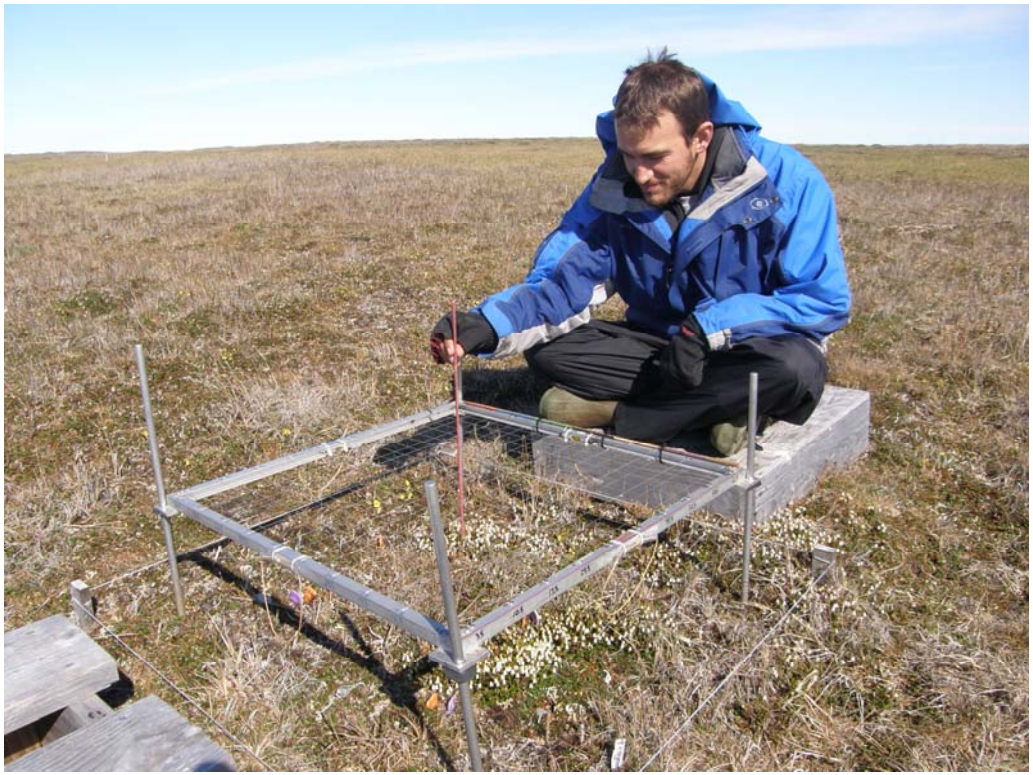
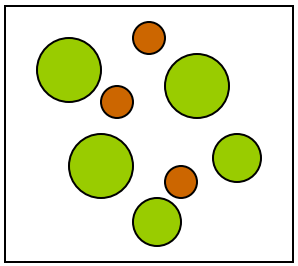
Validation of Top and Bottom Hit Only Point Frame Method

Jeremy May and Dr. Robert Hollister

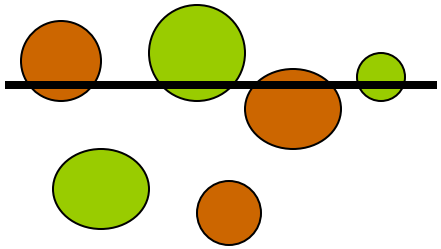


Community Measure Methods

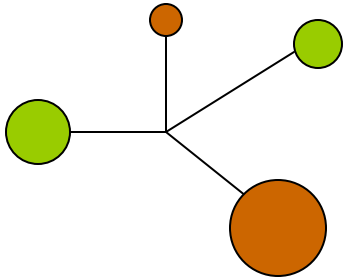
Quadrat method



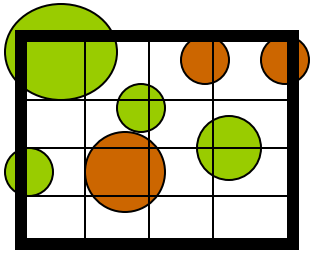
Line-Intercept method



Distance method



Point method



(Barbour et al, 1999)

Point Frame Method in Tundra Plant Communities

Widely used in monitoring Arctic plant communities

- **Small plant stature**

Multiple plots are most accurate for determining community change

- **Communities have high spatial hetergeneity**

Why Tundra?

Tundra is important in understanding the effects of climate change

- **Effects are felt the earliest and greatest in high latitude areas**

Warming temperatures have been documented since the 1800's

- **More rapidly since the mid 20th century (Wahren et al 2005)**
- **Even small variations can effect community function (Chapin and Shaver, 1985)**

Numerous long-term studies investigating

- **International Tundra Experiment (ITEX)**

Point Framing method often used by ITEX

- **Top and Bottom hit only method is often used as a short cut**

Sites

Four sites in northern Alaska

-Atqasuk

Dry Heath

Wet Meadow

Sampled in summer of 2007

-Barrow

Dry Heath

Wet Meadow

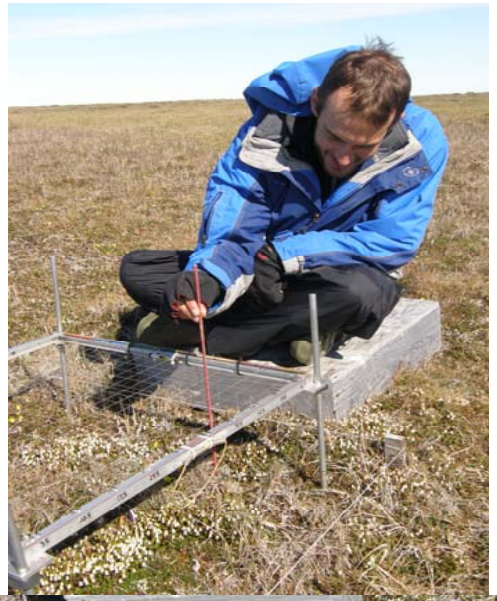
Sampled in summer of 2008

All sampling was done in the same 2 week period (late July-early August)

Point Frame Method (Short Cut)

Point Frame Grid

- **-75cmX75cm**
- **-100 points**
- **-Oriented and leveled above each plot**



Measurements

- **-At each point each top and bottom contact is recorded**
  - **Species**
  - **Live/Dead Status**
  - **Height**

(Hollister et al, 2005)

Assessment of Point Framing Accuracy

Point Framing in this study

- **Top and Bottom contacts Only**
- **All contacts at each point**

Allowing the assessment of whether Top and Bottom method is accurate in monitoring plant communities

Hypotheses:

- **Top and Bottom method will be accurate for most growth forms**
  - **Due to most points having only one or two contacts**
  - **Only graminoids and shrubs may be different due to layering**
- **Top and Bottom method will be accurate in determining species richness**

Types of Comparisons

All comparisons were done between All contact and Top and Bottom only methods

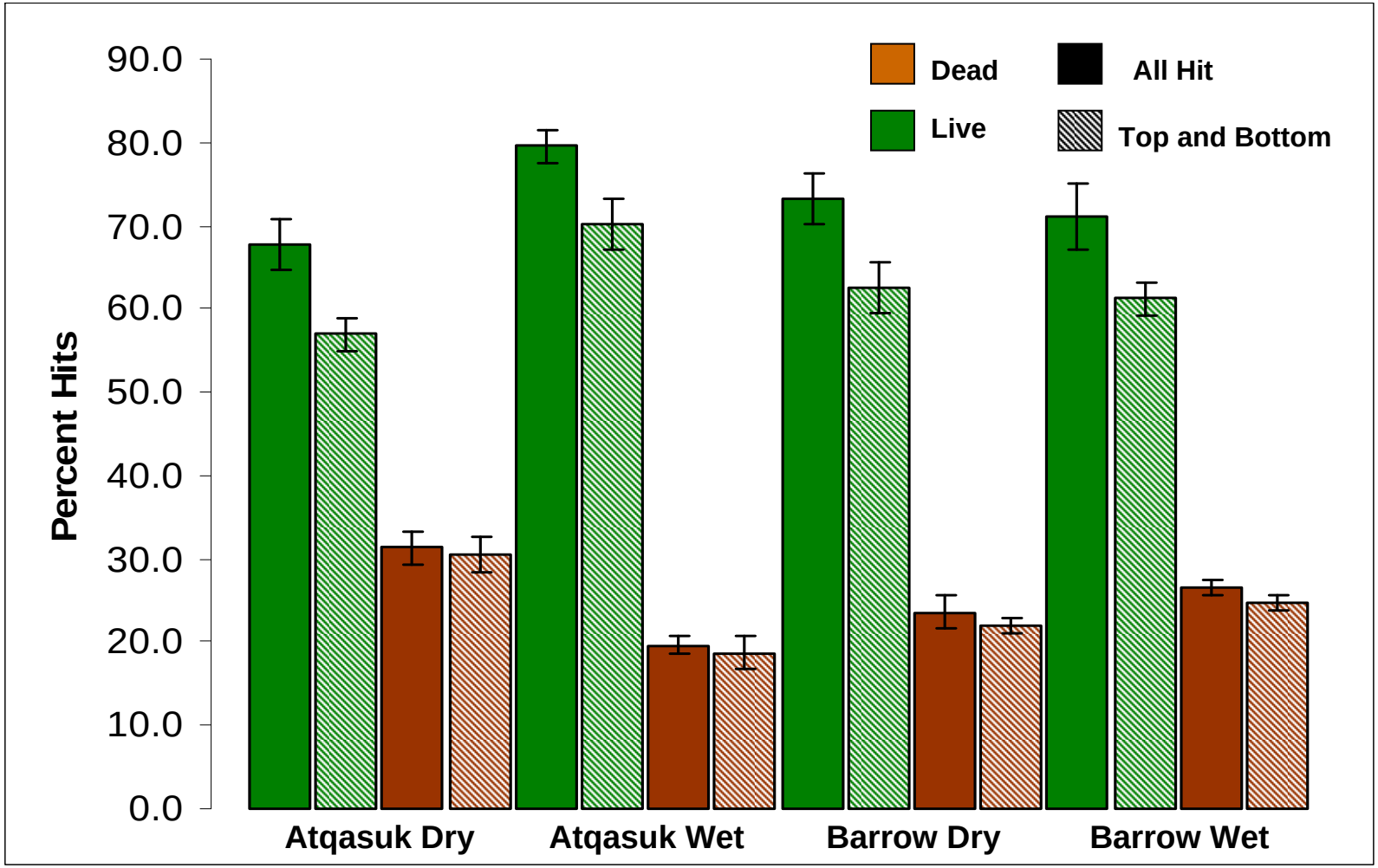
Comparison of type of hits across sites (Dead/Live)

Comparison of Absolute Cover for all growth forms

Comparison of Relative Cover for all major growth forms

Species Diversity (Richness, Evenness, Shannon, Simpson)

Live and dead Hits



Significant differences for number of live hits across sites

Absolute Cover

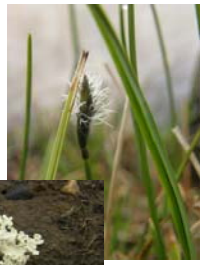
	Atqasuk						Barrow					
	Dry Site			Wet Site			Dry Site			Wet Site		
	AH	TB	Diff	AH	TB	Diff	AH	TB	Diff	AH	TB	Diff
D. Shrubs	0.7	0.7	0.0	14.1	9.9	4.2 ***	30.6	30.5	0.0	1.3	1.3	0.0
E. Shrubs	48.9	45.4	3.5 ***	-	-	-	32.8	27.7	5.1 ***	-	-	-
Forbs	1.7	1.6	0.1 ?	0.5	0.3	0.2 ?	13.5	12.2	1.3 ***	23.1	22.8	0.4 ***
Graminoids	29.4	23.2	6.2 ***	32.4	25.5	6.9 ***	19.7	16.6	3.1 ***	55.5	46.4	9.1 ***
Lichens	20.9	20.7	0.2 ***	0.3	0.3	0.0	18.5	18.2	0.3 **	3.1	3.1	0.0
Bryophytes	5.5	5.5	0.0	78.8	77.5	1.3 ***	7.9	7.9	0.0	26.9	26.8	0.1 ?

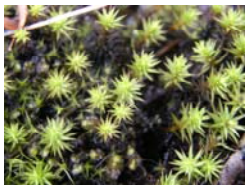
Shrubs show difference in cover due to layering

Forbs show varying differences across sites

Graminoids show difference across all sites due to layering

Nonvascular plants show little differences





Relative Cover

	Atqasuk						Barrow					
	Dry Site			Wet Site			Dry Site			Wet Site		
	AH	TB	Diff	AH	TB	Diff	AH	TB	Diff	AH	TB	Diff
D. Shrubs	0.5	0.5	0.0	61.6	67.0	5.4 ***	21.7	23.2	1.5 **	0.9	1.0	0.1
E. Shrubs	34.2	34.3	0.1	-	-	-	22.7	20.8	1.9 **	-	-	-
Forbs	1.3	1.3	0.0	0.1	0.1	0.0	9.6	9.4	0.2	16.9	17.8	0.9 ***
Graminoids	20.1	17.4	2.7 ***	14.5	16.1	1.5 ***	13.5	12.4	1.1 **	55.9	52.3	3.6 ***
Lichens	36.3	38.4	0.1 ***	0.3	0.2	0.1 **	23.4	24.6	1.2 **	3.7	3.9	0.2 ?
Bryophytes	7.6	8.1	0.1 ***	0.2	0.2	0.1 ***	8.9	9.4	0.5 **	22.3	24.5	2.2 ***

All differences are smaller

Shrubs and Forbs have less significant differences

Graminoids continue to show differences across all sites

Nonvascular plants overall show significant differences

Species Diversity

	Atqasuk						Barrow					
	Dry			Wet			Dry			Wet		
	AH	TB	Diff	AH	TB	Diff	AH	TB	Diff	AH	TB	Diff
Species Richness	15.833	15.813	0.021	11.896	11.583	0.313 *	18.646	18.583	0.063 ?	15.792	15.646	0.146
Shannon Div. Index	2.391	2.398	0.006 ?	1.884	1.848	0.037 **	2.327	2.343	0.016 *	2.181	2.217	0.036
Simpson Div. Index	0.884	0.885	0.001 **	0.789	0.778	0.011 ***	0.850	0.852	0.002 ***	0.824	0.835	0.010 ***
Pielou Evenness	0.869	0.871	0.003 ***	0.767	0.760	0.007 **	0.799	0.805	0.006 ***	0.794	0.810	0.016 ***

Species Richness shows little difference across sites

Shannon Diversity Index shows contrast in differences across sites

Simpson Diversity Index shows significant differences across all sites

Pielou's Evenness shows significant differences all sites

Conclusions

Absolute Cover

- **Graminoids and Shrubs show the most difference**

Relative Cover

- **Graminoids and nonvascular plants show significant differences**
- **All differences are less than Absolute Cover**

Species Diversity

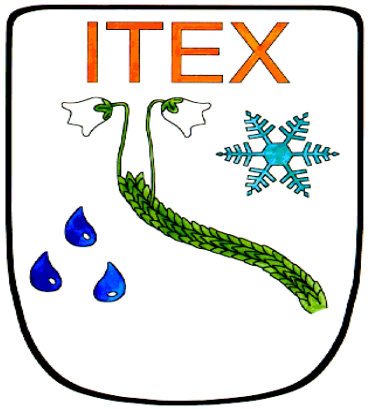
- **Overall lost of diversity and evenness**

Top and Bottom Hit Only method is more accurate for determining Relative Cover for most growth forms

Method is less accurate for determining Absolute Cover and species richness and evenness

Acknowledgements

Rob Slider, Jennifer Liebig, Amanda Snyder, Jean Galang, and Mike Lothshultz



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Questions?