

Endemic vascular plant taxa of the Athabasca Sand Dunes of northern Saskatchewan

Digit Guedo

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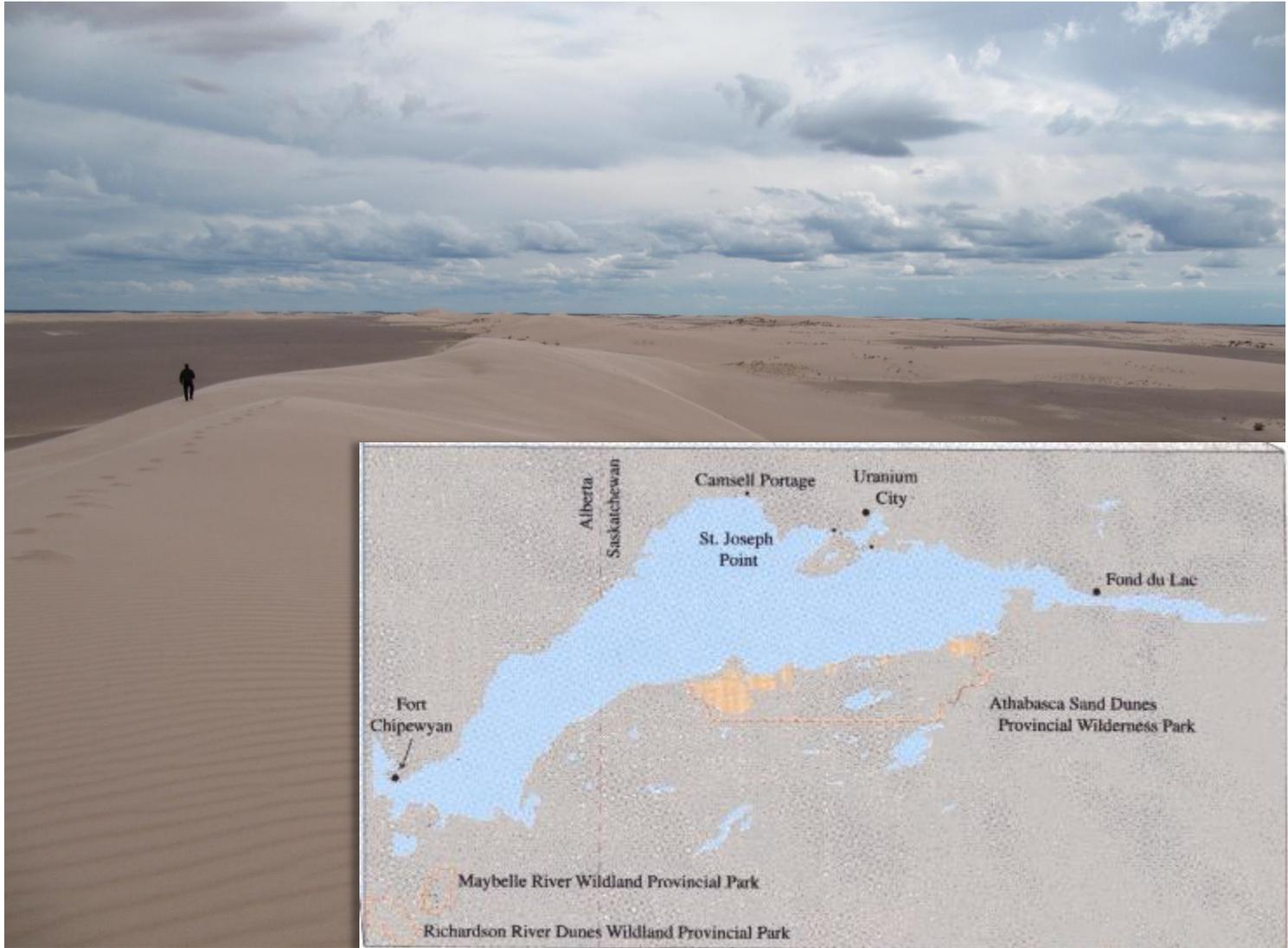


Outline

- Introduction
 - Landscape
 - Endemic species
 - Risks
- Methods
- Results
- Summary



Location and landscape



The endemics

| Characteristic | Moderates |
|-----------------------|---|
| Silvery | Reflects incoming UV, lessens heat in chlorophyll |
| Densely hairy, woolly | Reduces heat buildup and moisture loss, traps dew |
| Curved leaf edges | Reduces moisture loss |
| Toughened cuticle | Resists damage from sand abrasion |
| Fast apical growth | Resists sand burial |
| Flexible stems | Reduces wind and sand damage |
| Adventitious rooting | Survives burial, support structure |
| Rhizomatous growth | Survives burial, reproduction without seed |

Impoverished pinweed - *Lechea intermedia* var. *depauperata*



Photo/ image: Vernon Harmes, W.P. Fraser Herbarium (1999)

Large-headed Woolly Yarrow - *Achillea millefolium* var. *megacephalum*



S.Vinge

Athabasca Thrift - *Armeria maritima* ssp. *interior*



D. Guedo

Mackenzie Hairgrass - *Deschampsia mackenziana*



C. Neufeld

Sand Stitchwort- *Stellaria arenicola*



Sand-dune Short-capsuled Willow-
Salix brachycarpa var. *psammophila*



M. Weiss



A. Tucker

Felt-leaf Willow- *Salix silicicola*



S. Vinge

Turnor's Willow- *Salix turnorii*



Tyrell's Willow- *Salix tyrellii*



G. Longpre

Floccose Tansy – *Tanacetum huronense* var. *floccosum*



S. Vinge

Risks

- Potential risks to endemic species:

- Climate change and species shift
- Ecotourism
- ATVs
- Mineral exploration
- Exotic species invasion
- Acid deposition



- To evaluate risks, we need understand the habitats and abundances of the endemic species

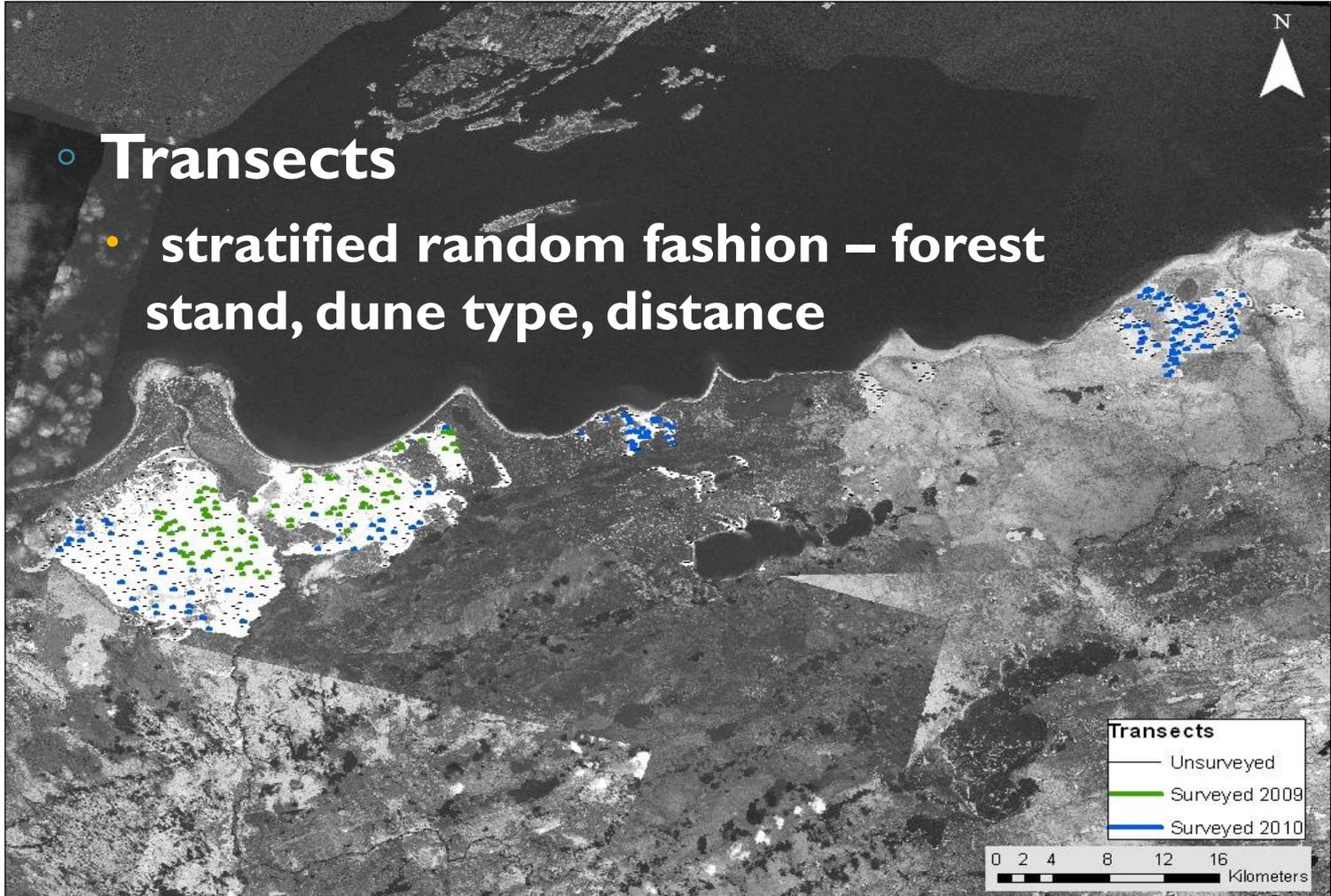
Objectives

- Quantitatively document the distribution and abundance of the endemics occurring in the Athabasca Sand Dunes

Study design and methods

- **Transects**

- stratified random fashion – forest stand, dune type, distance



Data collection - Habitat

- Slope
 - Upper, mid, lower
- Aspect
- Erosional status
 - Erosional, depositional, static
- Habitat



Wet inter-dune slack (WIDS)



S. Vinge

Saline inter-dune slack (SIDS)



S. Vinge

Gravel pavement (GRPV)



S. Vinge



C. Neufeld

Low slope gradient dune (LSDN)



A. Tucker

High slope gradient dune (HSDN)



S. Vinge

Lichen-crowberry-heather (LICH)



G. Longpre

Woodland (WOOD)



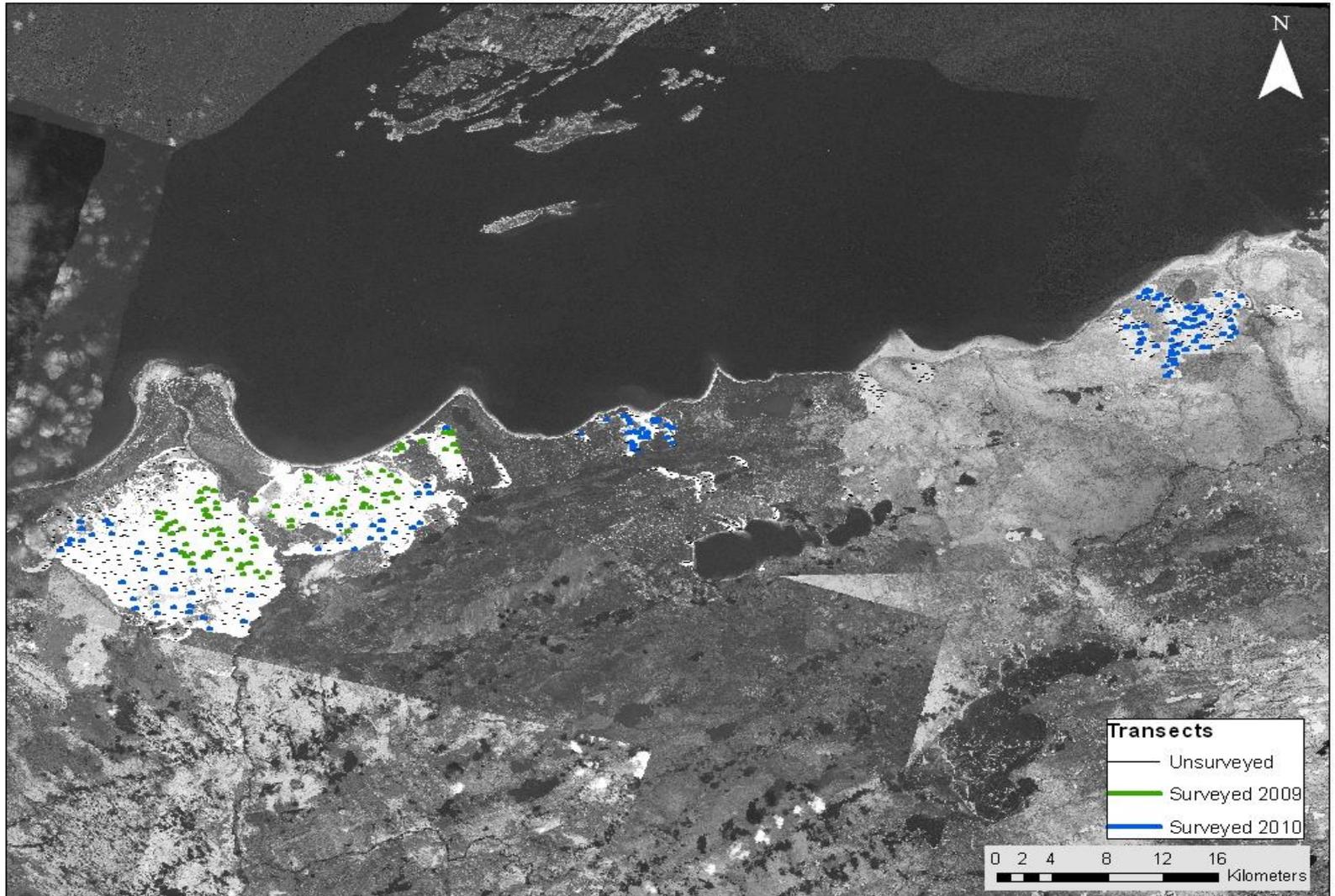
S. Vinge

Data collection - Vegetation

- Individuals
 - Forbs - separated by 20cm
 - Willows - individual stems
- Patches
 - Separated by 2m
 - Size measured by ellipse:
longest x perpendicular axis
- Search area
 - Forbs - 4m x 250m
 - Willows - 10m x 250m



Collection summary



Habitat summary

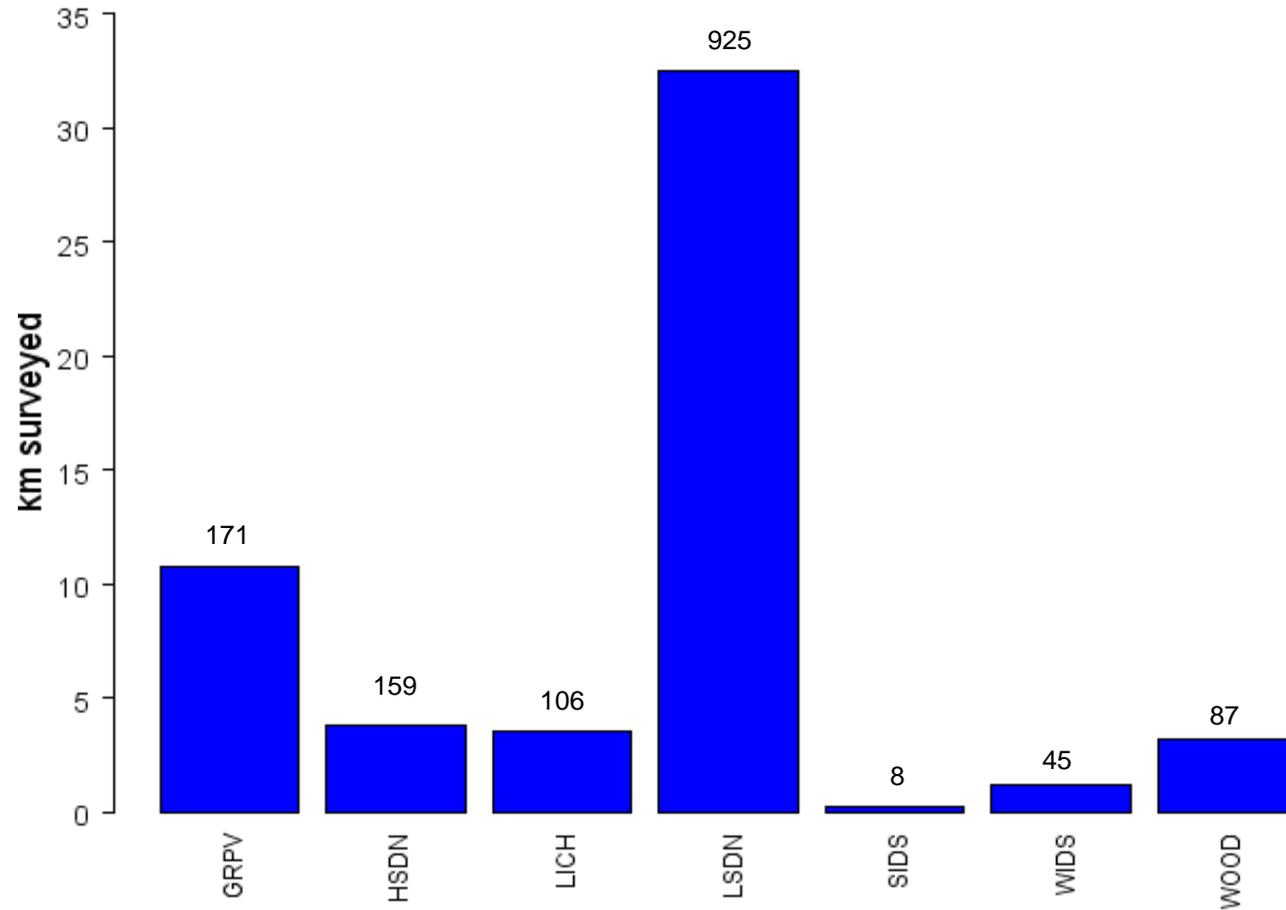


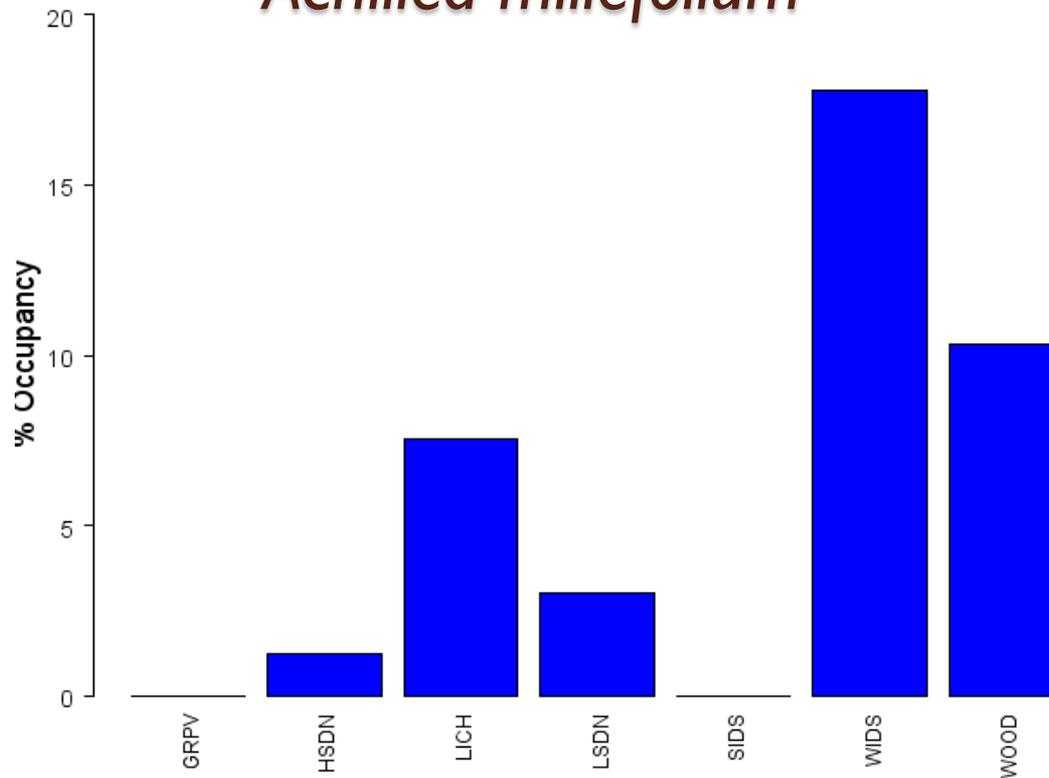
Figure 1: Kilometers of transect surveyed in each habitat type. Superscript numbers indicate number of habitat segments sampled in each habitat type.

Endemic observation summary

Table 1: Count of total observations and the relative abundance (percentage of total number of observations) of each taxa in the occupancy survey. Note that the relative abundance numbers are not adjusted for the wider search area for the willows.

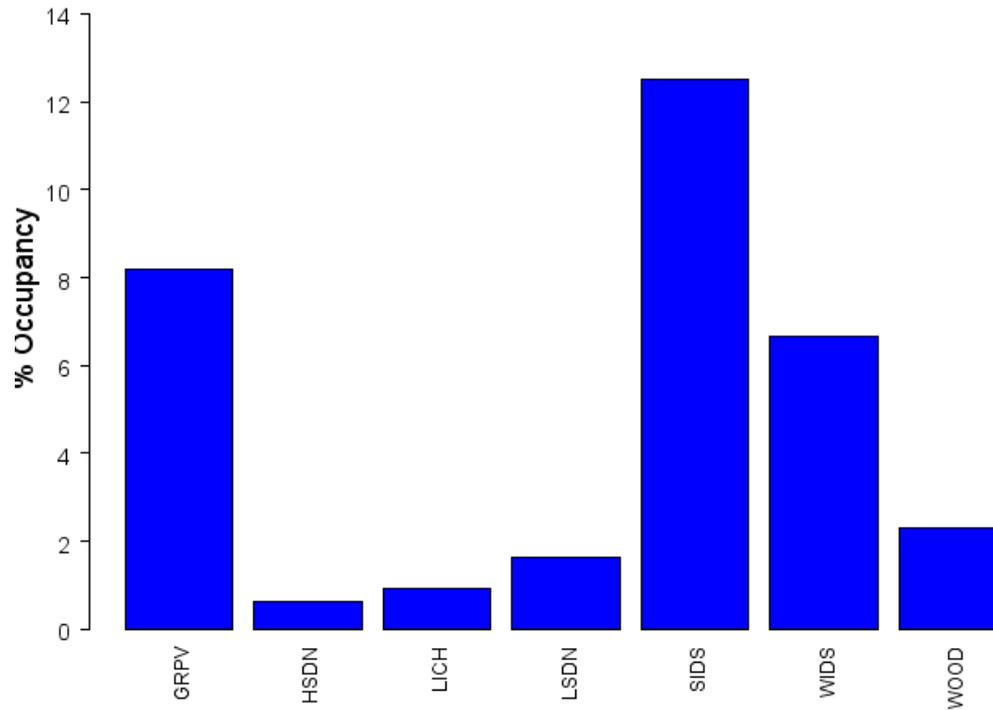
| Species | Count |
|---------------------------------|----------------|
| <i>Achillea millefolium</i> | 592 (0.29) |
| <i>Armeria maritima</i> | 272 (0.13) |
| <i>Deschampsia mackenzieana</i> | 14213 (6.89) |
| <i>Salix brachycarpa</i> | 28224 (13.69) |
| <i>Salix silicicola</i> | 23740 (11.52) |
| <i>Salix turnorii</i> | 15634 (7.58) |
| <i>Salix tyrellii</i> | 114025 (55.31) |
| <i>Stellaria arenicola</i> | 3810 (1.85) |
| <i>Tanacetum huronense</i> | 5628 (2.73) |

Achillea millefolium



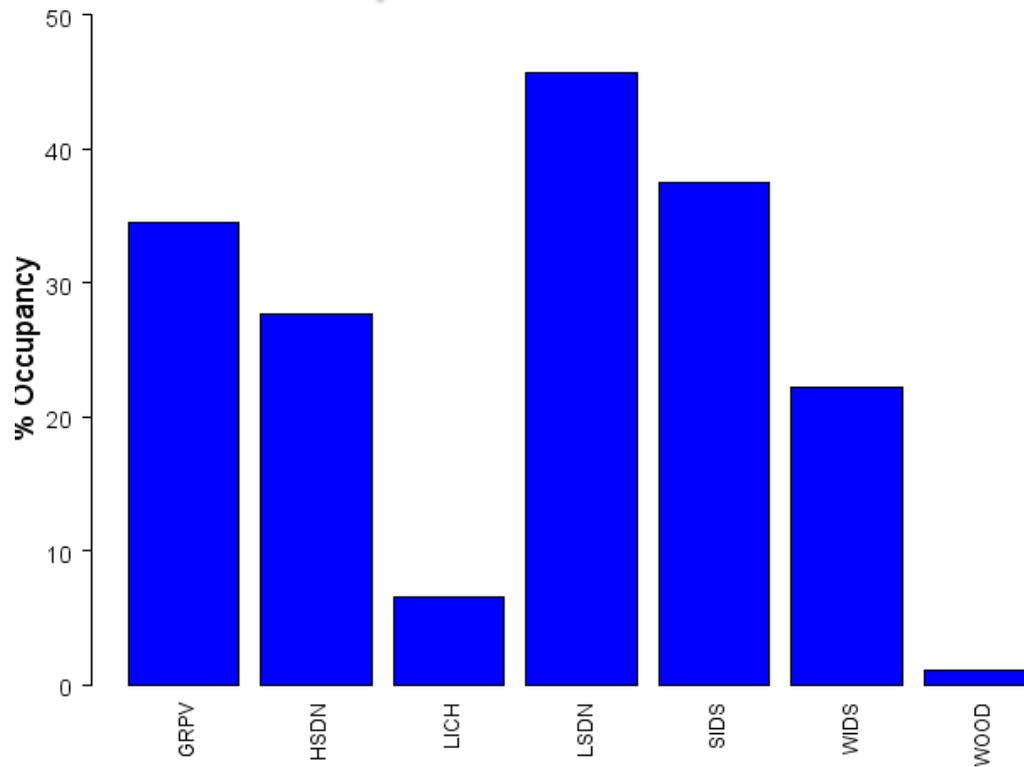
- Low abundance
- Highest occurrence in WIDS, then WOOD
 - Limited ability to tolerate burial by sand
 - Susceptible to acid deposition and traffic given habitat affinities

Armeria maritima



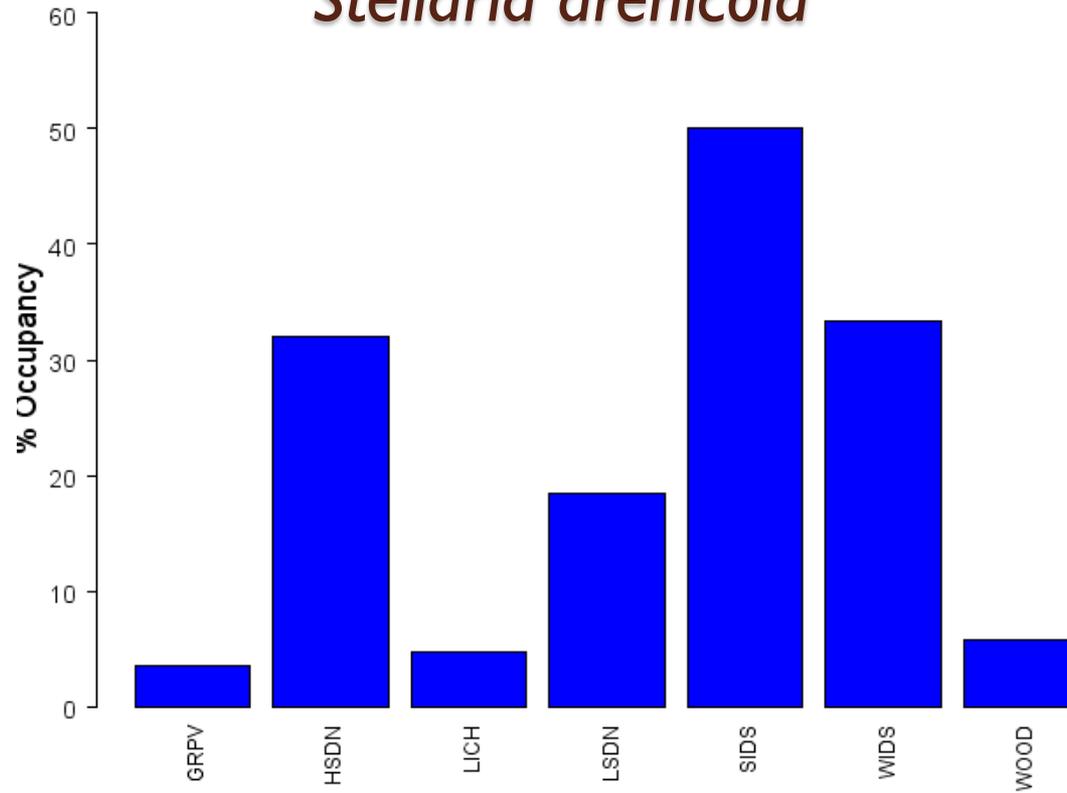
- Species with least occurrences
- Grows on more stable habitats such as gravel pavements
- Poorly adapted to sand burial and excavation
 - Taproot damage from traffic on GRPV and slacks
 - Susceptible to acid deposition given habitat affinities

Deschampsia mackenziana



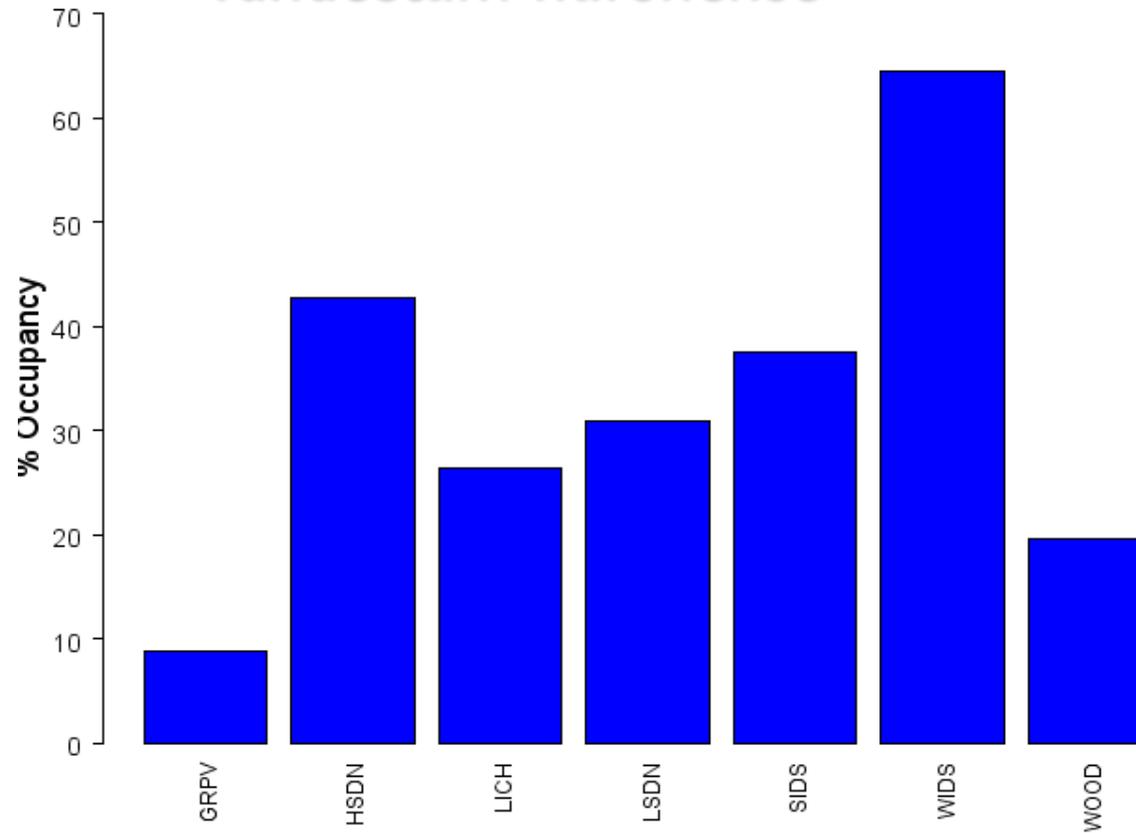
- Most frequently encountered species
- Occupancy highest on low-sloping dunes
- Often occurred in the absence of other species
 - Acid deposition may impact germination requirements

Stellaria arenicola



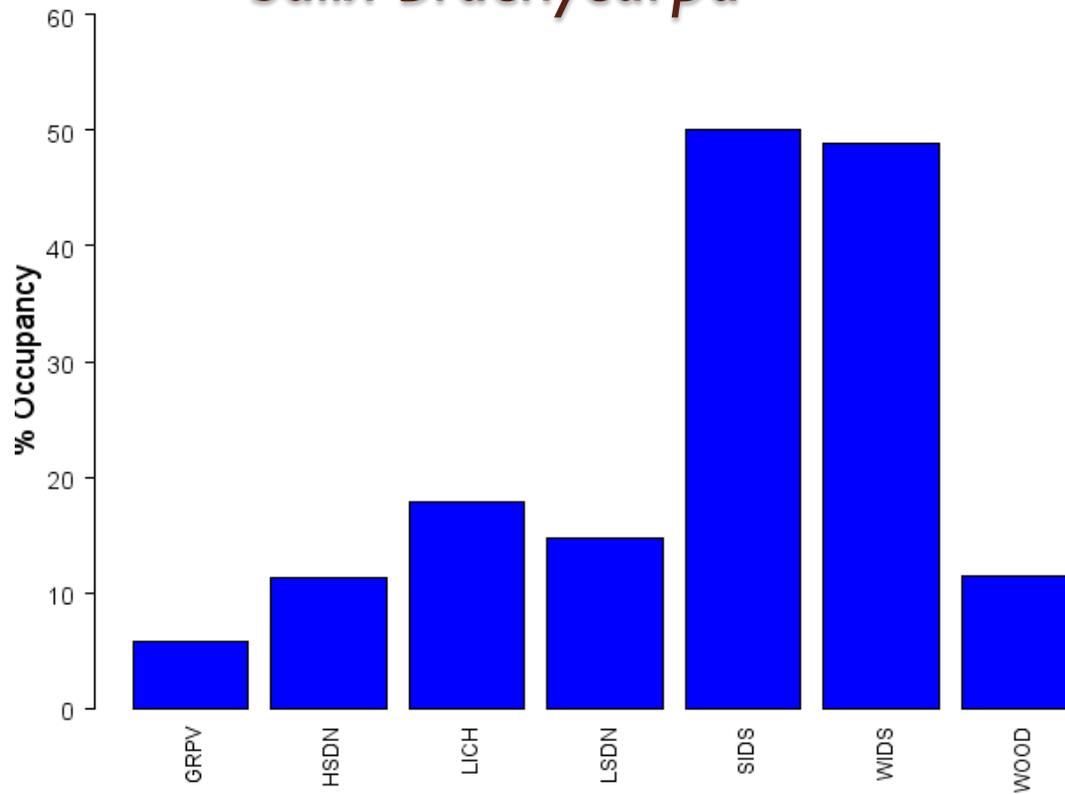
- Most occurrences in WIDS, SIDS and HSDN
- Susceptible to acid deposition and traffic given habitat affinities

Tanacetum huronense



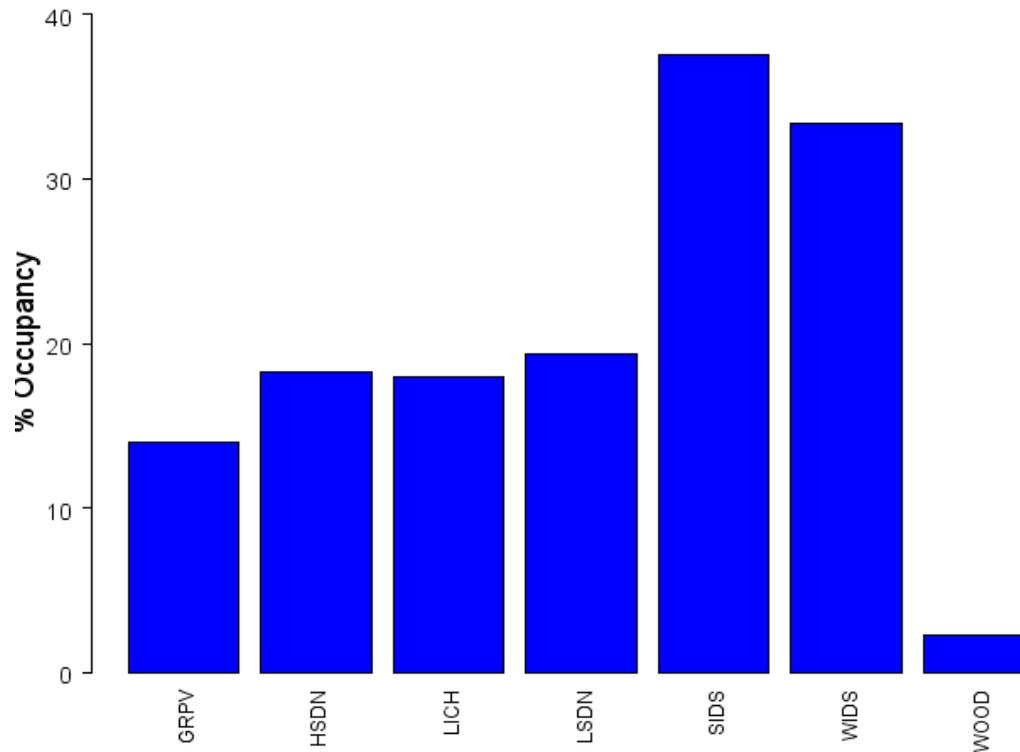
- Most occurrences on WIDS, HSDN and SIDS
- Seems to tolerate burial - vigorous rhizomatous growth
 - Susceptible to acid deposition and traffic given habitat affinities

Salix brachycarpa



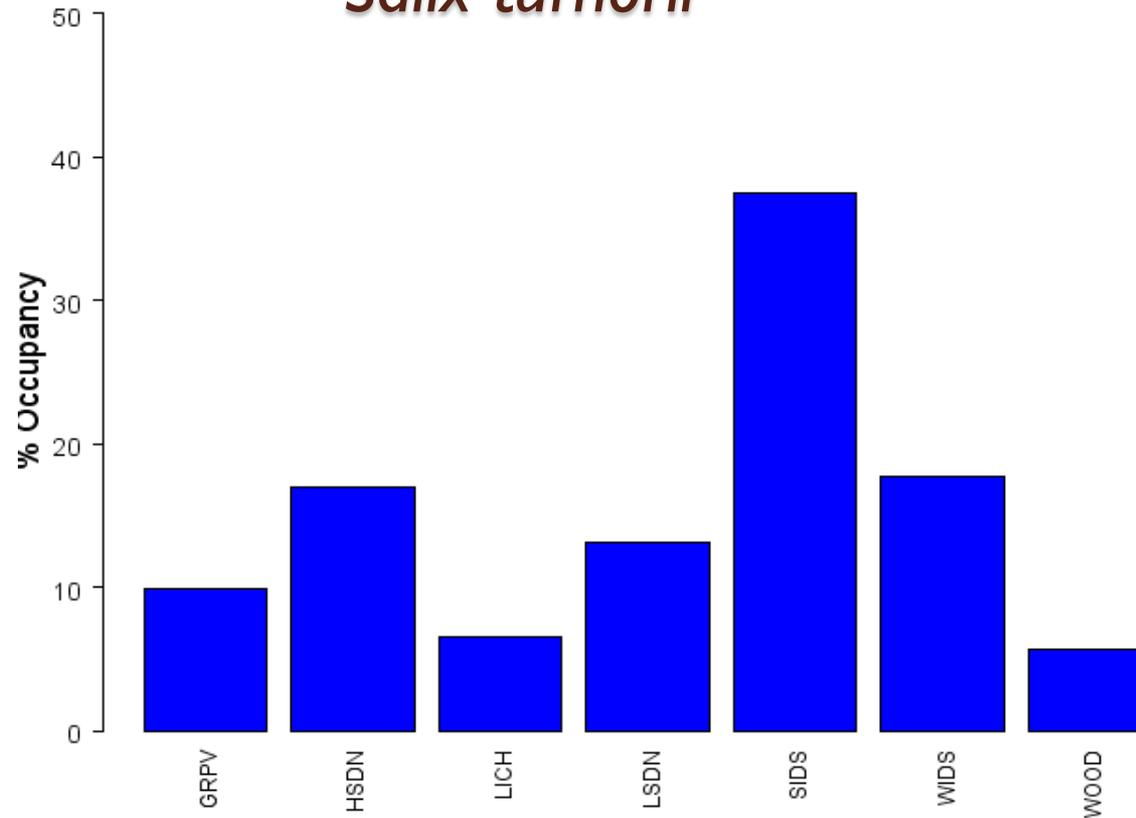
- Most occurrences on WIDS and SIDS

Salix silicicola



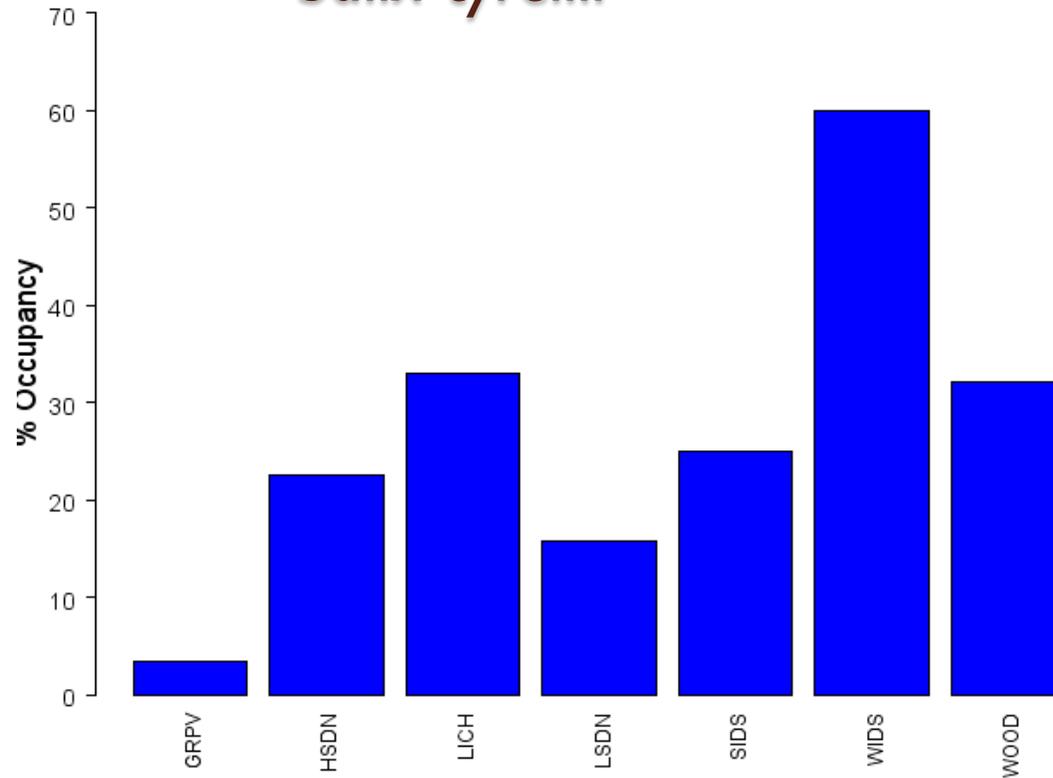
- Occurs similarly on all habitats, lower occurrences WOOD and GRPV

Salix turnorii



- Occurs similarly on all habitats, lower occurrences on WOOD and LICH

Salix tyrellii



- Occurs most frequently on WIDS, WOOD and LICH

Endemic species richness

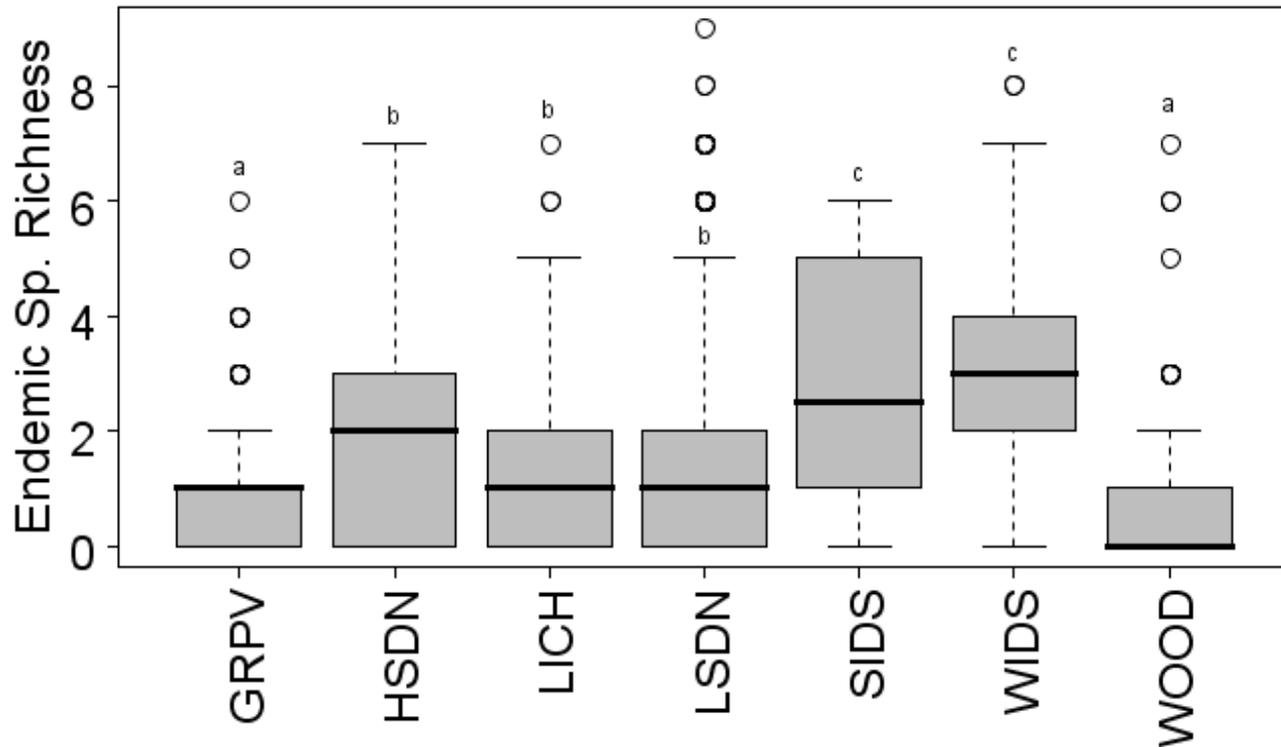


Figure 2: Endemic richness (number of species with at least one individual present in a habitat segment) in each major habitat type. The letters above the whiskers indicate groups of habitats that differ significantly in their mean species richness. The thick horizontal line is the median, and the lower and upper bounds of the box represent the 25th and 75th percentiles respectively.

- Saskatchewan Parks Service (2009 financial contribution)
- Habitat Stewardship Program (2010 financial contribution)
- Parks Service, Ministry of Tourism, Parks, Culture and Sport
 - Dr. Rob Wright, Bob Wilson, Glen Longpre, J. R. Smith, Kelvin Kelly
- Environmental Protection Branch, MOE
 - Murray Hilderman, Allison Tucker
- Environmental Assessment Branch, MOE
 - Sarah James
- Information Management and Geomatics Services Branch, MOE
 - Mike Andersen
- Fish and Wildlife Branch, MOE
 - Jeanette Pepper, Jeff Keith, Sue McAdam
- Native Plant Society of Saskatchewan
 - Chet Neufeld
- Department of Plant Sciences, U of S
 - Dr. Eric Lamb, Digit Guedo, Jenalee Mischkolz, Amanda Guy
- Nature Saskatchewan
 - Jessus Karst, Matt Weiss, Sarah Vinge
- National Museum of Canada
 - Dr. George Argus
- Canadian Wildlife Services, EC
 - Candace Neufeld, Darcy Henderson, Sarah Lowe
- Independent Consultants
 - Anna Leighton



K. Kelly



M. Hilderman

References

Environment Canada (2011) Species at risk registry.

<http://www.sararegistry.gc.ca>

Jonker, P.M. & Rowe, J.S. (2001) The sand dunes of Lake Athabasca: our adventure in learning. University Extension Press, Saskatoon, SK.

Lamb, E.G. (2010) The distribution and abundance of the endemic vascular plant taxa of the Athabasca Sand Dunes of northern Saskatchewan. Unpublished report to the Canadian Wildlife Service (Environment Canada)

Thanks!

Report accessible online:

<http://homepage.usask.ca/~egl388/index.html>

Table 5: Summary of survey extent including transect length (km) and number of habitat units in each major habitat type.

| Habitat | Km Surveyed | # habitat units | Average unit length (m ± SD) | Total area surveyed for Willows (ha) | Total area surveyed for forbs and grasses (ha) |
|---------------------------------|--------------------|------------------------|-------------------------------------|---|---|
| Gravel Pavement (GRPV) | 10.778 | 171 | 63 ±62.5 | 10.78 | 4.31 |
| High Slope Dune (HSDN) | 3.841 | 159 | 24.2 ±22.8 | 3.84 | 1.54 |
| Lichen – crowberry heath (LICH) | 3.520 | 106 | 33.2 ±42.6 | 3.52 | 1.41 |
| Low slope dune (LSDN) | 32.473 | 925 | 35.1 ±32.7 | 32.47 | 12.99 |
| Saline Inter-dune slack (SIDS) | 0.257 | 8 | 32.1 ±31.1 | 0.26 | 0.10 |
| Wet inter-dune slack (WIDS) | 1.204 | 45 | 26.8 ±15.4 | 1.20 | 0.48 |
| Woodland (WOOD) | 3.239 | 87 | 37.2 ±40.3 | 3.24 | 1.30 |
| Total | 55.312 | 1501 | 36.9 ±38.6 | 55.31 | 22.13 |

Table 12: Percentage of habitat units surveyed where at least one individual of the target taxa were observed. Superscripts indicate habitats where the probability of occurrence was not significantly different. Superscript letters are ordered from “a” (lowest probability) and up. Note that the reported occurrence rates in the SIDS habitat are likely very unreliable as only eight habitat units of this type were surveyed.

| Species | GRPV | HSDN | LICH | LSDN | SIDS | WIDS | WOOD |
|-----------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <i>Achillea millefolium</i> | 0 ^a | 1.3 ^a | 7.6 ^c | 3.0 ^b | 0 ^a | 17.8 ^e | 10.3 ^d |
| <i>Armeria maritima</i> | 8.2 ^b | 0.6 ^a | 0.9 ^a | 1.6 ^a | 12.5 ^b | 6.7 ^b | 2.3 ^a |
| <i>D. mackenzieana</i> | 34.5 ^c | 27.7 ^c | 6.6 ^b | 45.6 ^d | 37.5 ^c | 22.2 ^c | 1.2 ^a |
| <i>Salix brachycarpa</i> | 5.9 ^a | 11.3 ^a | 17.9 ^b | 14.7 ^b | 50.0 ^c | 48.9 ^c | 11.5 ^a |
| <i>Salix silicicola</i> | 14.0 ^a | 18.2 ^b | 17.9 ^b | 19.4 ^b | 37.5 ^b | 33.3 ^b | 2.3 ^a |
| <i>Salix turnorii</i> | 9.9 ^b | 17.0 ^b | 6.6 ^a | 13.2 ^b | 37.5 ^b | 17.8 ^b | 5.8 ^a |
| <i>Salix tyrellii</i> | 3.5 ^a | 22.6 ^b | 33.0 ^c | 15.8 ^b | 25.0 ^b | 60.0 ^c | 32.2 ^c |
| <i>Stellaria arenicola</i> | 3.5 ^a | 32.1 ^c | 4.7 ^a | 18.5 ^b | 50.0 ^c | 33.3 ^c | 5.8 ^a |
| <i>Tanacetum huronense</i> | 8.8 ^a | 42.8 ^c | 26.4 ^b | 30.9 ^b | 37.5 ^c | 64.4 ^c | 19.5 ^a |
| Total surveyed | 171 | 159 | 106 | 925 | 8 | 45 | 87 |