Porcupine Caribou in the Yukon North Slope
habitat use and resource selection

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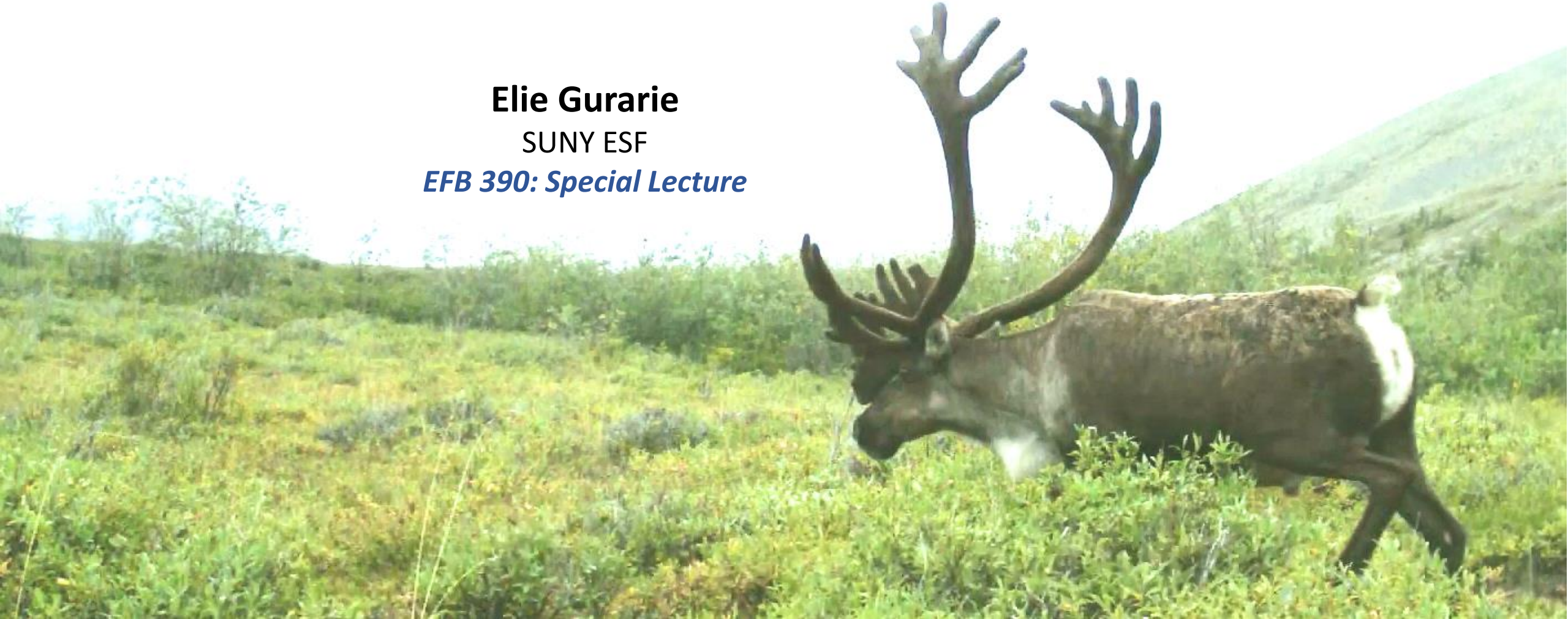
SUNY ESF
EFB 390: Special Lecture



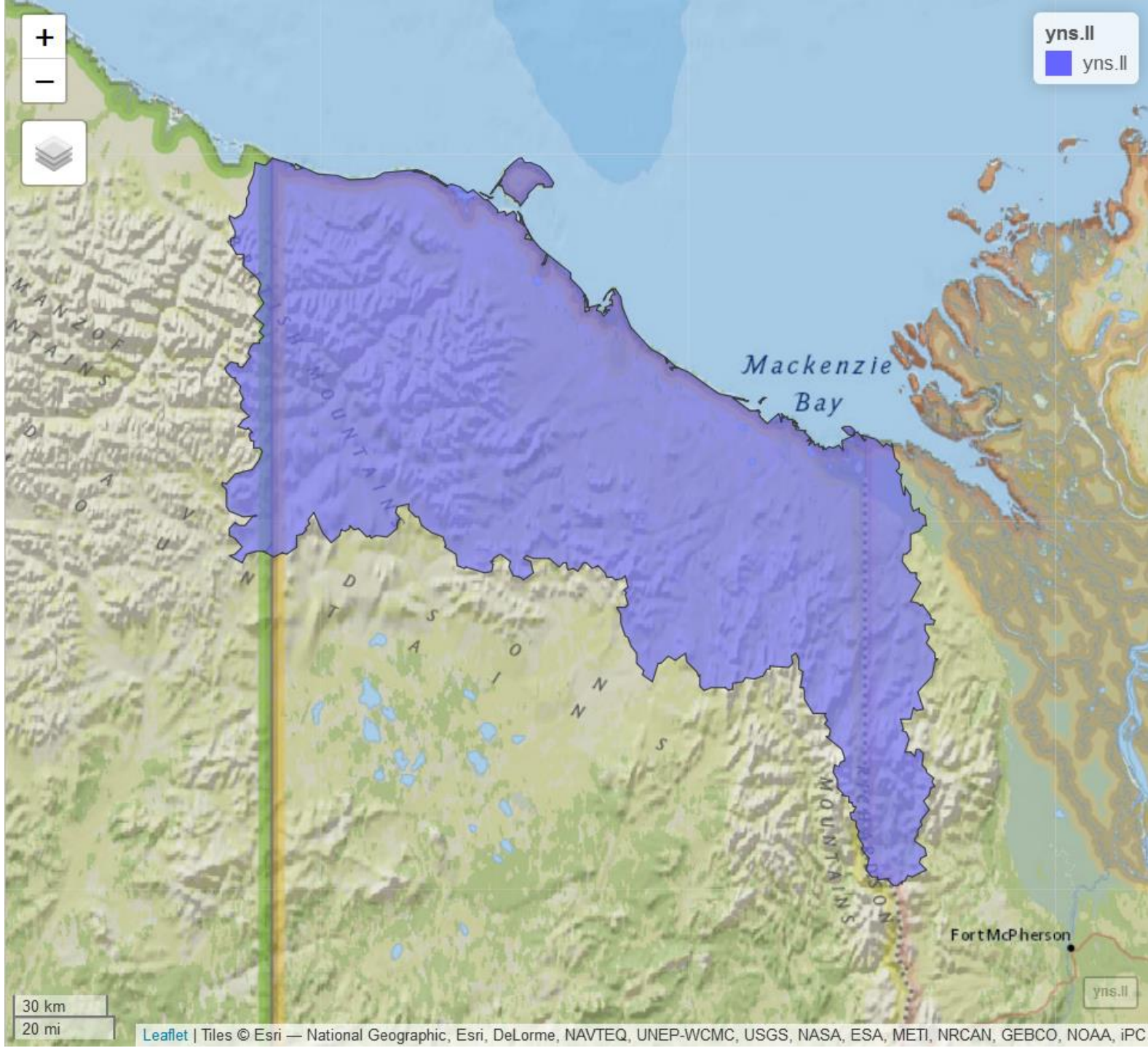
Goals

1. Identify **habitat variables** that are important to / preferentially used by PCH caribou in the Yukon North Slope.
2. Spatially **map** areas of greater / lesser importance.
3. Use this information to **predict potential impacts** of landscape change, e.g. **development**

Study Area:

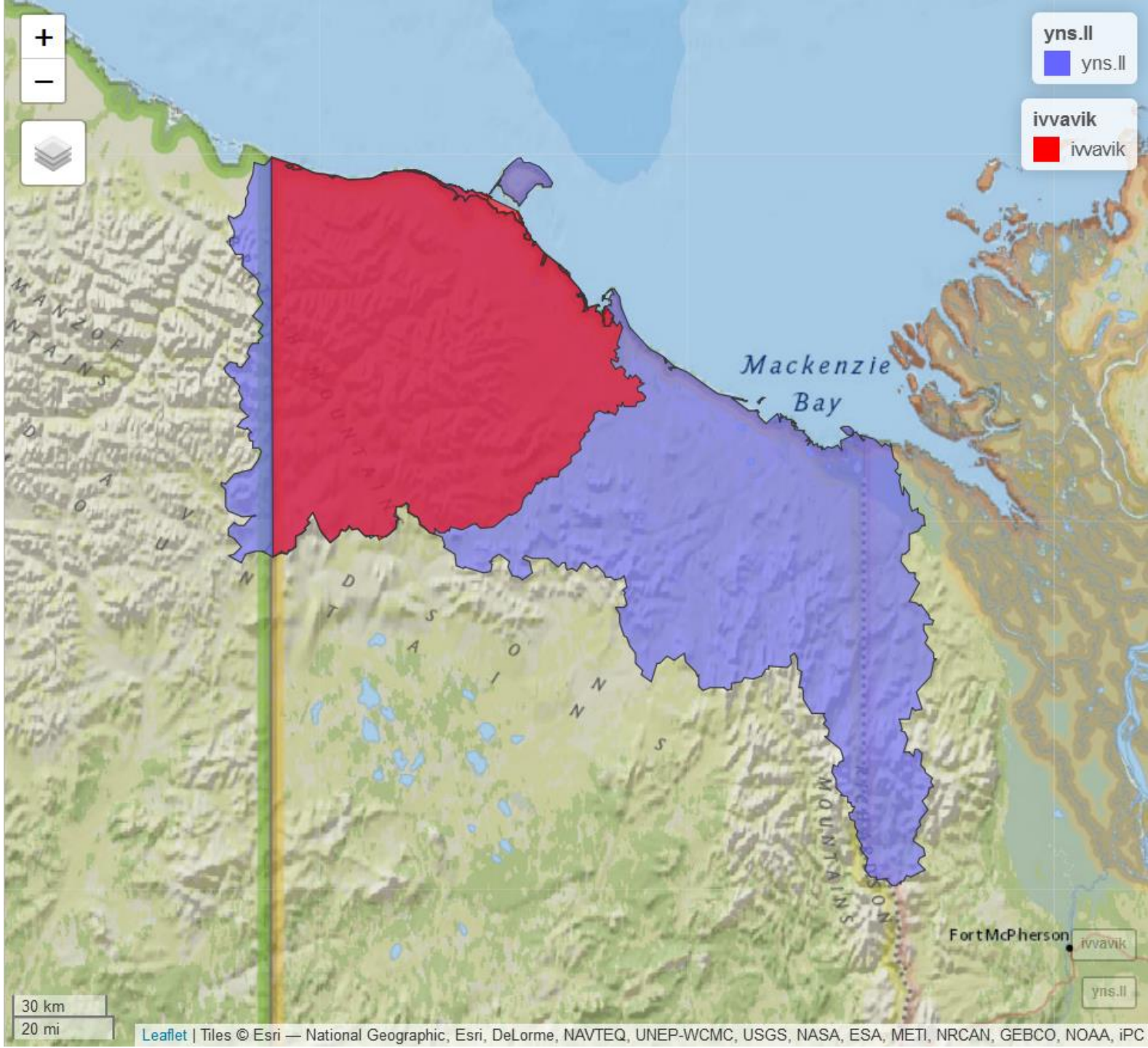
Yukon North Slope

- Within **Yukon Territory** and N. of **Brooks Range**
- ~22,000 km^2



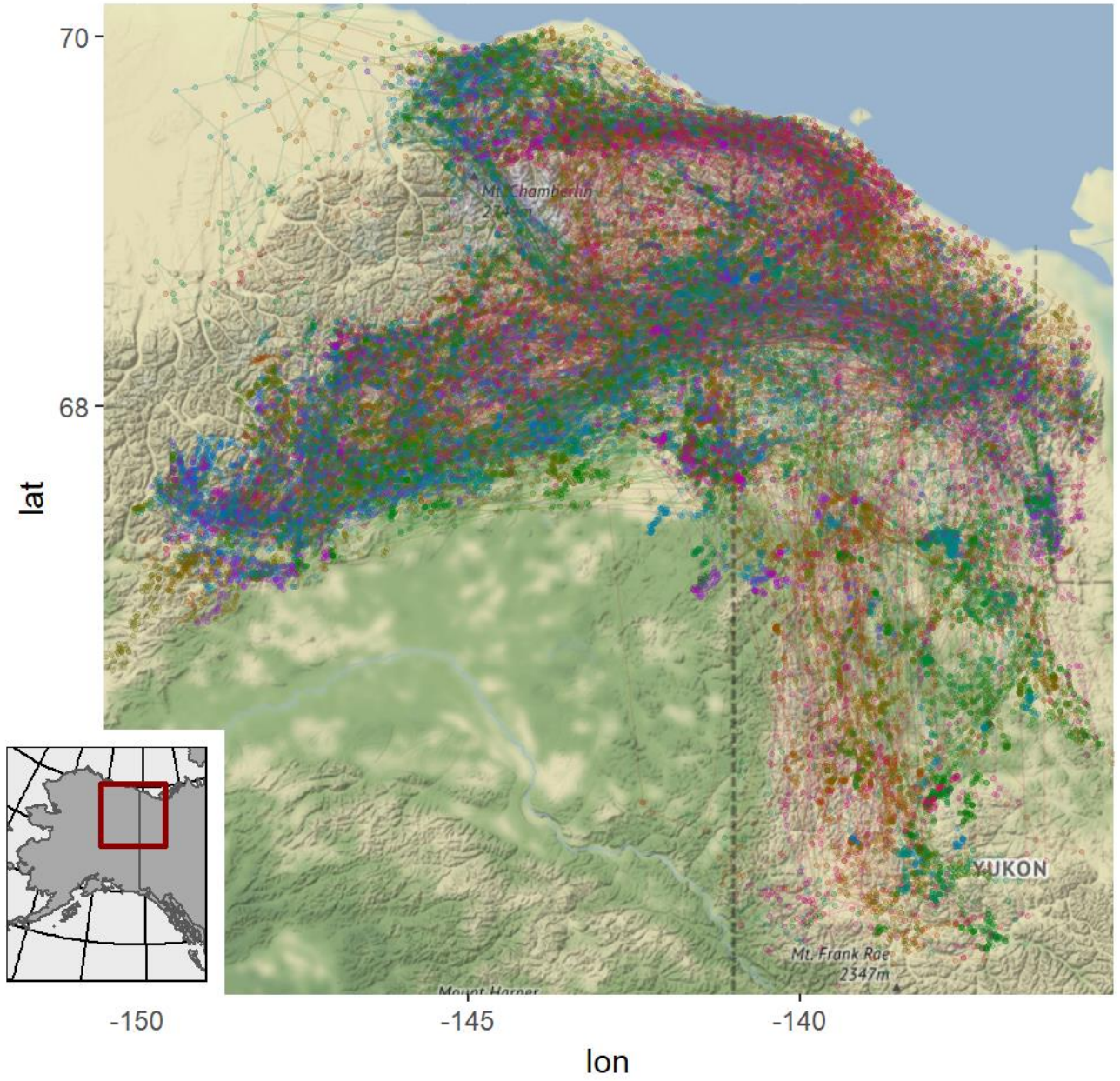
Study Area:
Yukon North Slope

- Within **Yukon Territory** and N. of **Brooks Range**
- ~22,000 km^2
- **Ivvavik N.P.** set aside as protected area, **~45%**



Data:
Collared Caribou

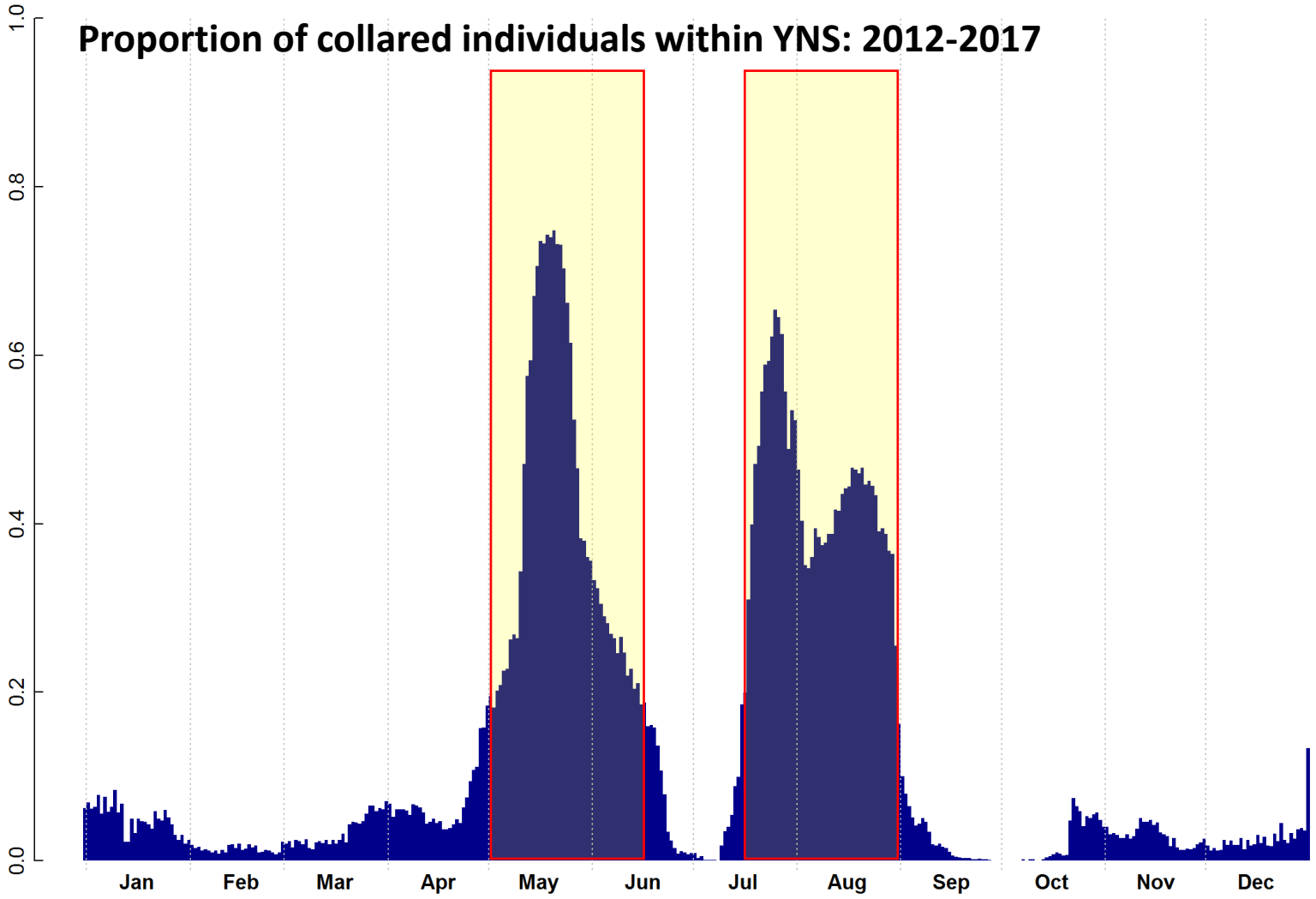
- Since 1998, 175 caribou tracked …



Seasonal use of YNS

Two main periods of use:

1. Spring (May 1 – June 15)
   migration towards calving grounds + some calving
2. Summer (July 1 – August 30)
   summer to late summer

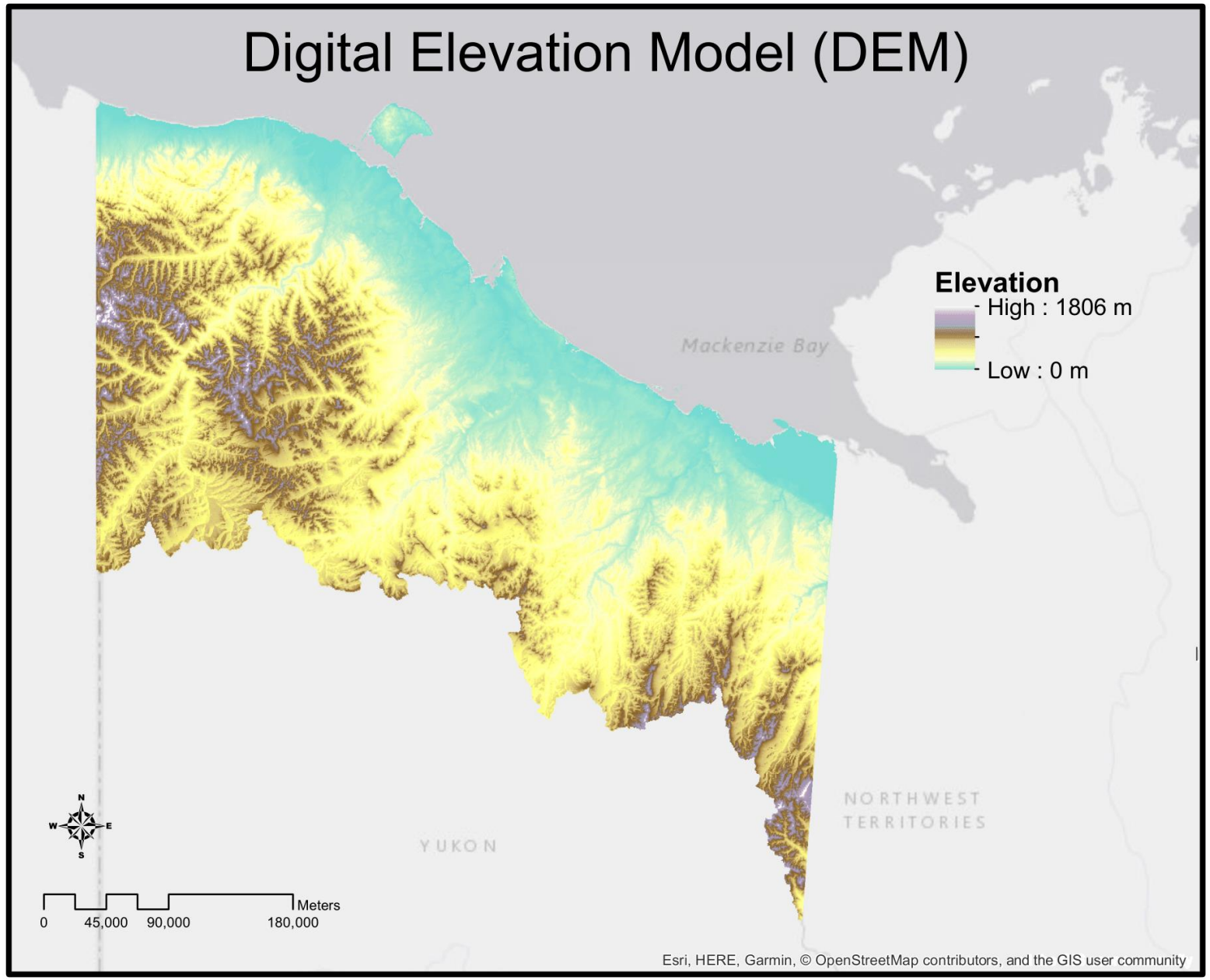


Data: Environmental Covariates

1. Elevation
2. Productivity
3. Land-cover type
   3b. Land cover diversity
4. Waterways?
5. Muskoxen?
6. Traditional Ecological Knowledge?

Data: **Elevation**

From: **National Topographic Data Base**

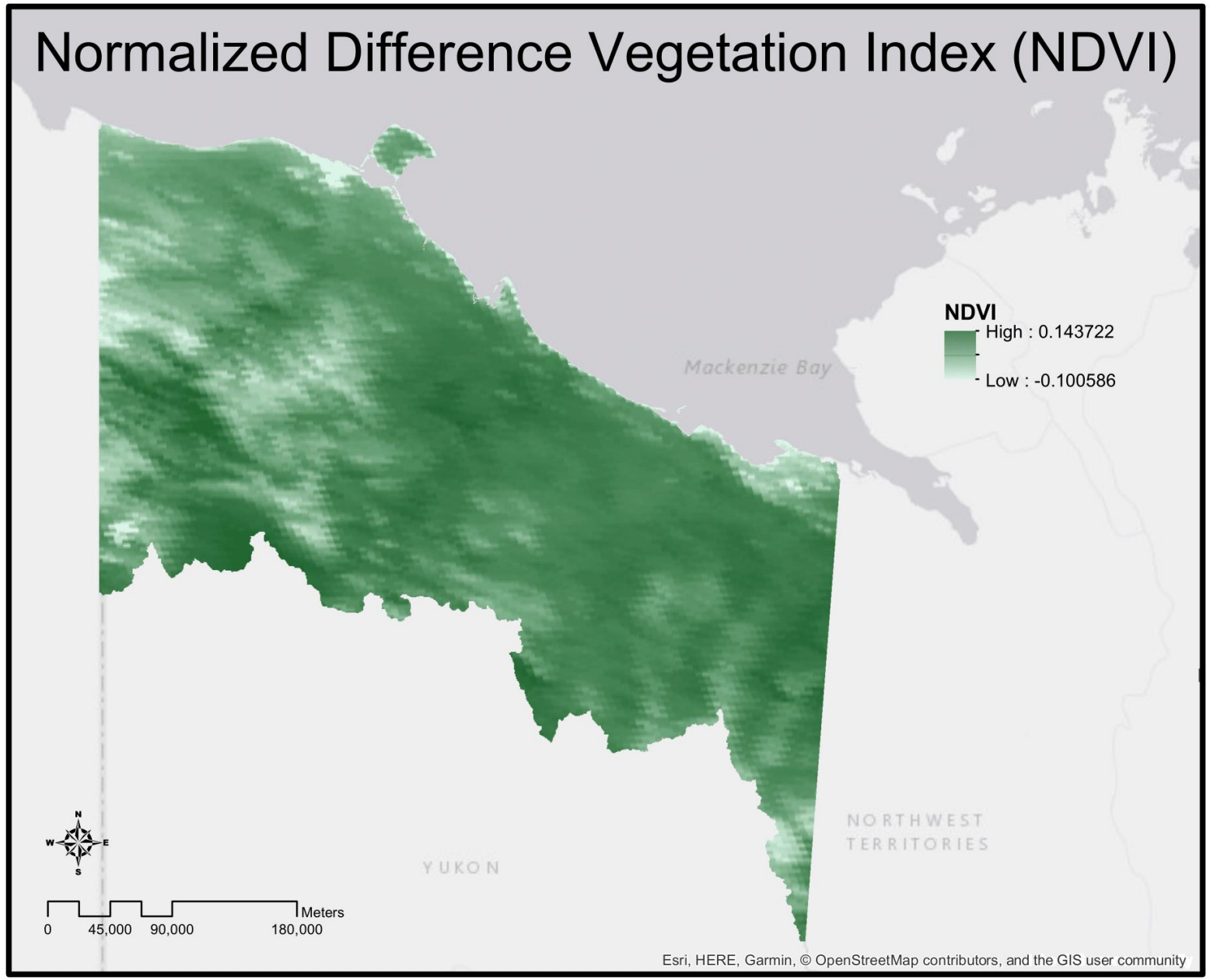


Data: **NDVI**

Satellite-derived measure of vegetative productivity.

Coarsely measured (500x500m).

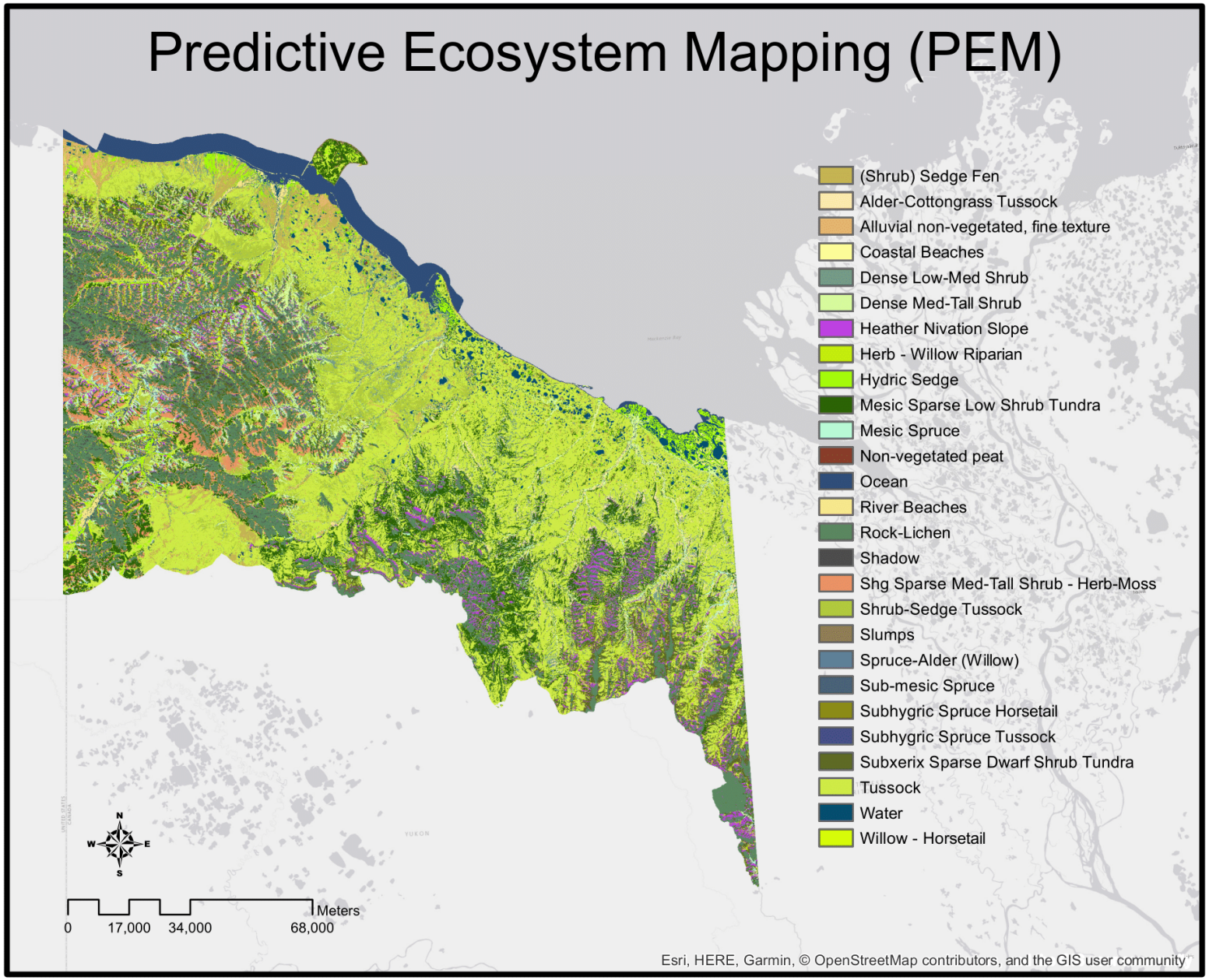
We used **maximum NDVI** averaged over period 2012-2017.



Data: **Land-cover**

Assembled by Terrestrial Ecosystem Mapping Team for Yukon Gov't.

Combines **satellite** imagery, **aerial** imagery, **ground truthing**, lots of **modeling**.

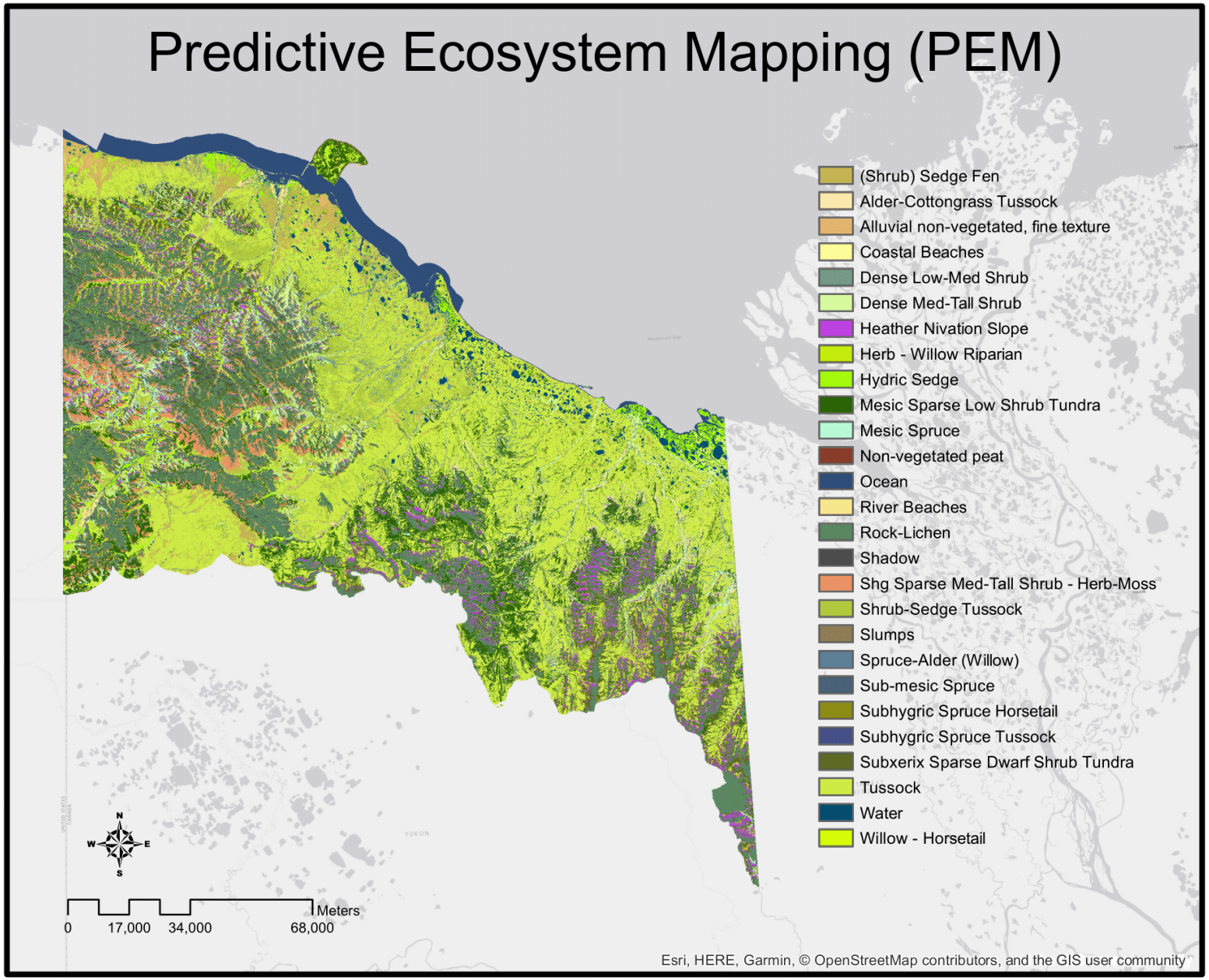


Data: **Land-cover**

6x6m resolution – very high!
(e.g. … smaller than **GPS error**.)

27 land classes, of which:

- 31% - TUSSOCK
- 15% - ROCK-LICHEN
- 10% - Mesic Sparse Low Shrub Tundra

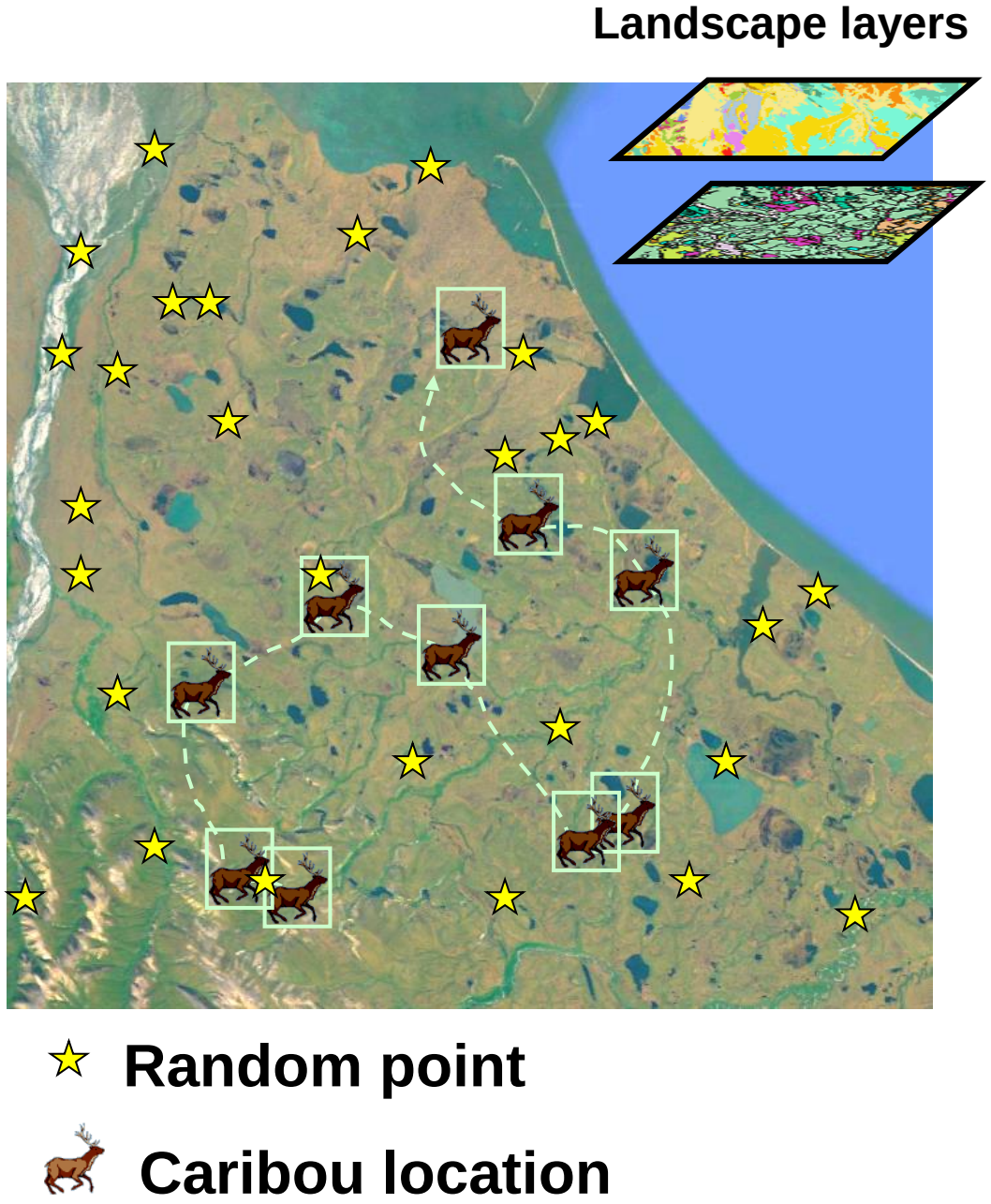


Analysis: **Resource Selection Functions**

Q: How do locations that are **used** by animals compare to **available** locations?

Steps:

1. Find used locations
   (*collaring data*)
2. Define "available" locations
   (random points in YNS)
3. Find environmental variables in both.



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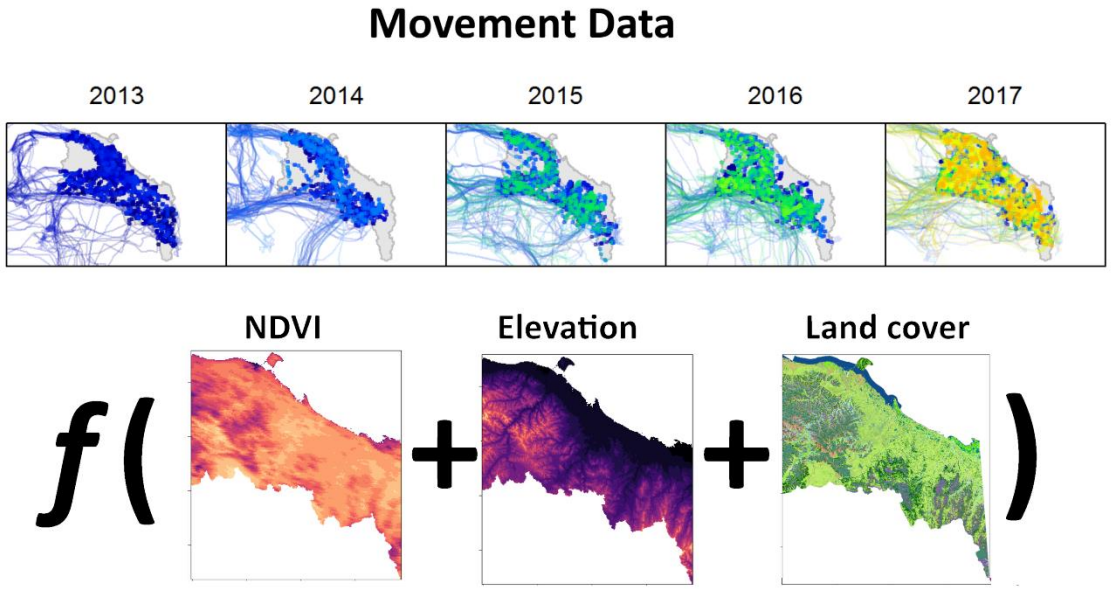

Steps:

1. Find used locations
   (*collaring data*)
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   (random points in YNS)
3. Find environmental variables in both.
4. Statistically compare *used* vs. *available*
   (fitting the RSF)

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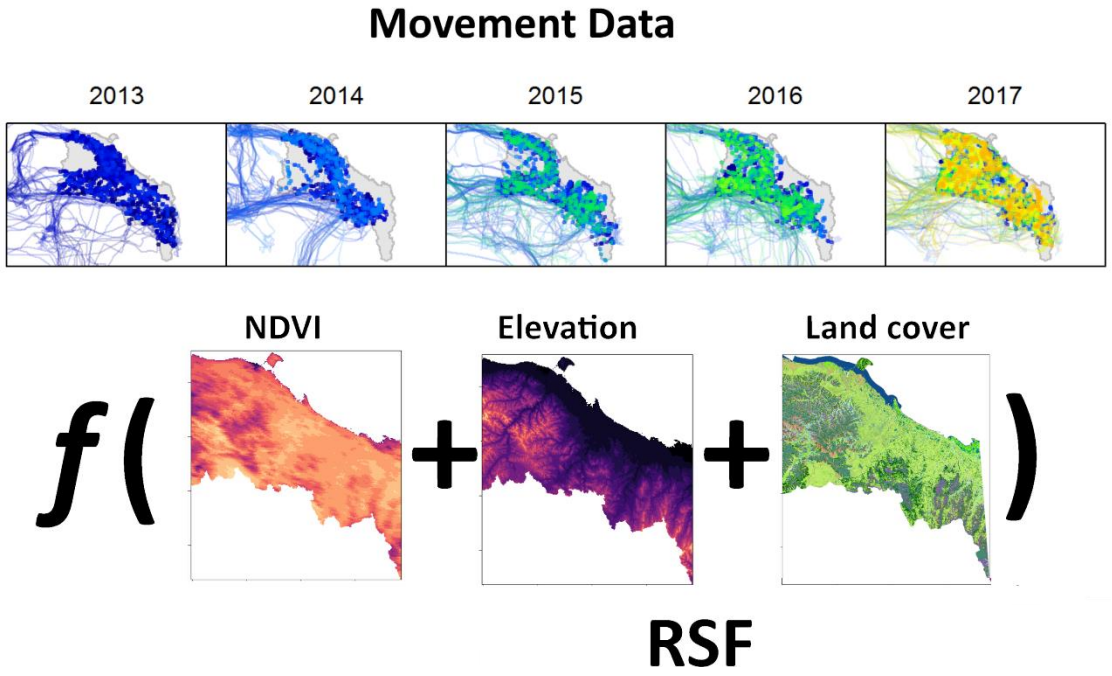
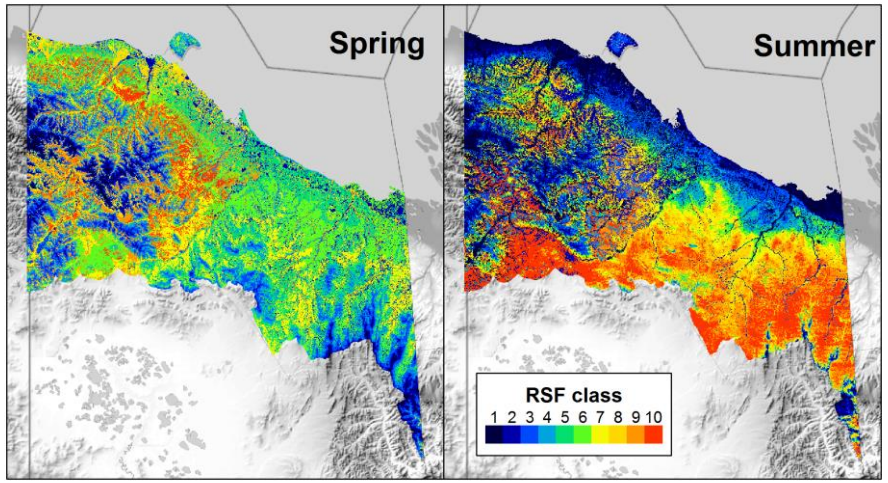
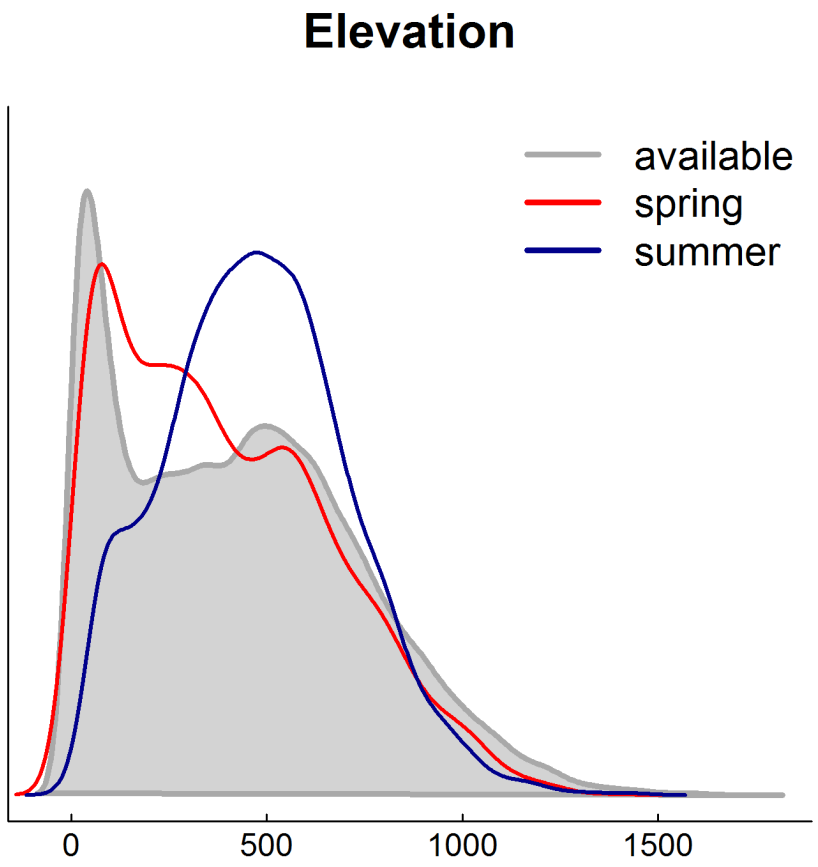
Steps:

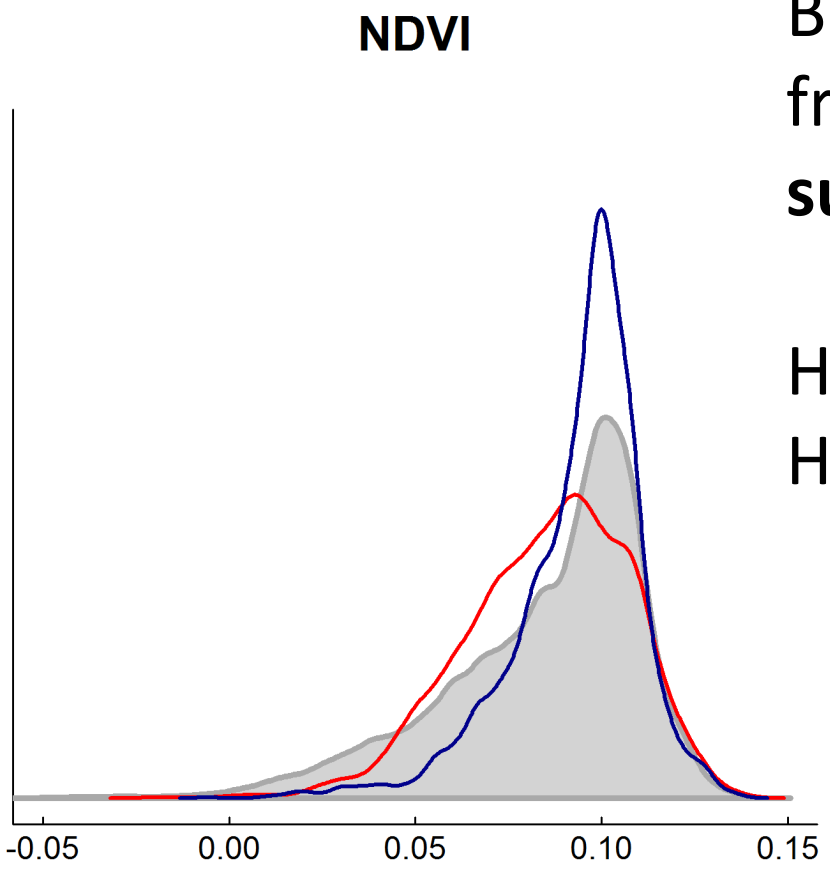
1. Find used locations
   (*collaring data*)
2. Define "available" locations
   (random points in YNS)
3. Find environmental variables in both.
4. Statistically compare *used* vs. *available*
   (fitting the RSF)
5. Use this statistical model to "predict" use over landscape.





Results: **Empirical comparisons**

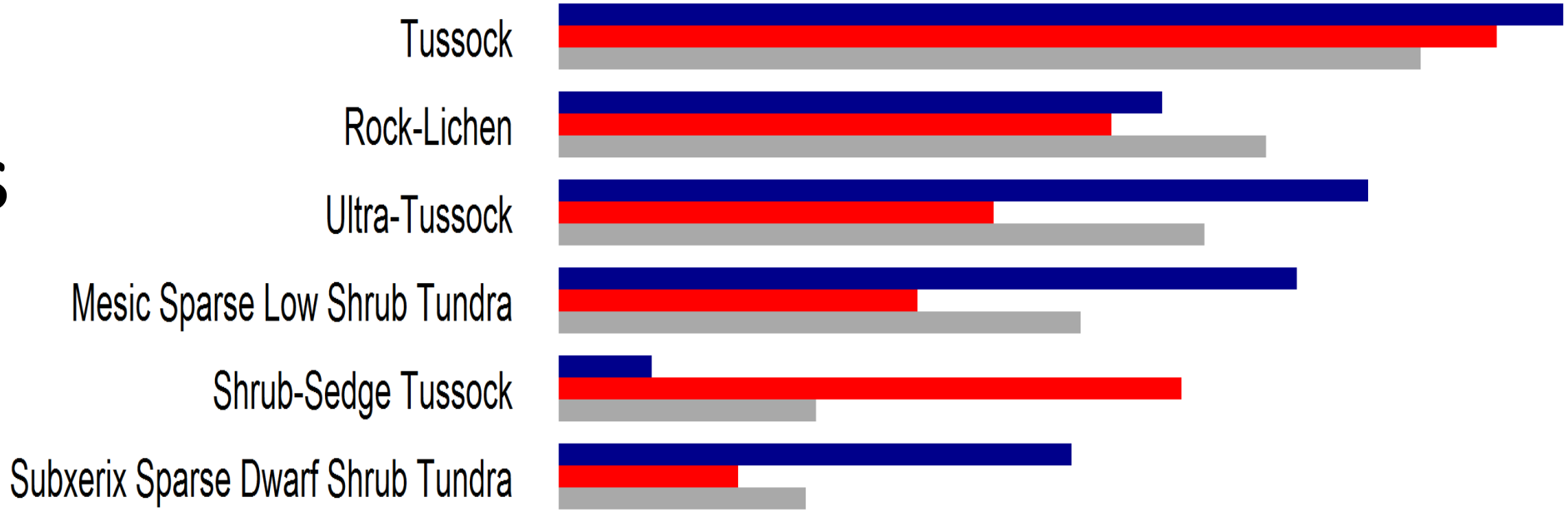




Bigger differences from **available** in **summer** than **spring**.

Higher elevations, Higher NDVI.

Results:
Empirical comparisons



Some patterns:

- Much higher summer use of “**ultra-Tussock**” & “**shrub-Tundras**”
- Much higher spring use of “**Shrub-sedge Tussock**”

Results: **Fitted RSF – model selection**

Model	spring		summer	
	R^2_c	ΔBIC	R^2_c	ΔBIC
DEM + NDVI + PEM	**0.07**	**0.0**	**0.23**	**0.0**
DEM + PEM	0.07	12.1	0.2	169.7
PEM	0	45.0	0	676.0
PEM + NDVI	0.1	49.9	0.2	392.5
DEM + NDVI * PEM	0.09	76.8	0.26	117.1
NDVI * PEM	0.08	127.0	0.22	483.1
NDVI + DEM * PEM	0	170.0	0	274.0
DEM * PEM	0.1	184.0	0.2	425.9
DEM * NDVI	0.04	224.5	0.19	–
DEM + NDVI	0.02	277.2	0.15	311.5
DEM	0	284.0	0	588.0
1	0	358.9	0	1256.2
NDVI	0	366.0	0.05	897.1

THIS IS THE BEST MODEL!
We will talk about why later.

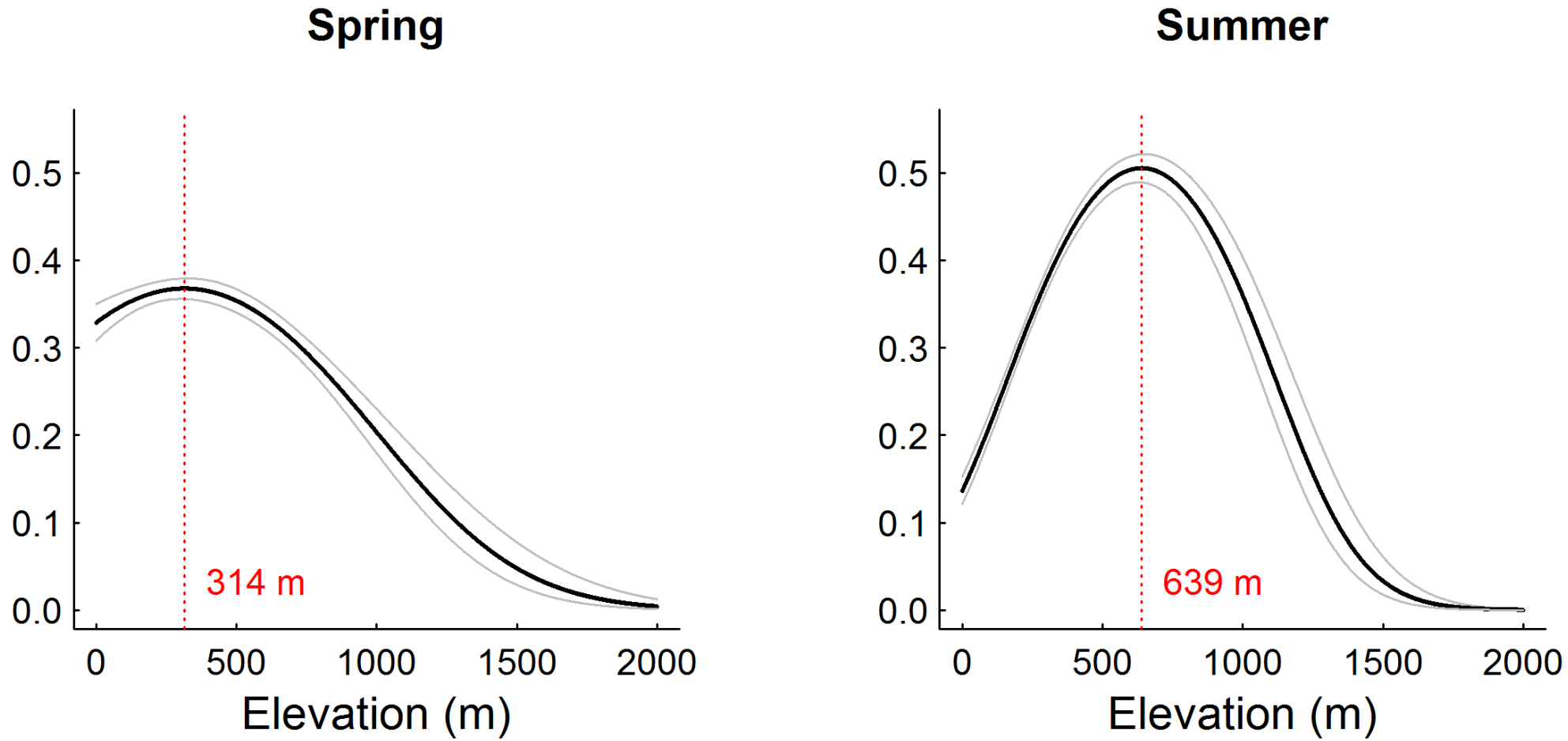
Takeaways:

- For **both seasons** all **THREE** variables are important as main effects.
- **Summer** model explains *much more* (23%) than **Spring** model (7%).

Note: "DEM" is second-order polynomial: DEM + DEM²

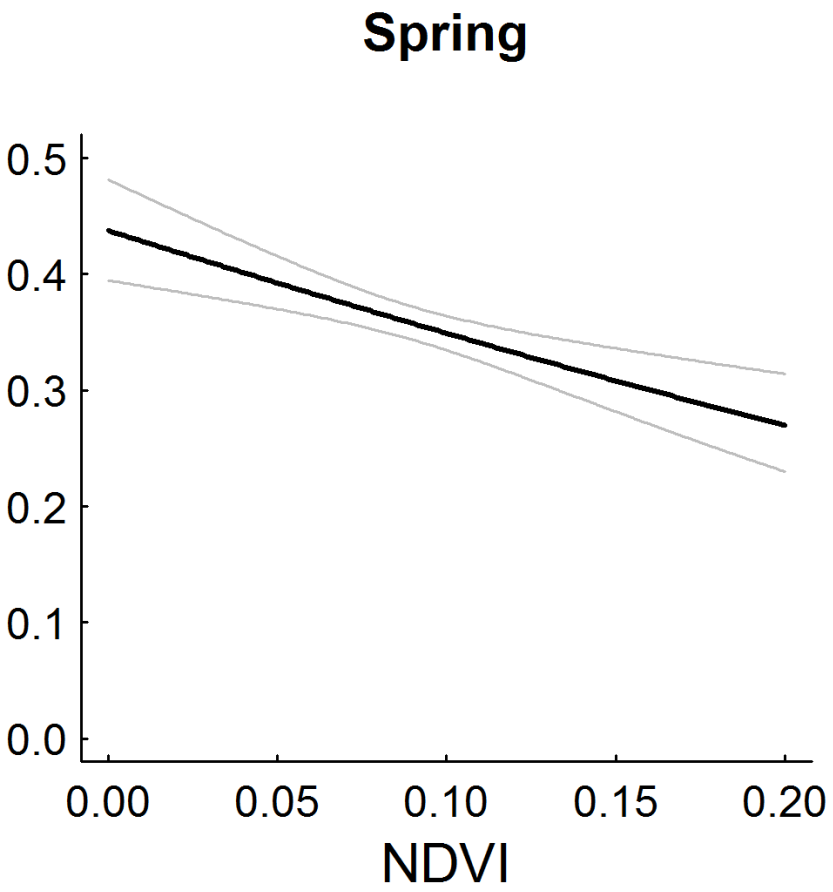
Results: **Fitted RSF – Elevation preferences**

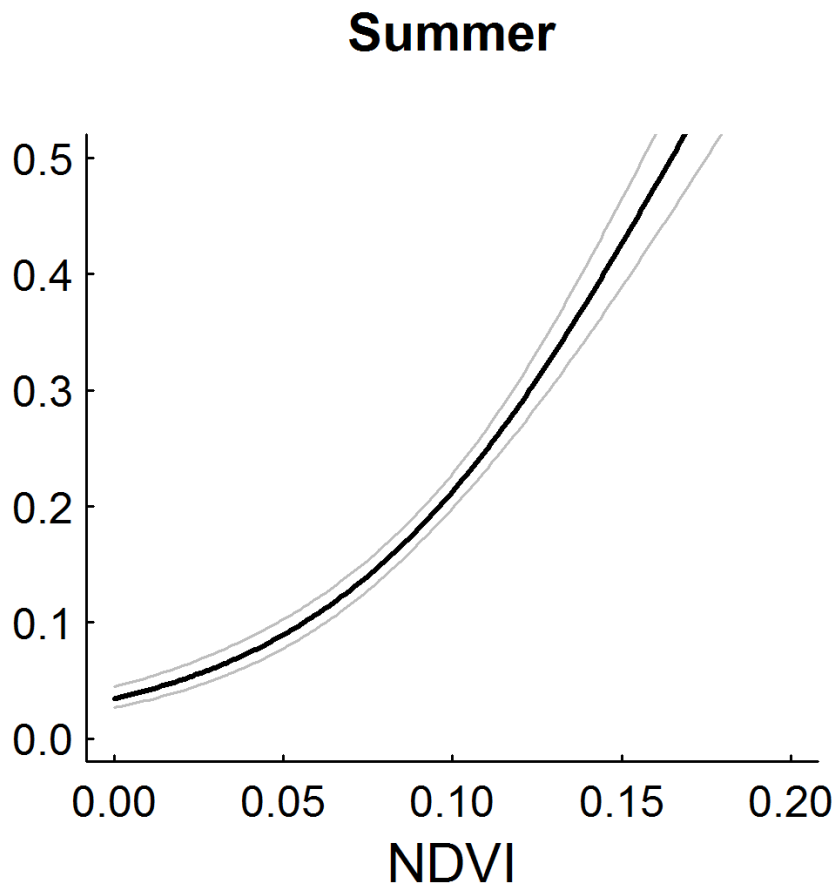
Higher elevations preferred in summer (~ 600 m.)



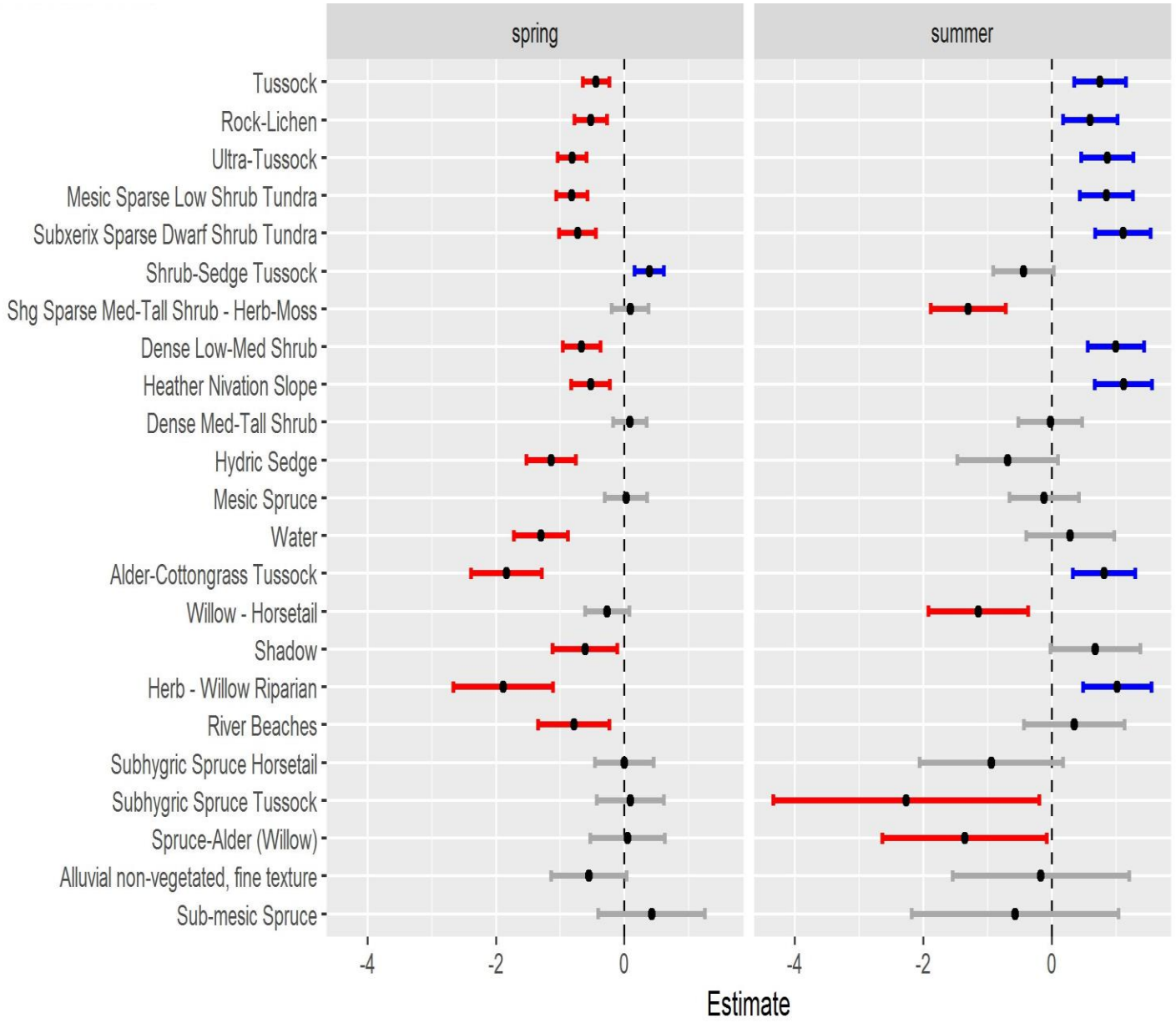
Results: **Fitted RSF – NDVI preferences**

Much stronger preference for more productive zones in summer





Results: **Fitted RSF – landcover preferences**



Nearly opposite preferences in **summer** vs **spring!**

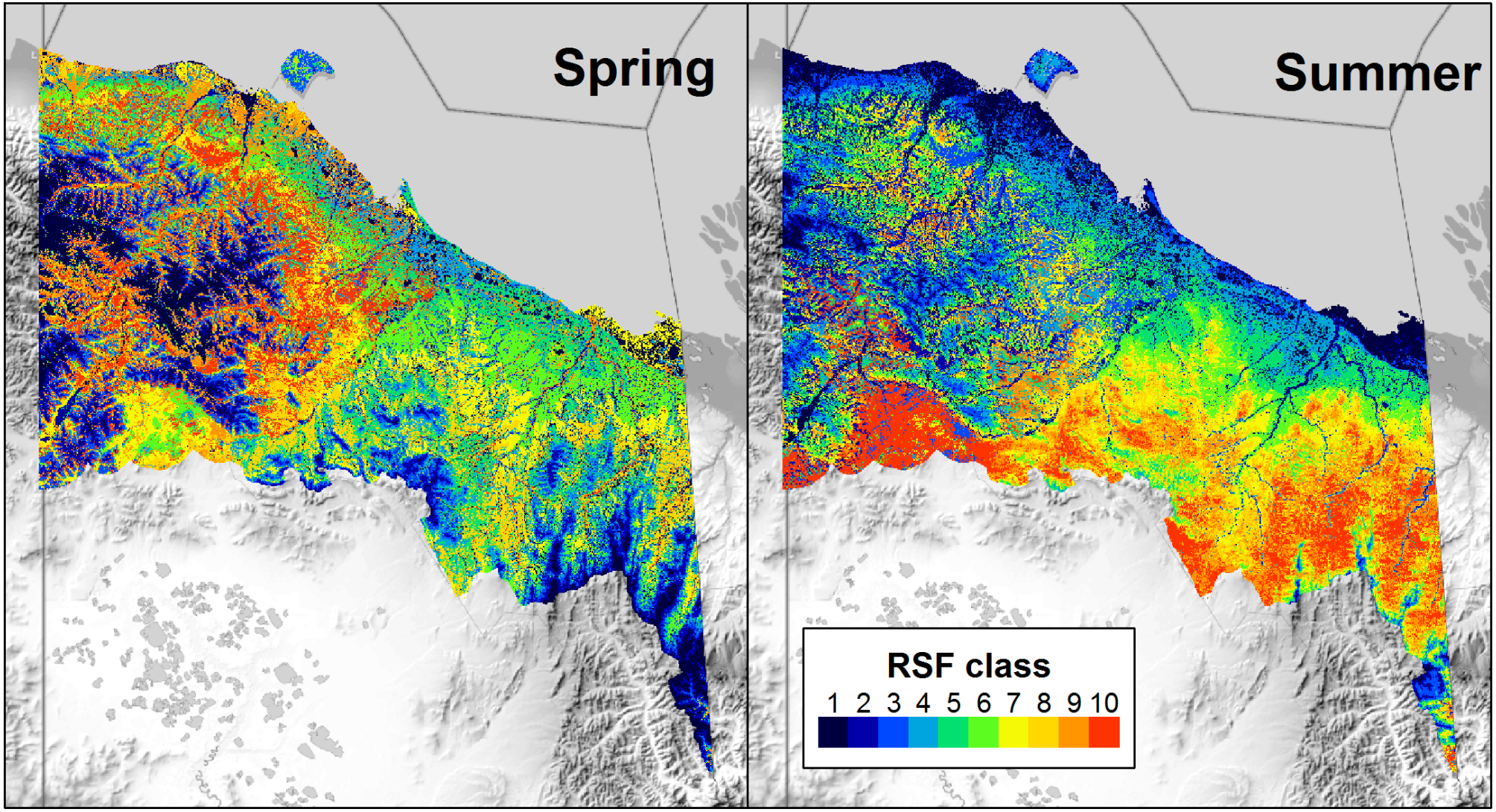
Spring:

- likes **Shrub-Sedge Tussock**
- avoids **most everything else**
- really avoids **Herb-Willow Riparian**

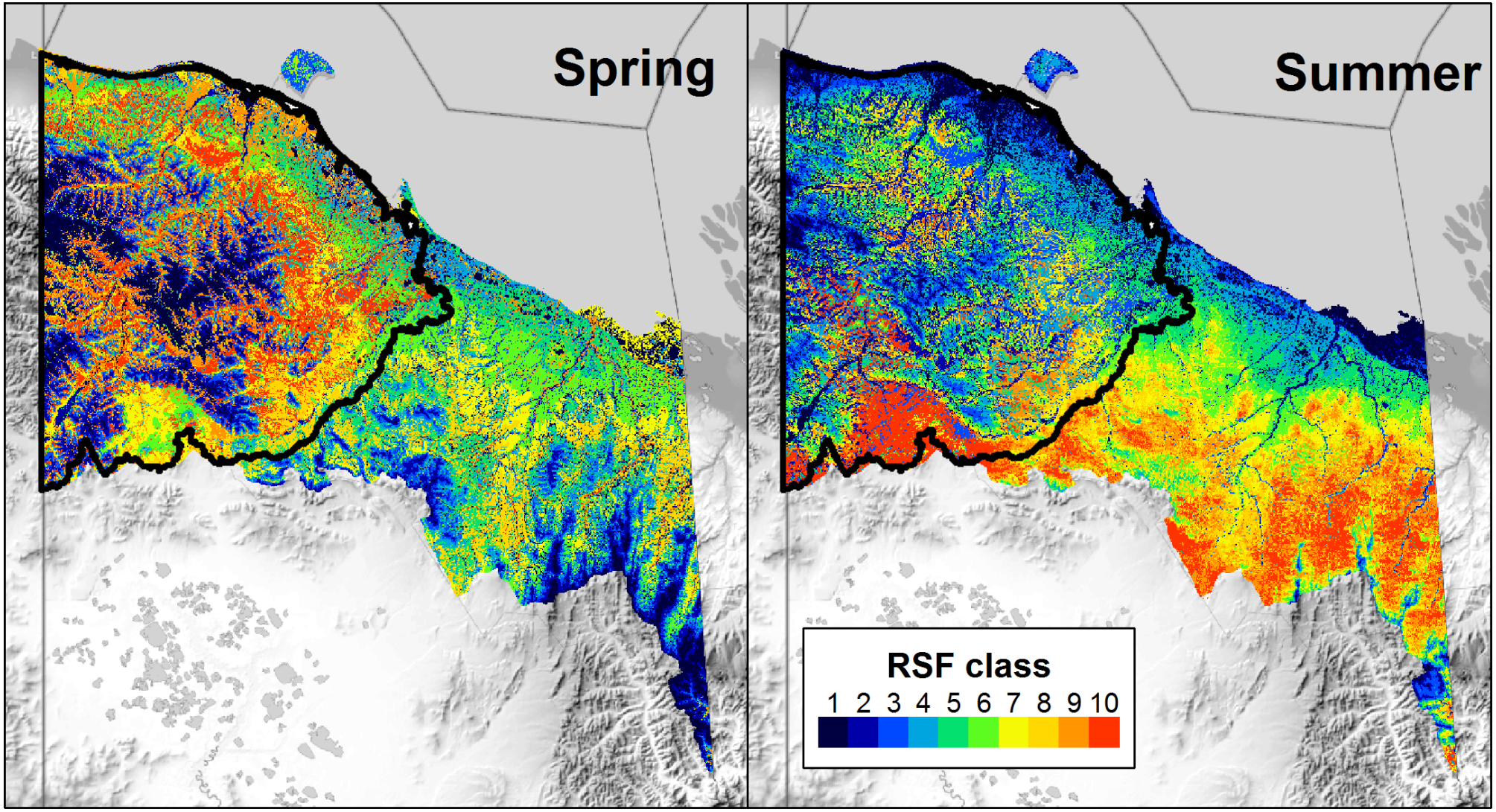
Summer:

- love all 5 most common habitats **Tussock** to **Subxerix Sparse Dwarf Shrub Tundra** …
- but NOT **Shrub-Sedge Tussock**
- avoid **Sparse Medium-Tall Shrub / Herb-Moss**
- kinda likes **Herb-Willow Riparian**

Use the model to make an RSF map



Currently protected area not in peak RSF



Wildlife Management Advisory Council North Slope

Yukon Government

also:

- Martin Kienzler
- Kim Heinemeyer
- Julia Smith