Salix Resource Management Ltd.

File R4315

Assessment of Potential for a List of Vegetation Species To be Used as an Indicator of High Water Table or Groundwater Discharge in the Mixed Grass Prairie

Nov 20, 2018

Objective

PTAC project 15-SGRC-08 developed a scientific rationale document supporting an alternate closure protocol for salt-affected wellsites on native prairie grasslands. The PTAC project proposed that specific plants would be indicative of near surface groundwater (either high water table or groundwater discharge). In support of this protocol, a group of vegetation specialists from Salix Resource Management Ltd. (Salix) and Terrestrial Solutions Ltd. (Terrestrial) were asked to review vegetation species in the Mixed Grass or Dry Mixed Grass Natural sub-regions to determine if a list of species could be formulated to act as markers to determine the lack of an elevated water table or groundwater discharge, with the absence of the identified species being an indicator of a low likelihood of near surface groundwater.

Scope

This project was intended as a preliminary assessment to determine whether it was felt that a list of species could be developed to act as markers for areas with increased water. The assessment was intended to be based on existing vegetation and plant community classification systems, as well as the professional experience of the individuals on the project. No field studies were planned as a part of this investigation.

Methodology

In order to develop the desired list of species, the Alberta wetland classification¹ species list for swamps and marshes was utilized as a starting point. Swamps and marshes were chosen as they are the most prevalent wetland types within the subject area and exclude the obvious wetlands that have open water present. While the wetland classification system was utilized as a starting point for the species list, it should be noted that the objective is not to identify "wetlands", but areas with the potential for upwards movement of water or groundwater discharge. Such areas may not always meet the definition of a "wetland". For the purposes of this document these areas with upward movement of water, or groundwater discharge are referred to as "moist" ecosystems.

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¹ Alberta Environment and Sustainable Resource Development (ESRD). 2015. Alberta Wetland Classification System. Water Policy Branch, Policy and Planning Division, Edmonton, AB.

The wetland list was then cross-referenced to the Alberta Biodiversity Monitoring Institute (ABMI)² species list for species noted to be present in the area of the mixed-grass or dry mixed-grass natural sub-regions. As the ABMI list is not referenced by natural sub-region, an area south of township 32 and east of range 26, west of the 4th meridian was used as a proxy for the two natural sub-regions.

The cross-referenced list produced a list of species which were noted to have been found in marshes and swamps, and have also been found south of township 32 and east of range 26, west of the 4th meridian (See Appendix A). The ABMI list does not separate species out as to prevalence. Therefore, many of the identified species are not common species in the subject area. Additionally, neither database utilized provides species found only in wetlands. Therefore, the list was then reviewed by senior vegetation specialists in Salix and Terrestrial to evaluate which species would be common enough in the subject area, or distinct enough to moist ecosystems, to be used as indicators of moist ecosystems. This ranking of species is found in Appendix A, with common wetland species given a "1", species too present in uplands to be indicative given a "2", and species not common enough in mixed grass prairie to be useful given a "3".

Results

The list of species produced by the comparison of the AB wetland and the ABMI lists consisted of 197 species (Appendix A). After review, 33 species were determined to be too common in uplands to be useful and 142 species were considered not common enough in the subject area to be used as indicator species. The remaining species produced a list of 23 species which were felt had the potential for being used as indicators of moist ecosystems (See Appendix B).

Discussion

After the potential list was produced, the species were reviewed as a group to determine whether presence of any one of these species on a site would be a reasonable indicator of moist ecosystems (either high water table or groundwater discharge). From the experience of the Salix and Terrestrial staff, it was considered that the list would likely identify most of the wetland ecosystems within the subject area. However, some "moist" sites not meeting the definition of a "wetland" may not be identified, and the presence of any one of the species was considered to be so prevalent within upland systems, that the number of false positives (upland areas identified as moist areas) was considered to be too high to make the list a useful tool. Consideration was given to attempting to produce a list of plant associations that would be more indicative of wetlands. However, it was considered that the variability in wetland systems in the area made plant associations too unlikely to accurately identify most of the wetlands without resulting in the same high levels of false positives.



² Alberta Biodiversity Monitoring Institute (ABMI) http://www.abmi.ca/home.html

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	Chenopodium capitatum Aschers	strawberry blite	3
	Chenopodium glaucum var. salinum (Standl.) B. Boivin	oak-leaved goosefoot	3

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Chenopodium rubrum L. Cicuta maculata L.	red goosefoot water-hemlock	3
Cirsium arvense (L.) Scop.	creeping thistle	3
Conium maculatum L.	poison hemlock	3
Conyza canadensis (L.) Cronquist	horseweed	3
Crepis tectorum L.	annual hawk's-beard	3
Cyclachaena xanthifolia (Nutt.) Fresen	false ragweed	3
Deschampsia cespitosa (L.) Beauv.		
Descurainia sophia (L.) Webb ex Prantl	tufted hairgrass flixweed	1
<u> </u>		3
Distichlis spicata ssp. stricta (Torr.) Beetle	Inland saltgrass	3
Elaeagnus commutata Bernh. ex Rydb.	silverberry	2
Elatine triandra Schkuhr.	waterwort	3
Eleocharis acicularis (L.) Roemer & Schult.	needle spikerush	3
Eleocharis palustris (L.) Roemer & Schult.	creeping spike-rush	1
Elodea canadensis Mitchx.	Canada waterweed	3
Elymus repens (L.) Gould	quackgrass	2
Elymus trachycaulus (Link) Gound ex Shinners	slender wheatgrass	2
Epilobium ciliatum Raf.	northern willowherb	3
Epilobium palustre L	marsh willowherb	3
Equisetum arvense L.	common horsetail	2
Equisetum fluviatile L.	swamp horsetail	3
Equisetum hyemale L.	common scouring-rush	3
Equisetum palustre L.	marsh horsetail	3
Erigeron lonchophyllus Hook.	fleabane	2
Erigeron philadelphicus L.	Philadelphia fleabane	2
Erysimum cheiranthoides L.	wormseed mustard	3
Fallopia convolvulus (L.) Löve	wild buckwheat	3
Fragaria vesca L.	woodland strawberry	3
Fragaria virginiana Duchesne	wild strawberry	3
Galeopsis tetrahit L.	hemp-nettle	2
Galium boreale L.	Labrador bedstraw	3
Galium trifidum L.	small bedstraw	3
Galium triflorum Michx.	sweet-scented bedstraw	3
Geum aleppicum Jacq.	yellow avens	3
Geum macrophyllum Willd.	large-leaved yellow avens	3
Geum rivale L.	purple avens	3
Glyceria borealis (Nash) Batch.	northern manna grass	3
Glyceria grandis S. Wats.	common tall mannagrass	3
Glyceria striata (Lam.) Hitchc.	fowl manna grass	1
Glycyrrhiza lepidota (Nutt.) Pursh	wild licorice	3
Gnaphalium palustre Nutt.	marsh cudweed	3
Gratiola neglecta Torr.	clammy hedge-hyssop	3
Hedysarum alpinum L.	alpine hedysarum	3
Helenium autumnale L.	sneezeweed	3
Helianthus nuttallii Torr. & Gray	common tall sunflower	3
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Heracleum sphondylium ssp. montanum (Schleich.) Briq.	cow parsnip	3
Hieracium umbellatum L.	narrow-leaved hawkweed	3
Hippuris vulgaris L.	common maretail	3
Hordeum jubatum L.	foxtail barley	1
Iva axillaris Pursh	povertyweed	3
Juneus balticus Willd.	wire rush	1
Juncus bufonius L.	toad rush	3
Juneus nodosus L.	knotted rush	3
Juncus tenuis Willd.	slender rush	3
Kochia scoparia (L.) Schrad.	summer-cypress	3
Lactuca serriola L.	prickly lettuce	2
Lathyrus ochroleucus Hook.	cream-coloured vetchling	3
Lemna minor L.	common duckweed	3
Lepidium densiflorum Schrad.	common pepper-grass	2
Limosella aquatica L.	mudwort	3
Lotus corniculatus L.	bird's-foot trefoil	3
Lycopus asper Greene	western water-horehound	3
Lysimachia maritima (L.) Galasso, Banfi & Soldano	sea milkwort	3
Lysimachia thyrsiflora L.	tufted loosestrife	3
Maianthemum stellatum (L.) Link	star-flowered Solomon's-seal	3
Matricaria discoidea DC	pineappleweed	3
Melilotus officinalis (L.) Lam	yellow sweet-clover	3
Mentha arvensis L.	wild mint	1
Monolepis nuttalliana (Schult.) Greene	spear-leaved goosefoot	3
Muhlenbergia asperifolia (Nees & Meyen ex Trin.) Parodi	scratch grass	3
Muhlenbergia richardsonis (Trin.) Rydb.	mat muhly	3
Myriophyllum sibiricum Kom.	spike water-milfoil	3
Osmorhiza longistylis (Torr.) DC.	smooth sweet cicely	3
Parnassia palustris L.	northern grass-of-Parnassus	3
Pascopyrum smithii	western wheatgrass	2
Persicaria amphibia (L.) Gray	water smartweed	3
Persicaria lapathifolia (L.) Gray	pale persicaria	3
Petasites frigidus var. sagittatus	arrow-leaved coltsfoot	3
Phalaris arundinacea L.	reed canary grass	1
Phalaris canariensis L.	canary grass	3
Phleum pratense L.	timothy	2
Plagiobothrys scouleri (Hook.&Arn.) Johnst.	Scouler's allocarya	3
Plantago eriopoda Torr.	saline plantain	3
Poa palustris L.	fowl bluegrass	1
Poa pratensis L.	Kentucky bluegrass	1
Polygonum achoreum S.F. Blake	striate knotweed	1
Polygonum erectum L.	striate knotweed	3
Polygonum ramosissimum Michx.	bushy knotweed	3
Populus deltoides Bartr. ex Marsh.	plains cottonwood	1
Potamogeton foliosus Raf.	leafy pondweed	3
	1	

Potamogeton gramineus L.	various-leaved pondweed	3
Potentilla anserina (L.) Rydb.	silverweed	2
Potentilla gracilis Douglas ex. Hook.	graceful cinquefoil	3
Potentilla norvegica L.	rough cinquefoil	3
Potentilla rivalis Nutt.	brook cinquefoil	3
Prunus virginiana L.	choke cherry	3
Puccinellia nuttalliana (Schult.) Hitchc.	Nuttall's salt-meadow grass	1
Ranunculus acris L.	tall buttercup	3
Ranunculus cymbalaria Pursh	seaside buttercup	3
Ranunculus gmelinii De Candolle	yellow water crowfoot	3
Ranunculus macounii Britt.	Macoun's buttercup	3
Rorippa palustris (L.) Besser	marsh yellow cress	3
Rumex crispus L.	curled dock	1
Rumex maritimus L.	golden dock	3
Rumex triangulivalvis (Danser) Rech. f.	narrow-leaved field dock	3
Ruppia cirrhosa (Petagna) Grande	widgeon-grass	3
Sagittaria cuneata Sheld.	arum-leaved arrowhead	3
Salicornia rubra A. Nels.	samphire	3
Salix exigua Nutt.	sandbar willow	1
Salsola kali L.	Russian-thistle	3
Schoenoplectus acutus var. acutus (Muhl. ex Bigelow)	great bulrush	3
Schoenoplectus heterochaetus	slender bulrush	3
Schoenoplectus pungens var. pungens (Vahl) Palla	three-square rush	3
Schoeoplectus tabernaemontani (Gmel.) Palla	common great bulrush	3
Scirpus microcarpus J. & K. Presl	small-fruited bulrush	3
Scolochloa festucacea (Willd.) Link	spangletop	3
Scutellaria galericulata L.	marsh skullcap	3
Senecio congestus (R. Br.) DC	marsh ragwort	2
Sisyrinchium montanum Greene	common blue-eyed grass	3
Sium suave Walter	common waterparsnip	1
Solidago canadensis L.	Canada goldenrod	3
Solidago gigantea Aiton	late goldenrod	3
Sonchus arvensis L.	perennial sow-thistle	3
Sonchus asper (L.) Hill	prickly annual sow-thistle	3
Sparganium angustifolium Michx.	narrow-leaved bur-reed	3
Spartina gracilis Trin.	alkali cordgrass	3
Spartina pectinata Line	prairie cord grass	3
Spergularia salina J. & K. Presl	salt-marsh sand spurry	3
Stachys palustris L.	marsh hedge-nettle	3
Stellaria calycantha (Ledeb.) Bong.	northern stitchwort	3
Stellaria crassifolia Ehrh.	fleshy stitchwort	3
Stellaria longifolia Muhl. ex Willd.	long-leaved chickweed	3
Stuckenia pectinata (L.) Börner	sago pondweed	3
Suaeda calceoliformis (Hook.) Moq.	western seablite	3
Symphyotrichum boreale (Torr. & Gray) A. & D. Löve	marsh aster	3

Symphyotrichum ciliatum (Ledeb.) Nesom	rayless aster	3
Symphyotrichum ciliolatum (Lindl.) A. & D. Löve	Lindley's aster	3
Symphyotrichum ericoides (L.) Nesom	tufted white prairie aster	2
Symphyotrichum lanceolatum (Willd.) Nesom	western willow aster	2
Tanacetum vulgare L.	common tansy	3
Taraxacum officinale Weber ex Wiggers	common dandelion	2
Thalictrum venulosum Trel.	veiny meadow rue	2
Thlaspi arvense L.	stinkweed	2
Trifolium hybridum L.	alsike clover	2
Trifolium repens L.	white clover	2
Triglochin palustris L.	slender arrow-grass	3
Typha latifolia L.	common cattail	3
Urtica dioica L.	common nettle	2
Utricularia vulgaris L.	common bladderwort	3
Veronica anagallis-aquatica L.	speedwell	3
Veronica peregrina L.	hairy speedwell	3
Vicia americana Muhl. ex Willd.	wild vetch	3
Viola renifolia Gray	kidney-leaved violet	3
Zannichellia palustris L.	horned pondweed	3
Zizia aptera (A. Gray) Fernald	heart-leaved Alexanders	3

Rating Legend

1	mainly wetland species, and fairly common
2	too present in uplands to be indicative
3	not common enough in mixed grass prairie

APPENDIX B - MIXED-GRASS SPECIES COMMON TO SWAMPS AND MARSHES

Alopecurus aequalis Sobol.	short-awned foxtail
Beckmannia syzigachne (Steud.) Fernald	sloughgrass
Calamagrostis stricta ssp.inexpansa (Gray) Greene	northern reed grass
Carex aquatilis Wahlenb.	water sedge
Carex atherodes Spreng.	awned sedge
Carex pellita Muhl. ex Willd.	woolly sedge
Carex rostrata Stokes	beaked sedge
Cicuta maculata L.	water-hemlock
Deschampsia cespitosa (L.) Beauv.	tufted hairgrass
Eleocharis palustris (L.) Roemer & Schult.	creeping spike-rush
Glyceria striata (Lam.) Hitchc.	fowl manna grass
Hordeum jubatum L.	foxtail barley
Juncus balticus Willd.	wire rush
Mentha arvensis L.	wild mint
Phalaris arundinacea L.	reed canary grass
Poa palustris L.	fowl bluegrass
Poa pratensis L.	Kentucky bluegrass
Polygonum achoreum S.F. Blake	striate knotweed
Populus deltoides Bartr. ex Marsh.	plains cottonwood
Puccinellia nuttalliana (Schult.) Hitchc.	Nuttall's salt-meadow grass
Rumex crispus L.	curled dock
Salix exigua Nutt.	sandbar willow
Sium suave Walter	common waterparsnip