</i>
Yellow Beardtongue	<i>Penstemon confertus</i>
Slender Blue Beardtongue	<i>Penstemon procerus</i>
Showy Jacob's-ladder	<i>Polemonium pulcherrimum</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Common Blue-eyed Grass	<i>Sisyrinchium montanum</i>
Low Goldenrod	<i>Solidago missouriensis</i>
Alpine Goldenrod	<i>Solidago multiradiata</i>
Creeping White Prairie Aster	<i>Symphotrichum falcatum</i> var. <i>falcatum</i>
Early Blue Violet	<i>Viola adunca</i>

Table 360. Wild about Flowers high diversity mix – prairie meadow.

Common Name	Scientific Name
Yarrow	<i>Achillea millefolium</i>
Long-headed Anemone	<i>Anemone cylindrica</i>
Cut-leaved Anemone	<i>Anemone multifida</i>
Prairie Crocus	<i>Anemone patens</i>
Common Pussytoes	<i>Antennaria aprica</i>
Rosy Pussytoes	<i>Antennaria rosea</i>

Common Name	Scientific Name
Leafy Arnica	<i>Arnica chamissonis</i>
Prairie Sagewort	<i>Artemisia ludoviciana</i>
Showy Milkweed	<i>Asclepias speciosa</i>
Alpine Aster	<i>Aster alpinus</i>
Harebell	<i>Campanula rotundifolia</i>
Nuttall's Delphinium	<i>Delphinium nuttalianium</i>
Mountain Shooting Star	<i>Dodecatheon conjugens</i>
White Cinquefoil	<i>Drymocaulis arguta</i>
Purple Coneflower	<i>Echinacea angustifolia</i>
Smooth Fleabane	<i>Erigeron glabellus</i>
Spotted Joe Pyeweed	<i>Eutrochium maculatum</i>
Yellowbell	<i>Fritillaria pudica</i>
Gaillardia	<i>Gaillardia aristata</i>
Northern Bedstraw	<i>Galium boreale</i>
Sticky Purple Geranium	<i>Geranium viscosissimum</i>
Three-flowered Avens	<i>Geum triflorum</i>
Prairie Sunflower	<i>Helianthus petiolaris</i>
Golden Aster	<i>Heterotheca villosa</i>
Richardson's Alumroot	<i>Heuchera richardsonii</i>
Meadow Blazingstar	<i>Liatris ligulistylis</i>
Wild Blue Flax	<i>Linum lewisii</i>
Long-fruited Wild Parsley	<i>Lomatium macrocarpum</i>
Silvery Perennial Lupine	<i>Lupinus argenteus</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Low Goldenrod	<i>Solidago missouriensis</i>
Smooth Aster	<i>Symphyotrichum laeve</i>
Golden Bean	<i>Thermopsis rhombifolia</i>
Early Blue Violet	<i>Viola adunca</i>

Table 361. Wild about Flowers high diversity mix – dry/rocky.

Common Name	Scientific Name
Nodding Onion	<i>Allium cernuum</i>
Cut-leaved Anemone	<i>Anemone multifida</i>
Rosy Pussytoes	<i>Antennaria rosea</i>
Pasture Sagewort	<i>Artemisia frigida</i>
Harebell	<i>Campanula rotundifolia</i>
Purple Prairie-clover	<i>Dalea purpurea</i>
Nuttall's Delphinium	<i>Delphinium nuttalianum</i>
Yellow Mountain Avens	<i>Dryas drummondii</i>
Tufted Fleabane	<i>Erigeron caespitosus</i>
Subalpine Umbrellaplant	<i>Eriogonum umbellatum</i>
Arctic Aster	<i>Eurybia sibirica</i>
Gaillardia	<i>Gaillardia aristata</i>
Rhombic-leaved Sunflower	<i>Helianthus pauciflorus ssp. subrhomboideus</i>
Golden Aster	<i>Heterotheca villosa</i>
Dotted Blazingstar	<i>Liatris punctata</i>
Rhomboid-leaved Saxifrage	<i>Micranthes occidentalis</i>
Alpine Forget-me-not	<i>Myosotis asiatica</i>
Prickly-Pear	<i>Opuntia polyacantha</i>
Owl-clover	<i>Orthocarpus luteus</i>
Late Yellow Locoweed	<i>Oxytropis monticola</i>
Early Yellow Locoweed	<i>Oxytropis sericea</i>
Showy Locoweed	<i>Oxytropis splendens</i>
Blue Beardtongue	<i>Penstemon albertinus</i>
Shrubby Beardtongue	<i>Penstemon fruticosus</i>
Smooth Blue Beardtongue	<i>Penstemon nitidus</i>
Silky Scorpionweed	<i>Phacelia sericea</i>
Showy Jacob's-ladder	<i>Polemonium pulcherrimum</i>
Woolly Cinquefoil	<i>Potentilla hippiana</i>
Prairie Cinquefoil	<i>Potentilla pensylvanica</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>

Common Name	Scientific Name
Spotted Saxifrage	<i>Saxifraga bronchialis</i>
Lance-leaved Stonecrop	<i>Sedum lanceolatum</i>
Common Blue-eyed Grass	<i>Sisyrinchium montanum</i>
Sticky Goldenrod	<i>Solidago simplex</i>
Creeping White Prairie Aster	<i>Symphyotrichum falcatum var. falcatum</i>
Parry's Townsendia	<i>Townsendia parryi</i>

Table 362. Wild about Flowers high diversity mix – open woodland.

Common Name	Scientific Name
Red and White Baneberry	<i>Actaea rubra</i>
Giant Hyssop	<i>Agastache foeniculum</i>
Canada Anemone	<i>Anemone canadensis</i>
Long-headed Anemone	<i>Anemone cylindrica</i>
Yellow Angelica	<i>Angelica dawsonii</i>
Showy Everlasting	<i>Antennaria pulcherrima</i>
Blue Columbine	<i>Aquilegia brevistyla</i>
Yellow Columbine	<i>Aquilegia flavescens</i>
Sitka Columbine	<i>Aquilegia formosa</i>
Common Bearberry	<i>Arctostaphylos uva-ursi</i>
Common Red Paintbrush	<i>Castilleja miniata</i>
Alpine Red Paintbrush	<i>Castilleja rhexiifolia</i>
Common Fireweed	<i>Chamerion angustifolium</i>
Western Clematis	<i>Clematis ligusticifolia</i>
Purple Clematis	<i>Clematis occidentalis</i>
Bunchberry	<i>Cornus canadensis</i>
Tall Larkspur	<i>Delphinium glaucum</i>
Showy Fleabane	<i>Erigeron speciosus</i>
Glacier Lily	<i>Erythronium grandiflorum</i>
Showy Aster	<i>Eurybia conspicua</i>
Northern Bedstraw	<i>Galium boreale</i>
Prairie Gentian	<i>Gentiana affinis</i>

Common Name	Scientific Name
Wild White Geranium	<i>Geranium richardsonii</i>
Sticky Alumroot	<i>Heuchera cylindrica</i>
Western Wood Lily	<i>Lilium philadelphicum</i>
Fern-leaved Desert-parsley	<i>Lomatium dissectum</i>
Twining Honeysuckle	<i>Lonicera dioica</i>
Silvery Perennial Lupine	<i>Lupinus argenteus</i>
Star-flowered Solomon's-seal	<i>Maianthemum stellatum</i>
Wild Mint	<i>Mentha arvensis</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Blunt-fruited Sweet Cicely	<i>Osmorhiza berteroi</i>
Western Sweet Cicely	<i>Osmorhiza occidentalis</i>
Western Lousewort	<i>Pedicularis bracteosa</i>
Yellow Beardtongue	<i>Penstemon confertus</i>
Slender Blue Beardtongue	<i>Penstemon procerus</i>
Tall Jacob's-ladder	<i>Polemonium acutiflorum</i>
Graceful Cinquefoil	<i>Potentilla gracilis</i>
Fairybells	<i>Prosartes trachycarpa</i>
Canada Goldenrod	<i>Solidago canadensis</i>
White Meadowsweet	<i>Spiraea betulifolia</i>
Bronzebells	<i>Stenanthium occidentale</i>
Lindley's Aster	<i>Symphyotrichum ciliolatum</i>
Tall Meadow Rue	<i>Thalictrum dasycarpum</i>
White Camas	<i>Zigadenus elegans</i>
Heart-leaved Alexanders	<i>Zizia aptera</i>

Table 363. Wild about Flowers high diversity mix – moist sun.

Common Name	Scientific Name
Red and White Baneberry	<i>Actaea rubra</i>
Giant Hyssop	<i>Agastache foeniculum</i>
Wild Chives	<i>Allium schoenoprasum</i>
Canada Anemone	<i>Anemone canadensis</i>

Common Name	Scientific Name
Sitka Columbine	<i>Aquilegia formosa</i>
Low Milkweed	<i>Asclepias ovalifolia</i>
Showy Milkweed	<i>Asclepias speciosa</i>
Alpine Aster	<i>Aster alpinus</i>
Blue Camas	<i>Camassia quamash</i>
Scabrous Black Sedge	<i>Carex atratiformis ssp. raymondii</i>
Golden Sedge	<i>Carex aurea</i>
Western Clematis	<i>Clematis ligusticifolia</i>
Tall Larkspur	<i>Delphinium glaucum</i>
Saline Shooting Star	<i>Dodecatheon pulchellum</i>
Spotted Joe Pyeweed	<i>Eutrochium maculatum</i>
Prairie Gentian	<i>Gentiana affinis</i>
Purple Avens	<i>Geum rivale</i>
Cow Parsnip	<i>Heracleum maximum</i>
Fern-leaved Desert-parsley	<i>Lomatium dissectum</i>
Twining Honeysuckle	<i>Lonicera dioica</i>
Fringed Loosestrife	<i>Lysimachia ciliata</i>
Star-flowered Solomon's-seal	<i>Maianthemum stellatum</i>
Wild Mint	<i>Mentha arvensis</i>
Blunt-fruited Sweet Cicely	<i>Osmorhiza berteroi</i>
Elephant's-head	<i>Pedicularis groenlandica</i>
Slender Blue Beardtongue	<i>Penstemon procerus</i>
Canada Goldenrod	<i>Solidago canadensis</i>
Western Willow Aster	<i>Symphyotrichum lanceolatum</i>
Purple-stemmed Aster	<i>Symphyotrichum puniceum</i>
Heart-leaved Alexanders	<i>Zizia aptera</i>

Table 364. Wild about Flowers wildlife mix – wildflowers for bees.

Common Name	Scientific Name
Giant Hyssop	<i>Agastache foeniculum</i>
Prairie Crocus	<i>Anemone patens</i>

Common Name	Scientific Name
Harebell	<i>Campanula rotundifolia</i>
Cut-leaved Fleabane	<i>Erigeron compositus</i>
Smooth Fleabane	<i>Erigeron glabellus</i>
Gaillardia	<i>Gaillardia aristata</i>
Golden Aster	<i>Heterotheca villosa</i>
Richardson's Alumroot	<i>Heuchera richardsonii</i>
Meadow Blazingstar	<i>Liatris ligulistylis</i>
Early Yellow Locoweed	<i>Oxytropis sericea</i>
Blue Beardtongue	<i>Penstemon albertinus</i>
Yellow Beardtongue	<i>Penstemon confertus</i>
Silky Scorpionweed	<i>Phacelia sericea</i>
Showy Jacob's-ladder	<i>Polemonium pulcherrimum</i>
Sticky Goldenrod	<i>Solidago simplex</i>
Smooth Aster	<i>Symphyotrichum laeve</i>

Table 365. Wild about Flowers wildlife mix – wildflowers for butterflies.

Common Name	Scientific Name
Pearly Everlasting	<i>Anaphalis margaritacea</i>
Yellow Angelica	<i>Angelica dawsonii</i>
Showy Milkweed	<i>Asclepias speciosa</i>
Alpine Aster	<i>Aster alpinus</i>
Purple Coneflower	<i>Echinacea angustifolia</i>
Showy Fleabane	<i>Erigeron speciosus</i>
Subalpine Umbrellaplant	<i>Eriogonum umbellatum</i>
Showy Aster	<i>Eurybia conspicua</i>
Spotted Joe Pyeweed	<i>Eutrochium maculatum</i>
Common Tall Sunflower	<i>Helianthus nuttallii</i>
Rhombic-leaved Sunflower	<i>Helianthus pauciflorus ssp. subrhomboideus</i>
Wild Bergamot	<i>Monarda fistulosa</i>
Slender Blue Beardtongue	<i>Penstemon procerus</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>

Common Name	Scientific Name
Alpine Goldenrod	<i>Solidago multiradiata</i>
Stiff Goldenrod	<i>Solidago rigida</i>
Early Blue Violet	<i>Viola adunca</i>
Heart-leaved Alexanders	<i>Zizia aptera</i>

Table 366. Wild about Flowers wildlife mix – wildflowers for birds.

Common Name	Scientific Name
Nodding Onion	<i>Allium cernuum</i>
Wild Chives	<i>Allium schoenoprasum</i>
Common Bearberry	<i>Arctostaphylos uva-ursi</i>
Balsamroot	<i>Balsamorhiza sagittata</i>
Alpine Red Paintbrush	<i>Castilleja miniata</i>
Bunchberry	<i>Cornus canadensis</i>
Yellow Umbrella-plant	<i>Eriogonum flavum</i>
Showy Aster	<i>Eurybia conspicua</i>
Wild Strawberry	<i>Fragaria virginiana</i>
Prairie Sunflower	<i>Helianthus petiolaris</i>
Dotted Blazingstar	<i>Liatris punctata</i>
Twining Honeysuckle	<i>Lonicera dioica</i>
Silky Lupine	<i>Lupinus sericeus</i>
Late Yellow Locoweed	<i>Oxytropis monticola</i>
Shrubby Beardtongue	<i>Penstemon fruticosus</i>
Smooth Blue Beardtongue	<i>Penstemon nitidus</i>
Mountain Cinquefoil	<i>Potentilla diversifolia</i>
Branched Cinquefoil	<i>Potentilla effusa</i>
Common Blue-eyed Grass	<i>Sisyrinchium montanum</i>

Table 367. Wild about Flowers Waterton Park wildflower mix – shade.

Common Name	Scientific Name
Red and White Baneberry	<i>Actaea rubra</i>
Yellow Columbine	<i>Aquilegia flavescens</i>

Common Name	Scientific Name
Spear-leaved Arnica	<i>Arnica lonchophylla</i>
Purple Clematis	<i>Clematis occidentalis</i>
Sparrow's-egg Lady's-slipper	<i>Cypripedium passerinum</i>
Sticky Alumroot	<i>Heuchera cylindrica</i>
Twining Honeysuckle	<i>Lonicera dioica</i>
Star-flowered Solomon's-seal	<i>Maianthemum stellatum</i>
Bishop's-cap	<i>Mitella pentandra</i>
Northern Grass-of-Parnassus	<i>Parnassia palustris</i>
Western Lousewort	<i>Pedicularis bracteosa</i>
Common Pink Wintergreen	<i>Pyrola asarifolia</i>
White Meadowsweet	<i>Spiraea betulifolia</i>
Bronzebells	<i>Stenanthium occidentale</i>
Clasping-leaved Twisted-stalk	<i>Streptopus amplexifolius</i>
Western Meadow-Rue	<i>Thalictrum occidentale</i>
Heart-leaved Alexanders	<i>Zizia aptera</i>

Table 368. Wild about Flowers Waterton Park wildflower mix – sun.

Common Name	Scientific Name
Nodding Onion	<i>Allium cernuum</i>
Cut-leaved Anemone	<i>Anemone multifida</i>
Rosy Everlasting	<i>Antennaria rosea</i>
Common Bearberry	<i>Arctostaphylos uva-ursi</i>
Harebell	<i>Campanula rotundifolia</i>
Alpine Red Paintbrush	<i>Castilleja miniata</i>
Mountain Shooting Star	<i>Dodecatheon conjugens</i>
Yellow Mountain Avens	<i>Dryas drummondii</i>
Smooth Fleabane	<i>Erigeron glabellus</i>
Subalpine Umbrellaplant	<i>Eriogonum umbellatum</i>
Gaillardia	<i>Gaillardia aristata</i>
Golden Aster	<i>Heterotheca villosa</i>
Dotted Blazingstar	<i>Liatris punctata</i>

Common Name	Scientific Name
Alpine Forget-me-not	<i>Myosotis asiatica</i>
Lance-leaved Stonecrop	<i>Sedum lanceolatum</i>
Early Blue Violet	<i>Viola adunca</i>



7.0 SOURCES OF INDIVIDUAL SPECIES IN MIXES

7.1 INNO TECH ALBERTA VARIETIES

InnoTech Alberta’s Breeder Seed Program has registered 22 native seed varieties for use in Alberta (Small et al., 2016a). Additional varieties are at various stages of development and registration.

Table 369. InnoTech Alberta Native Grass Varieties.

Registered Variety	Scientific Name	Soil /Region Adaptation	Origin
“AEC Highlander” slender wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i>	Black Chernozem, Brown, Dark Brown	Rocky Mountains
“AEC Hillcrest” awned wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	Black Chernozem, Brown, Dark Brown	Crowsnest Pass
“ARC Metisko” awned wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>	Sandy, Brown, Dark Brown	Metiskow
“AEC Mountaineer” broad-glumed wheatgrass	<i>Elymus violaceus</i>	Mountain soils, nutrient poor soils	Rocky Mountains
“AEC Glacier” alpine bluegrass	<i>Poa alpina</i>	Black Chernozem, Brown, Dark Brown	Lower elevation in the Rocky Mountains
“AEC Blueridge” alpine bluegrass	<i>Poa alpina</i>	Black Chernozem, Brown, Dark Brown	Rocky Mountains
“ARC Plateau” Rocky Mountain fescue	<i>Festuca saximontana</i>	Black Chernozem, Brown	Rocky Mountains
“AITF Painted Skies” Rocky Mountain fescue	<i>Festuca saximontana</i>	Sandy Parkland	Wainwright area
“ARC Butte” alpine fescue	<i>Festuca brachyphylla</i>	Sandy	Near Waterton Lake National Park
“ARC Vista” alpine fescue	<i>Festuca brachyphylla</i>	Black Chernozem, Brown	Rocky Mountains
“AITF Bison” plains rough fescue	<i>Festuca hallii</i>	Black Chernozem, Brown	Northern fescue region
“ARC Mountain View” June grass	<i>Koeleria macrantha</i>	Black Chernozem, Brown	Crowsnest Pass
“ARC Prairie” June grass	<i>Koeleria macrantha</i>	Black Chernozem, Brown, sandy	Crowsnest Pass

Registered Variety	Scientific Name	Soil /Region Adaptation	Origin
“ARC Grouse” green needle grass	<i>Nassella viridula</i>	Black Chernozem, Brown	Wainwright area
“AITF Badlands” blue grama	<i>Bouteloua gracilis</i>	Brown	Hand Hills, Hanna
“ARC Porter” Indian rice grass	<i>Achnatherum hymenoides</i>	Sandy, Dark brown	Wainwright – Ribstone Creek
“ARC Sentinel” spike trisetum	<i>Trisetum spicatum</i>	Black Chernozem, Brown, Dark Brown	Rocky Mountains
“ARC Hillbilly” nodding brome grass	<i>Bromus porteri</i>	Sandy Parkland	Wainwright area
“AITF Battle bend” tufted hair grass	<i>Deschampsia caespitosa</i>	Sandy Parkland, stabilisation of tailings sand	Wainwright area
“ARC Centennial” Canada wild rye	<i>Elymus canadensis</i>	Sandy	Wainwright area
“AITF Cascade” hairy wild rye	<i>Leymus innovatus</i>	Mountains/Upper Foothills	Jasper/Hinton
“ARC Aspen” Canada milk vetch (legume)	<i>Astragalus canadensis</i>	Sandy Parkland	Vegreville

7.2 COMMERCIAL SEED SOURCES

The following Alberta-based commercial sources for the species in the mixes were found. Species have been included if they were identified by the vendor as being currently available and/or historically available and/or potentially available on request. The information is provided in the Excel file.

ALCLA Native Plant Restoration Inc. – <http://www.alclanativeplants.com/> (updated species list provided by Al Fedkenheuer via e-mail)

BrettYoung – <http://www.brettyoung.ca/professional-turf-and-reclamation/seed/native-grasses>

Clark Ecoscience & Sustainability – https://static1.squarespace.com/static/5875a099c534a5e7e2b1805e/t/58ae699de58c62b1f48eab0f/1487825311083/CES_2017-Price-List.pdf

Dynamic Seeds Ltd. – <http://www.peaceforagetool.ca/supplier/dynamic-seeds-ltd> (list as of February 2015)

Gold Metal Seeds Ltd. (GMSL) – http://www.goldmedalseeds.ca/reclamation_pricelis.html

Green Patch Environmental Consulting Ltd. (GPEC) - <https://www.gpec.ca/native-grass.htm>

Hannas Seeds - <http://www.hannaseeds.com/view-page.aspx?id=9&Name=Grass-Seed>

Northstar Seed - Native & Reclamation Seed Guide - <http://www.northstarseed.com/wp-content/uploads/2017/02/Native-and-Reclamation-Guide-2017.pdf>

Pick Seed - http://www.pickseed.com/Admin/Public/DWSDownload.aspx?File=%2fFiles%2fFiles%2fCanada+Files%2f2018-Product-Guide%2fWestern-PAGES%2fNative-seed-for-reclamation_West.pdf

Sunshine Seeds - http://www.sunshinseeds.ca/native_grass_seed.html

Wild About Flowers - http://www.wildaboutflowers.ca/browse_latin_plant_name.php

The Canadian Native Plant Materials Exchange site may provide additional sources of native species plant materials¹².

Readers should contact vendors to determine ecological variety, source locality, species availability and volumes.



¹² See <http://hardgrass.ca/>

8.0 SUMMARY AND OPPORTUNITIES

8.1 SUMMARY

366 native species seed mixes were identified, 41% of which were either Required or Recommended (Figure 2). The majority of mixes (167) were for the Grasslands zone (Figure 3).

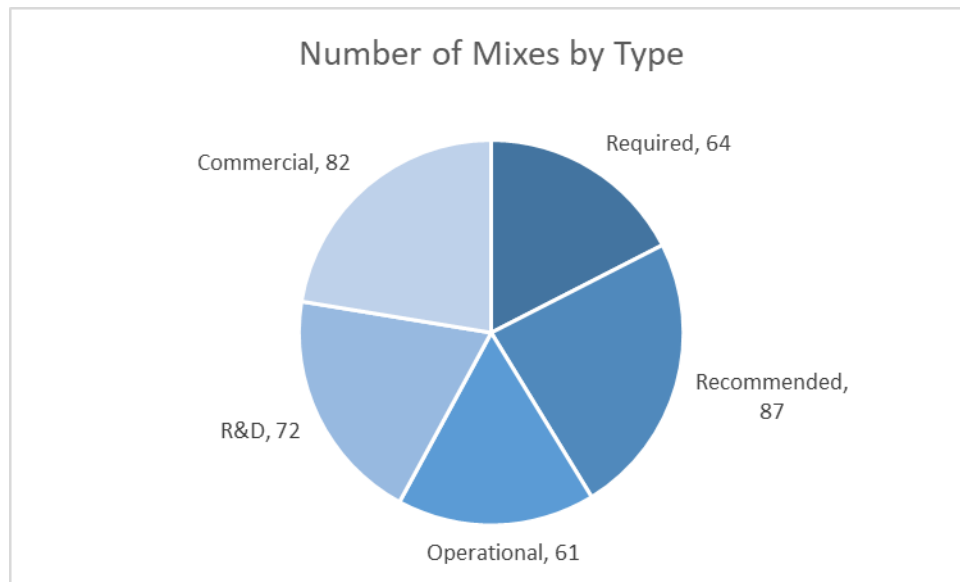


Figure 2. Types of mixes (366 total).

305 species and varieties/sources¹³ were included in the mixes; comprised of 269 unique species and 36 varieties/sources. The top five species found in the mixes were: June Grass – *Koeleria macrantha* (214 mixes); Northern Wheatgrass – *Elymus lanceolatus* (157); Western Wheatgrass – *Pascopyrum smithii* (129); Green Needle Grass – *Nassella viridula* (115); and, Rocky Mountain Fescue – *Festuca saximontana* (113). 108 species, mostly forbs, occurred only once in the mixes.

¹³ Some of the mixes noted a source (e.g., Alberta or Manitoba or Prairie Seeds) rather than a variety name.

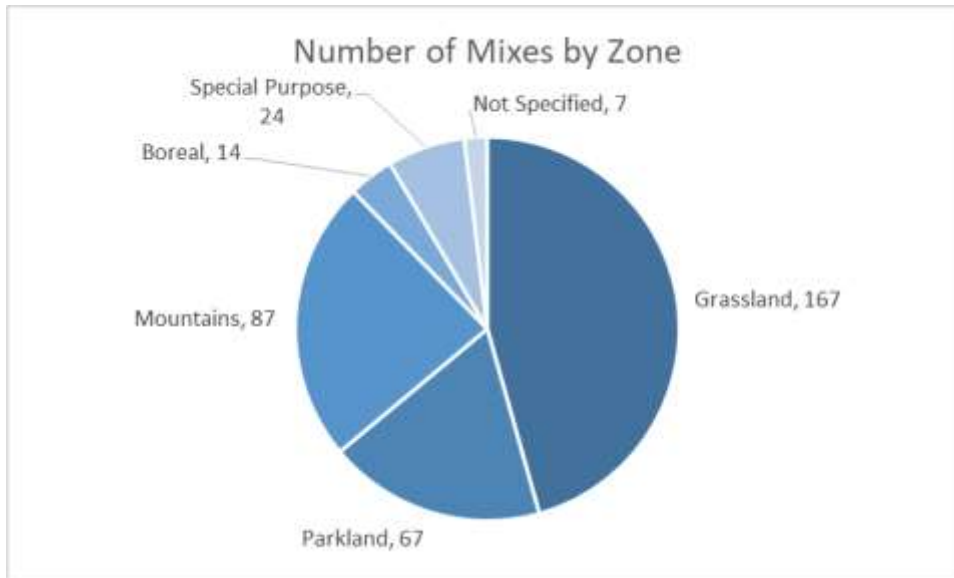


Figure 3. Number of mixes by zone (366 total).

Mixes with six species were most common (Figure 4; mean = 7.94; median = 7); the number of species in a mix ranged from 2 to 46. While the latter may seem high, the Tallgrass Prairie Center in Iowa recommended seeding 37 species of grasses, sedges and forbs for a diverse community (Williams, 2010).

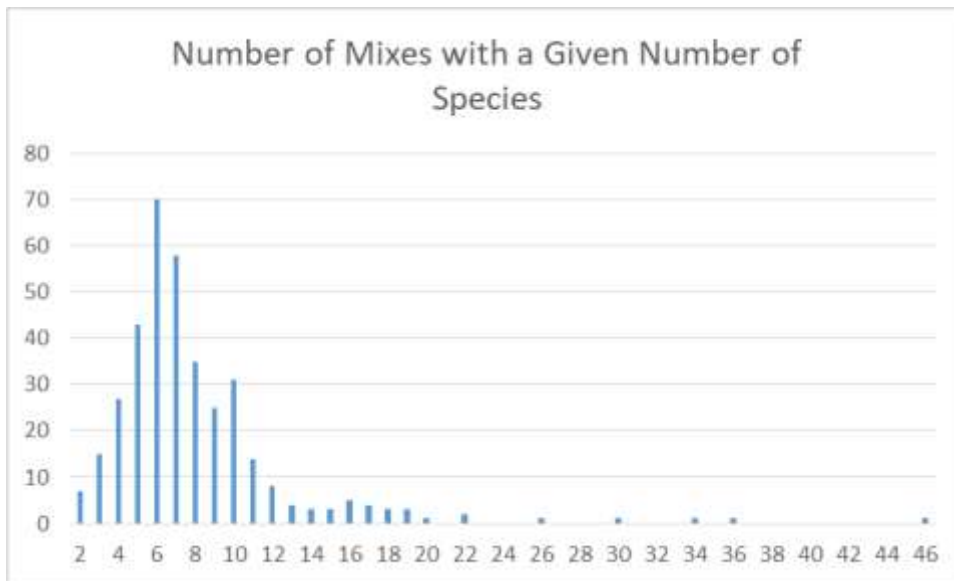


Figure 4. Number of species in mixes.

All mixes contained some common seed; 125 mixes included reference to at least one variety or source and 28 to an InnoTech Alberta variety.

The majority of mixes (233) were described in terms of weight % for each species (Figure 5), which ranged from a low of 1% in several mixes to a high of 80% (*Hesperostipa curtiseta* in the GMSL Special Areas sandy mix 3 (Dark Brown Soil Zone – Central Parkland)). The maximum PLS wt%

of 50 was found in 6 of the Recovery Strategy mixes (3 for *Festuca hallii*, two for *F. campestris* and one for *Hesperostipa comata*) (Lancaster et al., 2017a,b; Neville et al., 2014).

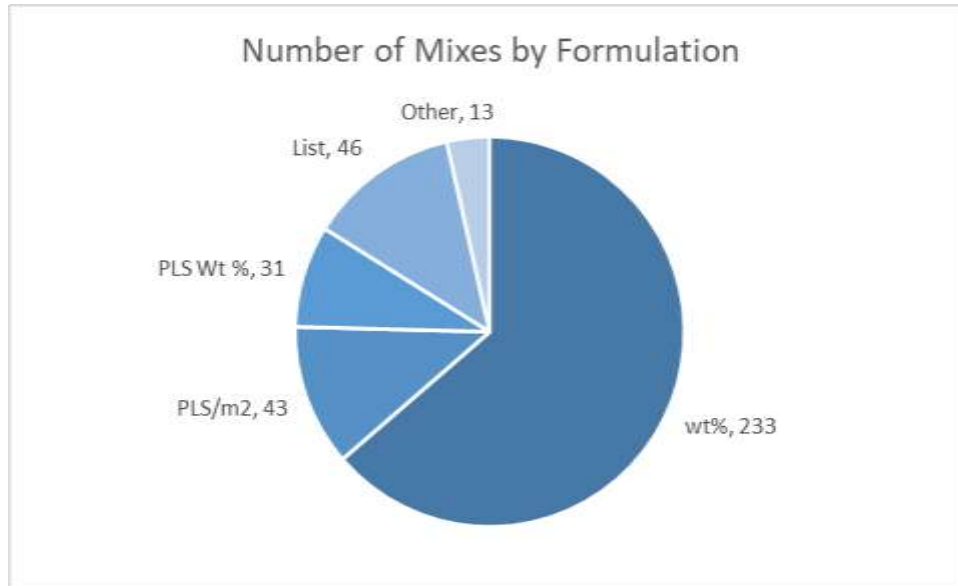


Figure 5. Number of mixes by formulation (366 total).

8.2 OPPORTUNITIES

The following opportunities for the native plants community, government agencies and researchers arise based on the inventory of mixes and seed sources found to date.

1. A number of Required Mixes are currently in place which should be a driver for the development and use of native species seed. However the requirements must be enforced to be effective.

OPPORTUNITY: Canvass agencies with Required Seed Mixes and the project proponents who must follow the requirements to determine the level of compliance with the Required Seed Mixes and identify barriers to successful compliance.

OPPORTUNITY: Once barriers have been identified, devise a follow-up action plan to increase compliance.

2. Some municipalities require use of native seed mixes where the revegetation goal is naturalization. Two municipalities (City of Airdrie (2014), and City of Chestermere (2015)) were found to require native seed mixes but leave it to the project proponent to propose a seed mix for approval.

OPPORTUNITY: Obtain information on approved seed mixes to be added to this inventory.

OPPORTUNITY: Work with municipal associations (e.g., Rural Municipalities of Alberta¹⁴ and Alberta Urban Municipalities Association¹⁵) or individual municipalities to increase awareness of the benefits of naturalization and native seed mixes with the ultimate goal of increasing the number of municipalities with Required Seed Mixes.

3. Seed mixes evolve over time (e.g., Jasper National Park historical vs. current mixes) and may move from the R&D stage to operational (e.g., AITF oil sands tailings stabilization mix -> Suncor erosion control mix), recommended or required mixes over time.

OPPORTUNITY: Track and report on changes over time to the content and use (classification) of seed mixes.

4. Specifying seed mix requirements in project tender specifications and/or project proposals can be problematic if the species or varieties or adequate volumes are not available.

OPPORTUNITY: Specify alternate species or varieties that will meet the same ecological needs but are more likely to be available (see for example the EnCana CFB Suffield mixes or the AEP loam to silty soils native seed mix for Northern Fescue Grasslands in this inventory).

OPPORTUNITY: Publish suitable alternate species for those currently in the Required Seed Mixes (see, for example, Pickseed (nd) or Native Plant Working Group (2000)).

5. Over the past 20 years InnoTech Alberta has registered 22 native seed varieties for use in Alberta representing 17 species but there were 100 species in Required Seed Mixes alone and 132 species in the Required Seed Mixes and Recommended Seed Mixes combined.

OPPORTUNITY: Continue to develop registered native species seed varieties to allow demand for seed in Required Seed Mixes to be fulfilled and to enable the Recommended Seed Mixes to shift to required (with appropriate proof of performance).

6. Even though there is strong interest in wetland mitigation and compensation, pit lake and wetland reclamation in pits and mines, and urban stormwater pond reclamation, only 27 seed mixes were identified for use in wet soils, wet areas or wetlands, and only 8 mixes contained *Carex* spp.

OPPORTUNITY: Develop and publish recommended seed mixes for wetland mitigation and compensation projects.

7. Although understory species in forested environments are key components of a functioning ecosystem there were only 14 seed mixes for the Boreal forest.

OPPORTUNITY: Develop and publish recommended seed mixes for use in Boreal forest revegetation projects.

8. There is a developing interest in pollinator mixes for urban naturalization projects. Four mixes in the inventory were designed for pollinators.

¹⁴ See <https://rmalberta.com/>

¹⁵ See <https://auma.ca/>

OPPORTUNITY: Develop and field test pollinator mixes for a variety of ecological settings, reclamation and urban naturalization projects in Alberta.

9. Most of the seed mixes in this report focus on development of target communities. In addition to the pollinator mixes described above, there are opportunities to design fit-for-purpose seed mixes to target specific use objectives (e.g., wildlife, traditional use, fire resistance, green roofs, etc.). Some examples of these mixes are found in the report.

OPPORTUNITY: Seek out additional examples of fit-for-purpose seed mixes and include them in the next iteration of the Inventory.

10. There are at least two commercial strategies that growers and vendors can adopt: target those species that have the highest demand and volume; and/or, target the low volume species in mixes that often are the key to increasing diversity and ultimate achievement of target ecosystems.

OPPORTUNITY: Continue to produce and update the Alberta Native Plant Council's inventory of native seed producers¹⁶ with an increased emphasis on relating the inventory to, at least, the Required Seed Mixes (and ideally the Recommended Seed Mixes).

OPPORTUNITY: Vendors should increase efforts to relate their available seed or seed mix products to the Required Seed Mix list (and ideally the Recommended Seed Mixes).

11. One of the difficulties in preparing this inventory was the different nomenclature (e.g., common name(s), old scientific name, new scientific name) and seed mix description formats (simple lists, wt %, PLS%, PLS/m², etc.). The latter is particularly noteworthy given the extensive literature recommending use of PLS/m² as the best method to ensure the appropriate seeding rates for individual species in a mix.

OPPORTUNITY: Develop a standard format for seed mix descriptions and require its use in project bid packages and regulatory documents.

OPPORTUNITY: Update all Required, Recommended and Commercial seed mixes to reflect currently accepted species names.

12. The vast number of seed mixes identified to date was not predicted when this project started, in part because there is not enough publicity around the requirements for, and use of, native species seed mixes in revegetation projects.

OPPORTUNITY: Create an information portal to provide current information on native species seed mixes (and native species in general) and an opportunity for practitioners, industry and regulators to share knowledge and raise issues. The portal can build on, and link to, existing information sources such as InnoTech Alberta, NAIT Centre for Boreal Research, the Alberta Native Plant Council, and the Foothills Restoration Forum.

This report focuses on the content of seed mixes. Many of the source documents, particularly those related to the R&D Mixes, contain detailed information on the successes and failures

¹⁶ See <http://anpc.ab.ca/wp-content/uploads/2018/07/ANPC-Native-Plant-Source-2018May.xlsx>

following deployment; however, much more information is needed to confirm the hypothesis that native species will lead to successful development of diverse, functioning communities.

In the context of this report, the following questions need further exploration:

1. What factors determine when it is most appropriate to use seed vs. other revegetation options?
2. Does seed from locally-sourced native species perform better than seed from outside the province?
3. Do mixes with more species lead to better results (e.g., greater diversity, quicker achievement of reclamation goals, increased use by wildlife, improved aesthetics, etc.)?
4. Would deploying different mixes with smaller numbers of species in patches across a landscape be more effective at achieving biodiversity and ecological resilience than using one highly diverse seed mix across the whole landscape?
5. Would greater availability and lower cost of native species seed lead to use of more diverse mixes (i.e., are the current mixes market-driven more than outcome-driven)?

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Alberta Agriculture and Forestry – Alberta Range Plants and Their Classification –
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Alberta Native Plant Council – <https://anpc.ab.ca/>

Database of Vascular Plants of Canada (VASCAN) –
<http://data.canadensys.net/vascan/search?lang=en>

Edmonton Native Plant Society – <http://edmontonnativeplantgroup.org/>

Flora of North America – http://www.efloras.org/flora_page.aspx?flora_id=1

Native Plant Society of Saskatchewan – <https://www.npss.sk.ca/>

United States Department of Agriculture, Natural Resources Conservation Service, Plant Materials Program –
<https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/plantmaterials/pmc/?cid=stelprdb1041225>

10.0 GLOSSARY

10.1 TERMS

Agronomic

Introduced annual cereals, forage and turf species.

Breeder Seed

Breeder seed crops are those crops certified by the CSGA as being produced by a recognized Plant Breeder under conditions, such as third party audited Quality Management Systems, which have ensured that the specific characteristics of the variety have been maintained. Breeder seed is the original source for all increases of seed crops of other pedigreed classes.

Common Seed

Non-pedigreed seed whose varietal origin or purity is uncertain. Common seed can also include seed that has lost its pedigreed status because it has been found not to meet the varietal purity standard or the prescribed quality standard.

Cover Crop

Seeded vegetation, usually agronomic species, used primarily for the purpose of protecting and improving the soil before establishment of the final vegetation on a reclaimed site.

Introduced (Exotic)

A species that is not native to a particular area.

Native

Plant species that is indigenous to a particular natural region; they were in that region prior to the time of Euro-American settlement.

Natural Subregion

The six natural regions of Alberta are sub-divided into 20 subregions based on recurring landscape patterns relative to other parts of the natural region.

Variety (Cultivar, Ecovar)

A variety denotes a group of cultivated plants, including hybrids constituted by controlled cross-pollination, that:

- are distinguished by common morphological, physiological, cytological, chemical or other characteristics; and,
- retain their characteristics when reproduced.

A variety must therefore be distinguishable, uniform, and stable.

10.2 ACRONYMS

ACIMS

Alberta Conservation Information Management System

AITF	Alberta Innovates - Technology Futures
ARC	Alberta Research Council
CVRI	Coal Valley Resources Inc.
EIA	Environmental Impact Assessment
EID	Eastern Irrigation District
FNA	Flora of North America
GMSL	Gold Metal Seeds Ltd.
GPEC	Green Patch Environmental Consulting Ltd.
nd	No Date (in citations and references)
PLS	Pure Live Seed
SEAC	Suffield Environmental Advisory Committee
VASCAN	Database of Vascular Plants of Canada
Wt %	Weight Percent

APPENDIX 1: LIST OF SPECIES IN THIS REPORT BY SCIENTIFIC NAME

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Yarrow	<i>Achillea millefolium</i>		Common Yarrow	Native
Columbia Needle Grass	<i>Achnatherum nelsonii</i> ssp. <i>dorei</i>	<i>Achnatherum nelsonii</i> <i>Stipa columbiana</i>	Nelson Achnatherum	Native
Richardson Needle Grass	<i>Achnatherum richardsonii</i>	<i>Stipa richardsonii</i>	Canada Mountain-ricegrass	Native
Indian Rice Grass	<i>Achnatherum hymenoides</i>	<i>Orzyopsis hymenoides</i>	Indian Mountain-ricegrass	Native
Red and White Baneberry	<i>Actaea rubra</i>		Red Baneberry	Native
Giant Hyssop	<i>Agastache foeniculum</i>		Blue Giant Hyssop	Native
Yellow False Dandelion	<i>Agoseris glauca</i>		Pale Agoseris Pale Goat-chicory	Native
Rough Hair Grass	<i>Agrostis scabra</i>		Tickle Grass Rough Bentgrass Hair Bentgrass	Native
Redtop	<i>Agrostis stolonifera</i>	<i>Agrostis gigantea</i>	Creeping Bentgrass	Introduced
Nodding Onion	<i>Allium cernuum</i>			Native
Wild Chives	<i>Allium schoenoprasum</i>			Native
Pearly Everlasting	<i>Anaphalis margaritacea</i>		Western Pearly Everlasting	Native
Canada Anemone	<i>Anemone canadensis</i>			Native
Long-headed Anemone	<i>Anemone cylindrica</i>			Native
Cut-leaved Anemone	<i>Anemone multifida</i>			Native
Prairie Crocus	<i>Anemone patens</i>	<i>Pulsatilla patens</i>	American Pasqueflower	Native
Yellow Angelica	<i>Angelica dawsonii</i>		Dawson's Angelica	Native

Common Name	Current Scientific Name	Other Scientific Name	Other Common Names	Alberta Status
Alpine Everlasting	<i>Antennaria aprica</i>		Common Pussytoes Alpine Pussytoes	Native
Small-leaved Everlasting	<i>Antennaria parvifolia</i>		Nuttall's Pussytoes Pussytoes	Native
Showy Everlasting	<i>Antennaria pulcherrima</i>		Handsome Pussytoes	Native
Rosy Everlasting	<i>Antennaria rosea</i>		Rosy Pussytoes	Native
Sweetgrass	<i>Anthoxanthum hirtum</i>	<i>Anthoxanthum nitens</i> <i>Hierochloe odorata</i> <i>Hierochloe hirta</i>	Northern Sweet Grass	Native
Blue Columbine	<i>Aquilegia brevistyla</i>			Native
Yellow Columbine	<i>Aquilegia flavescens</i>			Native
Sitka Columbine	<i>Aquilegia formosa</i>		Crimson Columbine	Native
Common Bearberry	<i>Arctostaphylos uva-ursi</i>		Bearberry	Native
Leafy Arnica	<i>Arnica chamissonis</i>			Native
Shining Arnica	<i>Arnica fulgens</i>		Hillside Arnica	Native
Spear-leaved Arnica	<i>Arnica lonchophylla</i>		Northern Arnica	Native
Pasture Sagewort	<i>Artemisia frigida</i>		Prairie Sagebrush	Native
Prairie Sagewort	<i>Artemisia ludoviciana</i>		White Sagebrush	Native
Low Milkweed	<i>Asclepias ovalifolia</i>		Dwarf Milkweed	Native
Showy Milkweed	<i>Asclepias speciosa</i>			Native
Alpine Aster	<i>Aster alpinus</i>			Native
Canadian Milk Vetch	<i>Astragalus canadensis</i>		Canada Milk Vetch	Native
Ascending Purple Milk Vetch	<i>Astragalus laxmannii</i> var. <i>robustior</i>	<i>Astragalus striatus</i>	Rattle Milkvetch	Native
Oats	<i>Avena sativa</i>			Introduced
Hooker's Oat Grass	<i>Avenula hookeri</i>	<i>Helictotrichon hookeri</i>	Spike-oat	Native

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Balsamroot	<i>Balsamorhiza sagittata</i>		Arrowleaf Balsamroot Balsamroot	Native
Slough Grass	<i>Beckmannia syzigachne</i>		American Sloughgrass	Native
Blue Grama	<i>Bouteloua gracilis</i>			Native
Fringed Brome	<i>Bromus ciliatus</i>			Native
Smooth Brome	<i>Bromus inermis</i>		Awnless Brome	Introduced
Mountain Brome	<i>Bromus marginatus</i>	<i>Bromus carinatus</i>		Native
Porter's Brome	<i>Bromus porteri</i>	<i>Bromus anomalus</i>	Nodding Brome Porter's Chess	Native
Bluejoint	<i>Calamagrostis canadensis</i>		Canada Reed Grass Blue-joint Reedgrass	Native
Plains Reed Grass	<i>Calamagrostis montanensis</i>			Native
Purple Reed Grass	<i>Calamagrostis purpurascens</i>			Native
Pine Reed Grass	<i>Calamagrostis rubescens</i>		Pine Grass	Native
Northern Reed Grass	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>		New England Northern Reedgrass	Native
Sand Grass	<i>Calamovilfa longifolia</i>		Prairie Sand Reed Sand Reed Grass	Native
Blue Camas	<i>Camassia quamash</i>		Common Camassia	Native
Harebell	<i>Campanula rotundifolia</i>		American Harebell	Native
Scabrous Black Sedge	<i>Carex atratiformis</i> ssp. <i>raymondii</i>		Black Sedge	Native
Golden Sedge	<i>Carex aurea</i>		Golden-fruit Sedge	Native
Low Sedge	<i>Carex duriuscula</i>		Narrow-leaved Sedge	Native
Geyer's Sedge	<i>Carex geyeri</i>			Native

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Sun-loving Sedge	<i>Carex pensylvanica</i>			Introduced
Hay Sedge	<i>Carex siccata</i>		Dry-spike Sedge	Native
Safflower	<i>Carthamus tinctorius</i>		False Saffron	Introduced
Common Red Paintbrush	<i>Castilleja miniata</i>		Greater Red Indian-paintbrush	Native
Alpine Red Paintbrush	<i>Castilleja rhexiifolia</i>		Rhexia-leaf Indian-paintbrush	Native
Common Fireweed	<i>Chamerion angustifolium</i>	<i>Epilobium angustifolium</i>	Fireweed	Native
Western Clematis	<i>Clematis ligusticifolia</i>		Western Virgin's-bower	Native
Purple Clematis	<i>Clematis occidentalis</i>			Native
Lance-leaved Tickseed	<i>Coreopsis lanceolata</i>		Lance-leaved Coreopsis	Introduced
Common Tickseed	<i>Coreopsis tinctoria</i>		Golden Tickseed Plains Coreopsis	Native
Bunchberry	<i>Cornus canadensis</i>		Dwarf Dogwood	Native
Sand Nut Grass	<i>Cyperus schweinitzii</i>		Schweinitz's Flatsedge	Native
Sparrow's-egg Lady's-slipper	<i>Cypripedium passerinum</i>			Native
White Prairie Clover	<i>Dalea candida</i>	<i>Petalostemon candidum</i>		Native
Purple Prairie Clover	<i>Dalea purpurea</i>	<i>Petalostemon purpureum</i>	Purple Prairie-clover	Native
Intermediate Oatgrass	<i>Danthonia intermedia</i>		Timber oatgrass Vassey's Oatgrass	Native
Parry Oatgrass	<i>Danthonia parryi</i>		Parry's Oatgrass	Native
Tall Larkspur	<i>Delphinium glaucum</i>		Pale Larkspur	Native
Nuttall's Larkspur	<i>Delphinium nuttalianium</i>		Nuttall's Delphinium	Native
Tufted Hair Grass	<i>Deschampsia caespitosa</i>		Tufted Hairgrass	Native

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Saltgrass	<i>Distichlis spicata</i>	<i>Distichlis spicata</i> ssp. <i>stricta</i> <i>Distichlis stricta</i>	Inland Saltgrass Seashore Saltgrass	Native
Mountain Shooting Star	<i>Dodecatheon conjugens</i>		Bonneville Shootingstar	Native
Saline Shooting Star	<i>Dodecatheon pulchellum</i>		Few-flower Shootingstar	Native
Yellow Mountain Avens	<i>Dryas drummondii</i>		Yellow Mountain-avens	Native
White Cinquefoil	<i>Drymocallis arguta</i>	<i>Potentilla arguta</i>	Tall Cinquefoil	Native
Purple Coneflower	<i>Echinacea angustifolia</i>			Introduced
Silverberry	<i>Elaeagnus commutata</i>		American Silverberry	Native
Canada Wild Rye	<i>Elymus canadensis</i>			Native
Awnless Wildrye	<i>Elymus curvatus</i>	<i>Leymus triticoides</i>	Beardless Wild Rye	Introduced
Smooth Wildrye	<i>Elymus glaucus</i>		Smooth Wild Rye	Native
Green Wheatgrass – AC Saltlander	<i>Elymus hoffmannii</i>			Introduced
Northern Wheatgrass	<i>Elymus lanceolatus</i>	<i>Agropyron dasystachyum</i> <i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	Streamside Wild Rye	Native
Streambank Wheatgrass – Sodar	<i>Elymus lanceolatus</i> ssp. <i>psammophilus</i>			Introduced
Streambank Wheatgrass	<i>Elymus lanceolatus</i> ssp. <i>riparius</i>	<i>Agropyron riparium</i> <i>Elymus lanceolatus</i>		Native
Slender Wheatgrass	<i>Elymus trachycaulus</i>	<i>Agropyron trachycaulum</i>		Native
Slender Wheatgrass	<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	<i>Agropyron subsecundum</i> <i>Agropyron trachycaulum</i> var. <i>unilaterale</i>	Awned Wheatgrass Awned Slender Wheatgrass	Native

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Slender Wildrye	<i>Elymus trachycaulus ssp. trachycaulus</i>	<i>Agropyron trachycaulum var. trachycaulum</i>	Slender Wildrye	Native
High Wildrye	<i>Elymus violaceus</i>	<i>Agropyron violaceum</i> <i>Elymus trachycaulus ssp. violaceus</i>	Violet Wheatgrass Broad-glumed Wheatgrass	Native
Thickspike Wheatgrass	<i>Elymus macrourus</i>	<i>Elymus lanceolatus ssp. lanceolatus</i>		Introduced
Tufted Fleabane	<i>Erigeron caespitosus</i>		Caespitose Fleabane	Native
Cut-leaved Fleabane	<i>Erigeron compositus</i>		Dwarf Mountain Fleabane	Native
Smooth Fleabane	<i>Erigeron glabellus</i>			Native
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>			Native
Showy Fleabane	<i>Erigeron speciosus</i>		Aspen Fleabane	Native
Yellow Umbrella-plant	<i>Eriogonum flavum</i>		Yellow Buckwheat	Native
Subalpine Umbrellaplant	<i>Eriogonum umbellatum</i>		Sulphur Flower Buckwheat	Native
Glacier Lily	<i>Erythronium grandiflorum</i>		Large-flower Yellow Fawnlily	Native
Showy Aster	<i>Eurybia conspicua</i>	<i>Aster conspicuus</i>		Native
Arctic Aster	<i>Eurybia sibirica</i>		Siberian Aster	Native
Spotted Joe Pyeweed	<i>Eutrochium maculatum</i>	<i>Eupatorium maculatum</i>		Native
Northern Rough Fescue	<i>Festuca altaica</i>	<i>Festuca scabrella</i>	Altai Fescue Rough Fescue Northern Fescue	Native
Alpine Fescue	<i>Festuca brachyphylla</i>			Native
Mountain Rough Fescue	<i>Festuca campestris</i>		Foothills Rough Fescue	Native

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Plains Rough Fescue	<i>Festuca hallii</i>	<i>Festuca altaica</i> ssp. <i>hallii</i>	Rough Fescue	Native
Bluebunch Fescue	<i>Festuca idahoensis</i>		Idaho Fescue	Native
Sheep Fescue	<i>Festuca ovina</i>			Introduced
Red Fescue	<i>Festuca rubra</i>		Creeping Red Fescue	Introduced
Rocky Mountain Fescue	<i>Festuca saximontana</i>			Native
Hard Fescue	<i>Festuca trachyphylla</i>	<i>Festuca ovina</i> var. <i>duriscula</i>		Introduced
Wild Strawberry	<i>Fragaria virginiana</i>			Native
Yellowbell	<i>Fritillaria pudica</i>		Yellow Missionbells	Native
Gaillardia	<i>Gaillardia aristata</i>		Brown Eyed Susan Blanket Flower Great Blanket-flower	Native
Northern Bedstraw	<i>Galium boreale</i>			Native
Prairie Gentian	<i>Gentiana affinis</i>			Native
Wild White Geranium	<i>Geranium richardsonii</i>		Richardson's Geranium	Native
Sticky Purple Geranium	<i>Geranium viscosissimum</i>		Sticky Geranium	Native
Purple Avens	<i>Geum rivale</i>			Native
Three-flowered Avens	<i>Geum triflorum</i>		Prairie Smoke	Native
Fowl Manna Grass	<i>Glyceria striata</i>		Fowl Mannagrass	Native
Wild Licorice	<i>Glycyrrhiza lepidota</i>			Native
Curly-cup Gumweed	<i>Grindelia squarrosa</i>		Broadleaf Gumweed	Native
Broom Weed	<i>Gutierrezia sarothrae</i>		Broom Snakeweed	Native

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Alpine Hedysarum	<i>Hedysarum alpinum</i>	<i>Hedysarum alpinum</i> <i>var. americanum</i>	American Sweet Vetch Alpine Sweetvetch	Native
Northern Hedysarum	<i>Hedysarum boreale</i>	<i>Hedysarum boreale</i> <i>ssp. mackenzii</i>	Northern Sweetvetch	Native
Aspen Sunflower	<i>Helianthella quinquenervis</i>		Five-nerved Sunflower Little Sunflower)	Native
Common Annual Sunflower	<i>Helianthus annuus</i>		Common Sunflower	Native
Narrow-leaved Sunflower	<i>Helianthus maximilianii</i>		Maximilian Sunflower	Introduced
Common Tall Sunflower	<i>Helianthus nuttallii</i>		Nuttall's Sunflower	Native
Rhombic-leaved Sunflower	<i>Helianthus pauciflorus</i> <i>ssp. subrhomboideus</i>		Stiff Sunflower	Native
Prairie Sunflower	<i>Helianthus petiolaris</i>			Native
False Sunflower	<i>Heliopsis helianthoides</i>		Ox-eye Sunflower	Introduced
Cow Parsnip	<i>Heracleum maximum</i>			Native
Needle-and-Thread Grass	<i>Hesperostipa comata</i>	<i>Stipa comata</i> <i>Hesperostipa comata</i> <i>ssp. comata</i>	Spear Grass	Native
Western Porcupine Grass	<i>Hesperostipa curtiseta</i>	<i>Stipa curtiseta</i>		Native
Golden Aster	<i>Heterotheca villosa</i>		Hairy Golden Aster Hairy False Golden Aster	Native
Sticky Alumroot	<i>Heuchera cylindrica</i>		Poker Alumroot	Native
Richardson's Alumroot	<i>Heuchera richardsonii</i>			Native
Meadow Barley	<i>Hordeum brachyantherum</i>			Native
Wire Rush	<i>Juncus balticus</i>		Baltic Rush	Native

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Creeping Juniper	<i>Juniperus horizontalis</i>			Native
June Grass	<i>Koeleria macrantha</i>	<i>Koeleria gracilis</i> <i>Koeleria cristata</i>	Prairie Junegrass	Native
Cream-colored Vetchling	<i>Lathyrus ochroleucus</i>		Pale Vetchling	Native
Giant Wild Rye	<i>Leymus cinereus</i>		Great Basin Wildrye	Native
Hairy Wild Rye	<i>Leymus innovatus</i>	<i>Elymus innovatus</i>	Northwestern Wildrye	Native
Meadow Blazingstar	<i>Liatris ligulistylis</i>		Strap-style Gayfeather	Native
Dotted Blazingstar	<i>Liatris punctata</i>		Dotted Gayfeather	Native
Western Wood Lily	<i>Lilium philadelphicum</i>		Wood Lily	Native
Wild Blue Flax	<i>Linum lewisii</i>		Prairie Flax <i>Linum perenne</i>	Native
Woolly Gromwell	<i>Lithospermum ruderales</i>		Western Gromwell	Native
Tall Fescue	<i>Lolium arundinaceum</i>	<i>Schedonorus arundinaceus</i> <i>Festuca elatior</i>		Introduced
Italian Ryegrass	<i>Lolium multiflorum</i>		Annual Ryegrass	Introduced
Perennial Ryegrass	<i>Lolium perenne</i>			Introduced
Fern-leaved Desert-parsley	<i>Lomatium dissectum</i>		Fernleaf Desert-parsley	Native
Long-fruited Wild Parsley	<i>Lomatium macrocarpum</i>		Large-fruit Desert-parsley	Native
Twining Honeysuckle	<i>Lonicera dioica</i>		Mountain Honeysuckle	Native
Bird's-foot Trefoil	<i>Lotus corniculatus</i>		Garden Bird's-foot-trefoil	Introduced
Silvery Perennial Lupine	<i>Lupinus argenteus</i>		Silvery Lupine	Native

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Silky Lupine	<i>Lupinus sericeus</i>		Silky Perennial Lupine Pursh's Silky Lupine	Native
Fringed Loosestrife	<i>Lysimachia ciliata</i>			Native
Star-flowered Solomon's-seal	<i>Maianthemum stellatum</i>		Starflower Solomon's-plume Star-flowered False Solomon's-seal	Native
Alfalfa	<i>Medicago sativa</i>			Introduced
Wild Mint	<i>Mentha arvensis</i>			Native
Rhomboid-leaved Saxifrage	<i>Micranthes occidentalis</i>		Western Saxifrage	Native
Bishop's-cap	<i>Mitella pentandra</i>		Five-point Bishop's-cap Mitrewort	Native
Wild Bergamot	<i>Monarda fistulosa</i>			Native
Alpine Forget-me-not	<i>Myosotis asiatica</i>			Native
Green Needle Grass	<i>Nassella viridula</i>	<i>Stipa viridula</i>		Native
Yellow Evening Primrose	<i>Oenothera biennis</i>		Common Evening Primrose	Native
Sainfoin	<i>Onobrychis viciifolia</i>		Common Sainfoin	Introduced
Prickly-Pear	<i>Opuntia polyacantha</i>			Native
Owl-clover	<i>Orthocarpus luteus</i>		Yellow Owl's-clover	Native
White-grained Mountain Rice Grass	<i>Oryzopsis asperifolia</i>		Mountain Rice Grass	Native
Blunt-fruited Sweet Cicely	<i>Osmorhiza berteroi</i>		Chilean Sweet-cicely	Native
Western Sweet Cicely	<i>Osmorhiza occidentalis</i>		Western Sweet-cicely	Native

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Northern Locoweed	<i>Oxytropis campestris</i>		Field Locoweed Northern Yellow Point-vetch	Native
Reflexed Locoweed	<i>Oxytropis deflexa</i>		Nodding Locoweed Pendant-pod Point-vetch	Native
Late Yellow Locoweed	<i>Oxytropis monticola</i>		Yellow-flower Locoweed Mountain Locoweed	Native
Early Yellow Locoweed	<i>Oxytropis sericea</i>		Silky Locoweed White Point-vetch	Native
Showy Locoweed	<i>Oxytropis splendens</i>		Showy Point-vetch	Native
Northern Grass-of-Parnassus	<i>Parnassia palustris</i>		Marsh Grass-of-Parnassus	Native
Western Wheatgrass	<i>Pascopyrum smithii</i>	<i>Agropyron smithii</i>		Native
Western Lousewort	<i>Pedicularis bracteosa</i>		Towering Lousewort	Native
Elephant's-head	<i>Pedicularis groenlandica</i>		Bull Elephant's-head	Native
Blue Beardtongue	<i>Penstemon albertinus</i>		Alberta Beardtongue Alberta Penstemon	Native
Yellow Beardtongue	<i>Penstemon confertus</i>		Yellow Penstemon	Native
Shrubby Beardtongue	<i>Penstemon fruticosus</i>			Native
Lilac-flowered Beardtongue	<i>Penstemon gracilis</i>		Slender Beardtongue	Native
Smooth Blue Beardtongue	<i>Penstemon nitidus</i>		Wax-leaf Beardtongue Waxleaf Penstemon	Native

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Slender Blue Beardtongue	<i>Penstemon procerus</i>		Slender Beardtongue Small-flower Beardtongue	Native
Beeplant	<i>Peritoma serrulata</i>		Rocky Mountain Beeplant Bee Spider-flower	Native
Silky Scorpionweed	<i>Phacelia sericea</i>			Native
Mountain Timothy	<i>Phleum commutatum</i>	<i>Phleum alpinum</i>	Alpine Timothy	Native
Timothy	<i>Phleum pratense</i>		Meadow Timothy	Introduced
Alpine Bluegrass	<i>Poa alpina</i>			Native
Arctic Bluegrass	<i>Poa arctica</i>			Native
Canada Bluegrass	<i>Poa compressa</i>			Introduced
Inland Bluegrass	<i>Poa interior</i>			Native
Fowl Bluegrass	<i>Poa palustris</i>			Native
Kentucky Bluegrass	<i>Poa pratensis</i>			Introduced
Sandberg Bluegrass	<i>Poa secunda</i>	<i>Poa sandbergii</i>	Curly Bluegrass	Native
Alkali Bluegrass	<i>Poa secunda ssp. juncifolia</i>	<i>Poa juncifolia</i> <i>Poa ampla</i>	Big Bluegrass	Introduced
Tall Jacob's- ladder	<i>Polemonium acutiflorum</i>			Native
Showy Jacob's- ladder	<i>Polemonium pulcherrimum</i>			Native
Mountain Cinquefoil	<i>Potentilla diversifolia</i>		Mountain Meadow Cinquefoil Smooth Leaved Cinquefoil	Native
Branched Cinquefoil	<i>Potentilla effusa</i>		Silver Cinquefoil	Native
Graceful Cinquefoil	<i>Potentilla gracilis</i>		Slender Cinquefoil Fanleaf Cinquefoil	Native
Woolly Cinquefoil	<i>Potentilla hippiana</i>		Horse Cinquefoil	Native

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Hooker's Cinquefoil	<i>Potentilla hookeriana</i>		Prairie Cinquefoil	Native
Prairie Cinquefoil	<i>Potentilla pensylvanica</i>		Pennsylvania Cinquefoil	Native
Mealy Primrose	<i>Primula incana</i>		Hoary Primrose Jones Primrose	Native
Fairybells	<i>Prosartes trachycarpa</i>		Rough-fruited Mandarin	Native
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	<i>Agropyron spicatum</i>		Native
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i> <i>ssp. spicata</i>			Native
Alkali Grass	<i>Puccinellia distans</i>		Slender Salt-Meadow Grass Spreading Alkali Grass	Introduced
Nuttall's Salt-meadow Grass	<i>Puccinellia nuttalliana</i>		Nuttall's Alkali Grass	Native
Common Pink Wintergreen	<i>Pyrola asarifolia</i>		Pink Wintergreen	Native
Prairie Coneflower	<i>Ratibida columnifera</i>		Upright Prairie Coneflower	Native
Prickly Rose	<i>Rosa acicularis</i>			Native
Black-eyed Susan	<i>Rudbeckia hirta</i>			Introduced
Western Dock	<i>Rumex occidentalis</i>			Native
Spotted Saxifrage	<i>Saxifraga bronchialis</i>		Matte Saxifrage	Native
Purple Oatgrass	<i>Schizachne purpurascens</i>		False Melic Purple Oat	Native
Little Bluestem	<i>Schizachyrium scoparium</i>			Native
Lance-leaved Stonecrop	<i>Sedum lanceolatum</i>		Lanceleaf Stonecrop	Native
Common Blue-eyed Grass	<i>Sisyrinchium montanum</i>		Strict Blue-eyed-grass	Native

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Tall Goldenrod	<i>Solidago altimssima</i>			Native
Canada Goldenrod	<i>Solidago canadensis</i>			Introduced
Elegant Goldenrod	<i>Solidago lepida</i>			Native
Low Goldenrod	<i>Solidago missouriensis</i>		Missouri Goldenrod	Native
Alpine Goldenrod	<i>Solidago multiradiata</i>		Northern Goldenrod	Native
Stiff Goldenrod	<i>Solidago rigida</i>		Prairie Goldenrod	Native
Sticky Goldenrod	<i>Solidago simplex</i>		Spike Goldenrod	Native
Prairie Cord Grass	<i>Spartina pectinata</i>		Fresh Water Cordgrass	Native
White Meadowsweet	<i>Spiraea betulifolia</i>			Native
Sand Dropseed	<i>Sporobolus cryptandrus</i>			Native
Bronzebells	<i>Stenanthium occidentale</i>		Western Featherbells	Native
Clasping-leaved Twisted-stalk	<i>Streptopus amplexifolius</i>		Clasping Twisted-stalk Twisted Stalk	Native
Lindley's Aster	<i>Symphyotrichum ciliolatum</i>	<i>Aster ciliolatus</i>		Native
Creeping White Prairie Aster	<i>Symphyotrichum falcatum</i> <i>var. falcatum</i>		White Prairie Aster	Native
Smooth Aster	<i>Symphyotrichum laeve</i>	<i>Aster laevis</i>	Smooth Blue Aster	Native
Western Willow Aster	<i>Symphyotrichum lanceolatum</i>		Panicled Aster	Native
New England Aster	<i>Symphyotrichum novae-angliae</i>	<i>Aster novae-angliae</i>		Introduced
Purple-stemmed Aster	<i>Symphyotrichum puniceum</i>	<i>Aster puniceus</i>	Swamp Aster	Native
Tufted White Prairie Aster	<i>Symphyotrichum ericoides</i>	<i>Aster ericoides</i>	White Heath Aster	Native
Tall Meadow Rue	<i>Thalictrum dasycarpum</i>		Purple Meadowrue	Native

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Western Meadow-rue	<i>Thalictrum occidentale</i>		Western Meadowrue	Native
Golden Bean	<i>Thermopsis rhombifolia</i>		Roundleaf Thermopsis	Native
Tall Wheatgrass	<i>Thinopyrum elongatum</i>	<i>Agropyron elongatum</i>		Introduced
Pubescent Wheatgrass	<i>Thinopyrum intermedium</i>		Intermediate Wheatgrass	Introduced
Parry's Townsendia	<i>Townsendia parryi</i>		Parry's Townsend-daisy	Native
Alsike Clover	<i>Trifolium hybridum</i>			Introduced
White Clover	<i>Trifolium repens</i>			Introduced
Spike Trisetum	<i>Trisetum spicatum</i>		Narrow False Oats	Native
Wild Vetch	<i>Vicia americana</i>		American Vetch American Purple Vetch	Native
Early Blue Violet	<i>Viola adunca</i>		Sand Violet	Native
White Camas	<i>Zigadenus elegans</i>			Native
Heart-leaved Alexanders	<i>Zizia aptera</i>		Heartleaf Alexanders	Native

APPENDIX 2: METHODS USED TO SELECT SCIENTIFIC AND COMMON NAMES

The following rules were used to determine which scientific and common names to use in the Inventory.

General Rules

Source Document Scientific Name	Source Document Common Name	Rule for Inventory Names
Matches ACIMS	Matches ACIMS	Use ACIMS Scientific Name and Common Name
Matches ACIMS	Does not match ACIMS	Use ACIMS Scientific Name and associated Common Name; enter the Source Document Common Name in the Other Common Names column in the List of Species in this Report
Does not match ACIMS	Matches ACIMS	<p>Look up Scientific Name in VASCAN</p> <p>If the Source Document Scientific Name is a synonym for an accepted Scientific Name in ACIMS, use the ACIMS Scientific Name; enter the synonym in the Other Scientific Names column of the List of Species in this Report</p> <p>If the Source Document Scientific Name is an accepted name in VASCAN then use the VASCAN accepted name as the Scientific Name (confirm by looking up the Scientific Name in Flora of North America or other source documents); indicate the species is Introduced in the List of Species in this Report</p>

Source Document Scientific Name	Source Document Common Name	Rule for Inventory Names
Does not match ACIMS	Does not match ACIMS	<p>Look up Scientific Name in VASCAN</p> <p>If the Source Document Scientific Name is a synonym for an accepted Scientific Name in ACIMS, use the ACIMS Scientific Name and associated Common Name; enter the Source Document Scientific Name in the Other Scientific Names column of the List of Species in this Report and the Source Document Common Name in the Other Common Names column of the List of Species in this Report</p> <p>If the Source Document Scientific Name is an accepted name in VASCAN then use the VASCAN accepted name as the Scientific Name and the VASCAN vernacular name as the Common Name (confirm by looking up the Scientific Name in Flora of North America or other source documents and the VASCAN vernacular name in ACIMS); indicate the species is Introduced in the List of Species in this Report</p> <p>If the Source Document Scientific Name is not in VASCAN then look up the Common Name in ACIMS and use the associated Scientific Name from ACIMS (confirm by looking up the Common Name in VASCAN); enter the Source Document Scientific Name in the Other Scientific Names column of the List of Species in this Report</p> <p>If the Source Document Scientific Name is not in VASCAN and the Common Name is not in ACIMS then look up the Common Name in VASCAN and use the associated accepted Scientific Name; enter the Source Document Scientific Name in the Other Scientific Names column of the List of Species in this Report and the Source Document Common Name in the Other Common Names column of the List of Species in this Report</p>
Matches ACIMS	Not provided	Use ACIMS Scientific Name and associated Common Name
Not provided	Matches ACIMS	Look up the Common Name in ACIMS and use the associated ACIMS Scientific Name; confirm Scientific Name by checking in VASCAN

Source Document Scientific Name	Source Document Common Name	Rule for Inventory Names
Not provided	Does not match ACIMS	<p>Look up Common Name in VASCAN and check the associated accepted Scientific Name in ACIMS</p> <p>If the Scientific Name is in ACIMS use the ACIMS Scientific Name and associated Common Name; enter the Source Document Common Name in the Other Common Names column of the List of Species in this Report</p> <p>If the accepted name is not in ACIMS use the VASCAN Scientific Name and the VASCAN vernacular name as the Common Name; indicate the species is Introduced</p>

Slender Wheatgrass Rules

ACIMS considers *Elymus trachycaulus*, *Elymus trachycaulus ssp. subsecundus* and *Elymus trachycaulus ssp. trachycaulus* to all be slender wheatgrass. In many of the Source Documents *Elymus trachycaulus ssp. subsecundus* was called awned wheatgrass and *Elymus trachycaulus ssp. trachycaulus* was called slender wheatgrass (note many of the older Source Documents referred to *Elymus* as *Agropyron*). Therefore the following rules were used to determine which Scientific Name to use in the Inventory (in all case the Common Name reported in the Inventory is slender wheatgrass).

Source Document Scientific Name	Source Document Common Name	Rule for Inventory Scientific Name
Not provided	Slender wheatgrass	<i>Elymus trachycaulus</i>
Not provided	Awned wheatgrass	<i>Elymus trachycaulus ssp. subsecundus</i>
Not provided	Both slender wheatgrass and awned wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> and <i>Elymus trachycaulus ssp. subsecundus</i>
<i>Elymus trachycaulus</i>	Not provided	<i>Elymus trachycaulus</i>
<i>Elymus trachycaulus ssp. trachycaulus</i>	Slender wheatgrass or not provided	<i>Elymus trachycaulus ssp. trachycaulus</i>
<i>Elymus trachycaulus ssp. subsecundus</i>	Awned wheatgrass or not provided	<i>Elymus trachycaulus ssp. subsecundus</i>
<i>Elymus trachycaulus</i> and <i>Elymus trachycaulus ssp. subsecundus</i>	Slender wheatgrass and awned wheatgrass	<i>Elymus trachycaulus ssp. trachycaulus</i> and <i>Elymus trachycaulus ssp. subsecundus</i>