Habitat suitability modeling of velvet grass (*Holcus lanatus*) in Yosemite, Kings Canyon & Sequoia National Parks

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Background

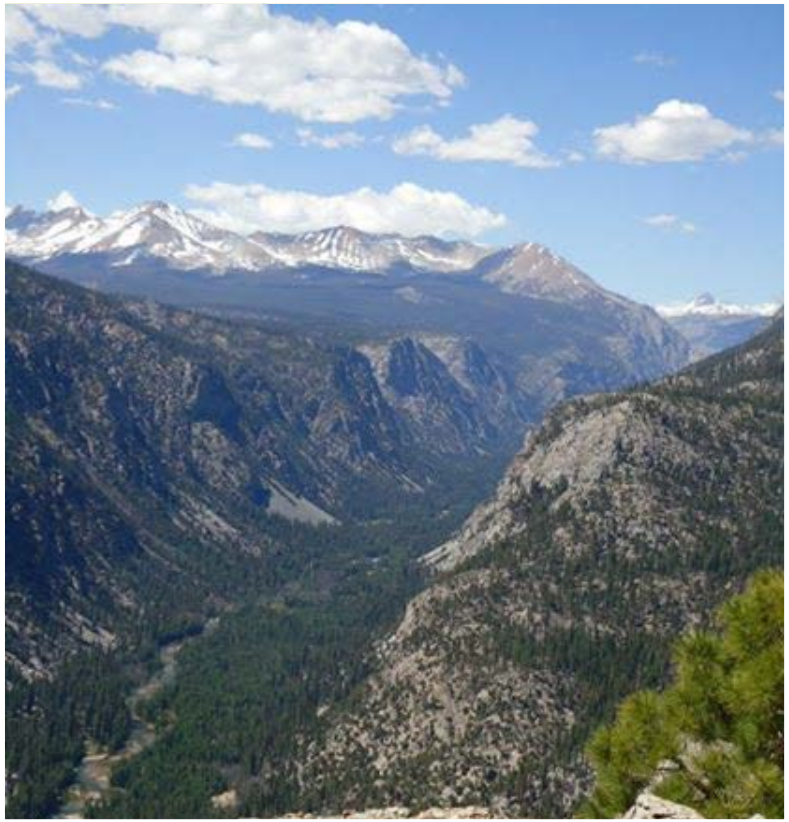
2008

Mission:

Protect Sierra Nevada wilderness from an ecosystem invader.

Velvet grass attacks unsuspecting lily

Location: Kern Canyon, Sequoia NP



Kern Canyon & River

Target: velvet grass (*H. lanatus*)

Photo Credit: Franz Xaver

Tools:

Hand tools, clipping inflorescences, laying tarps, hand-pulling, herbicide…

Early Detection: The Best Defense

"If I were velvet grass, where would I live?"

Challenges: Small crews, big parks.

Rich Thiel descends from a monster weed survey

- Long travel times
- Short time frames
- Limited resources

2014

Mission:

Help prioritize early detection surveys for velvet grass.

(a.k.a. "Year of the Mouse Arm")

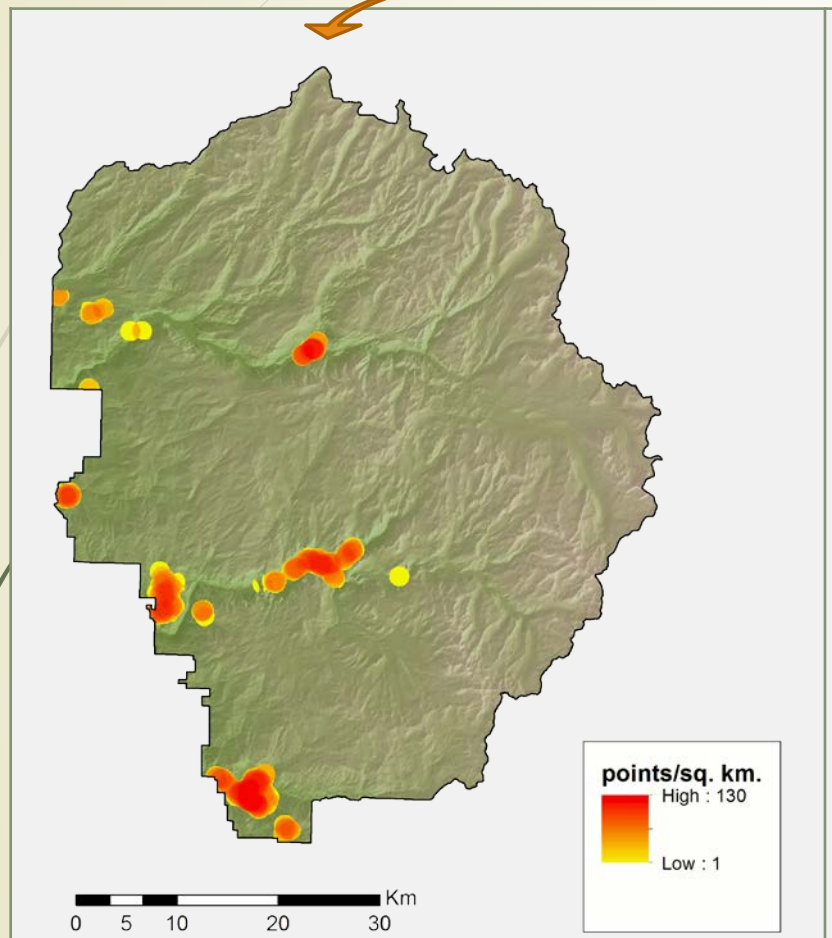
The click is mightier than the sword

Habitat Suitability Analysis:

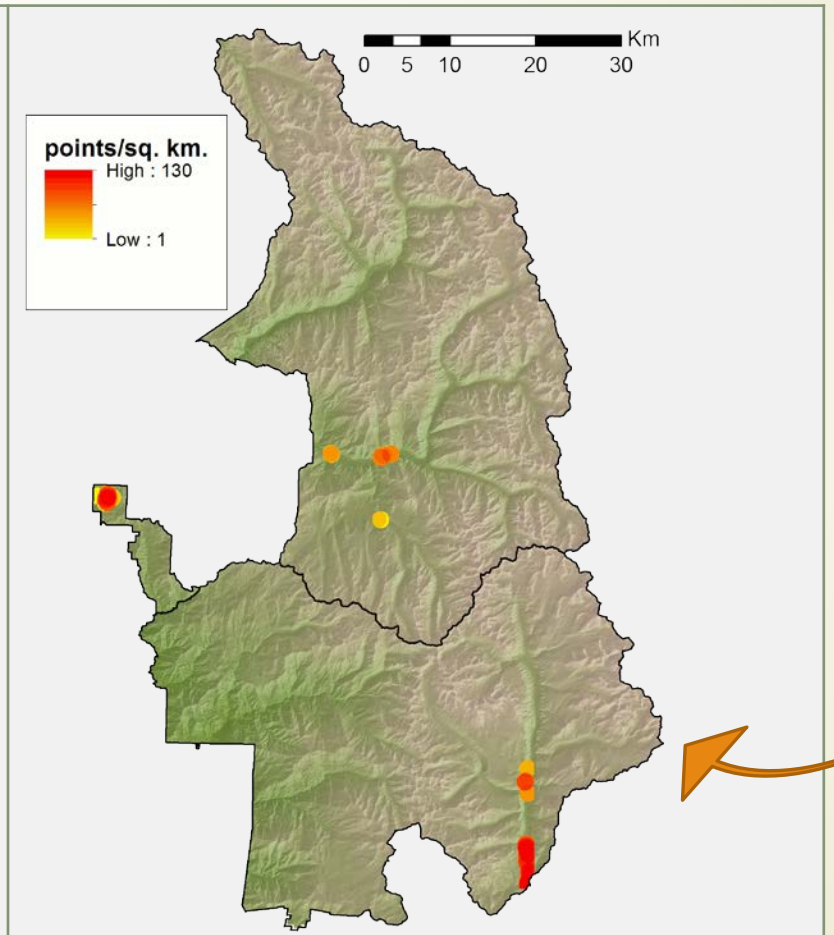
From: “If I were velvet grass, where would I live?”

To: “What is the likelihood from 0 to 1, given the existing environmental variables, that a defined area contains suitable habitat for velvet grass?”

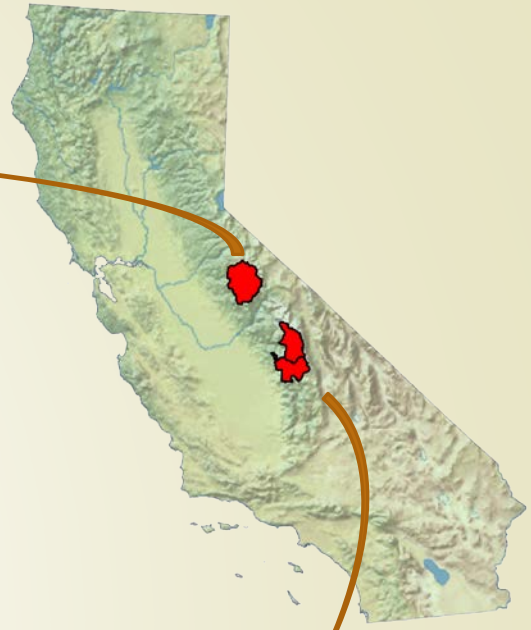
Presence Data: 2,865 points



Yosemite National Park: 1,572 points



Kings Canyon and Sequoia National Parks: 1,283 points

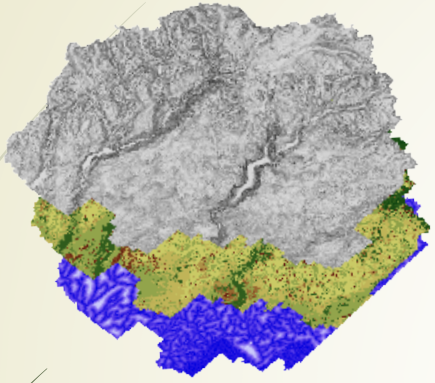


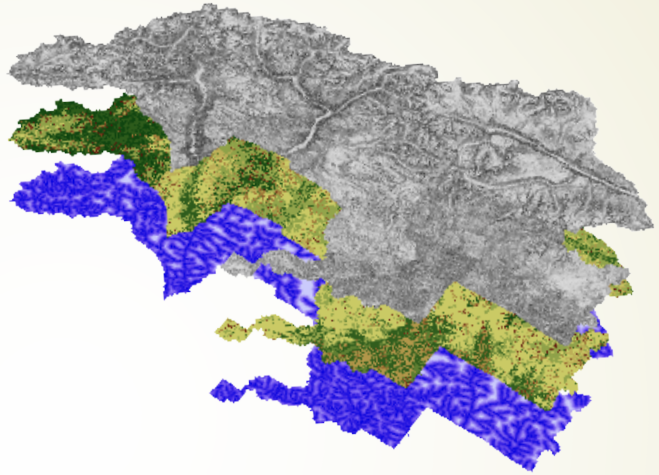
Thank you Yosemite and Sequoia-Kings Staff!

Two models produced in Maxent:

10 m Resolution	900 m Resolution
• Terrain and vegetation data	• Climate data (BioClim)

10 m resolution model inputs

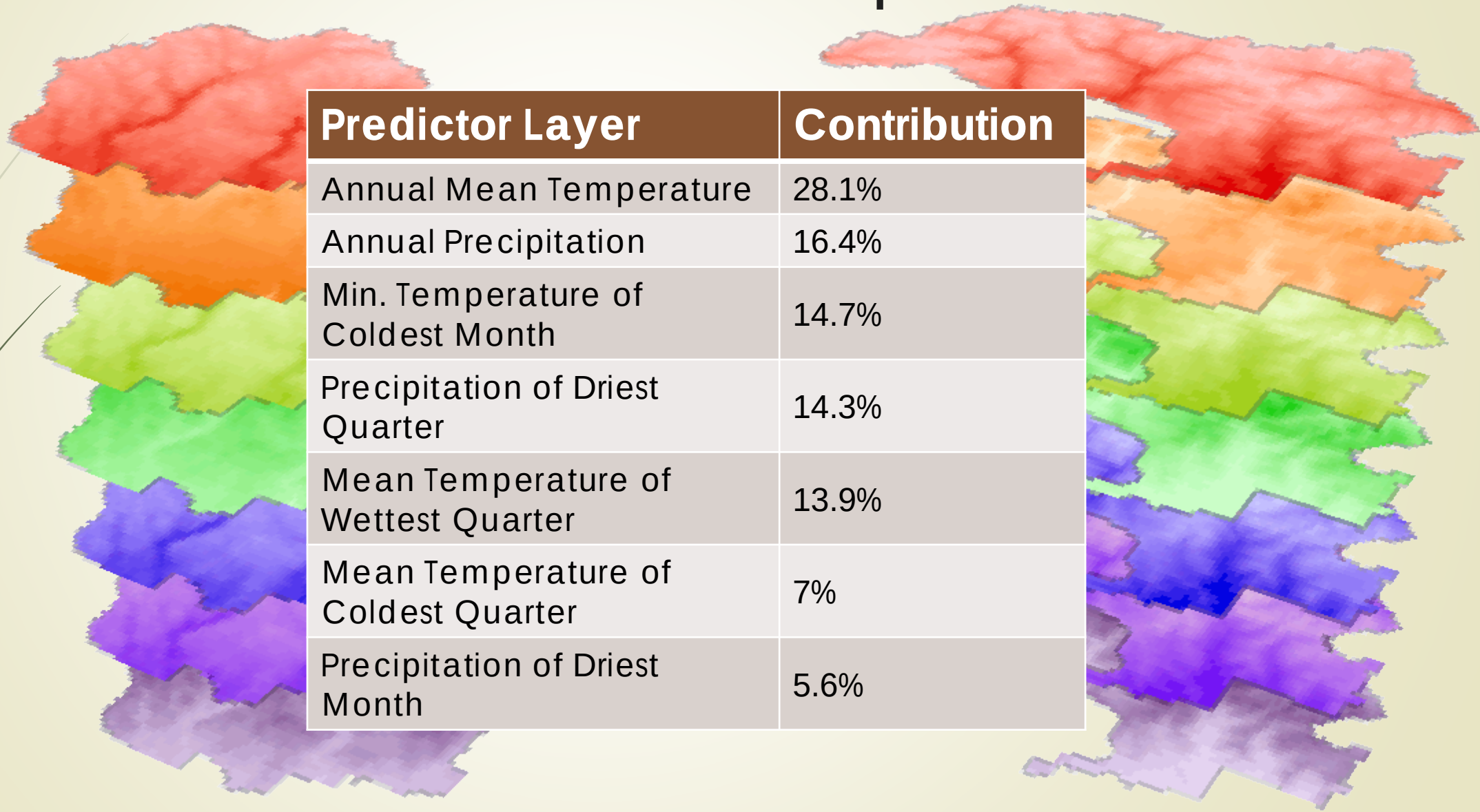




Predictor Layer	Contribution to Model
Slope	70.7%
Vegetation Community	21.9%
Distance to Stream*	7.3%

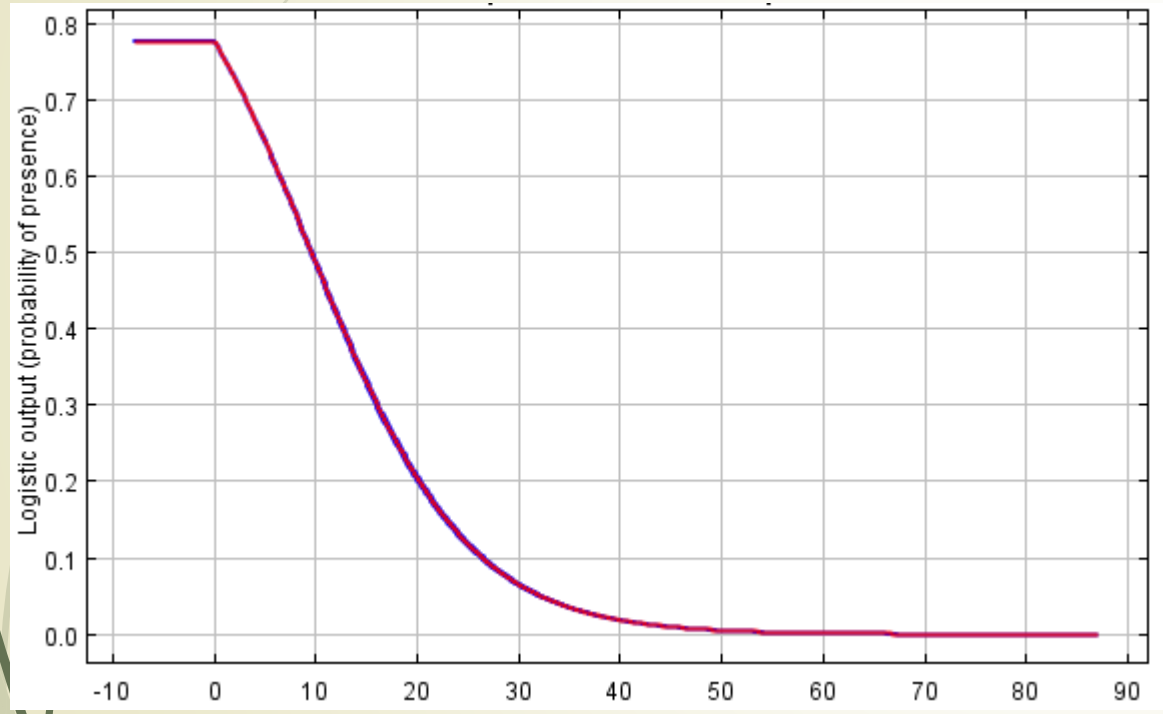
*Euclidean distance

900 m resolution model inputs

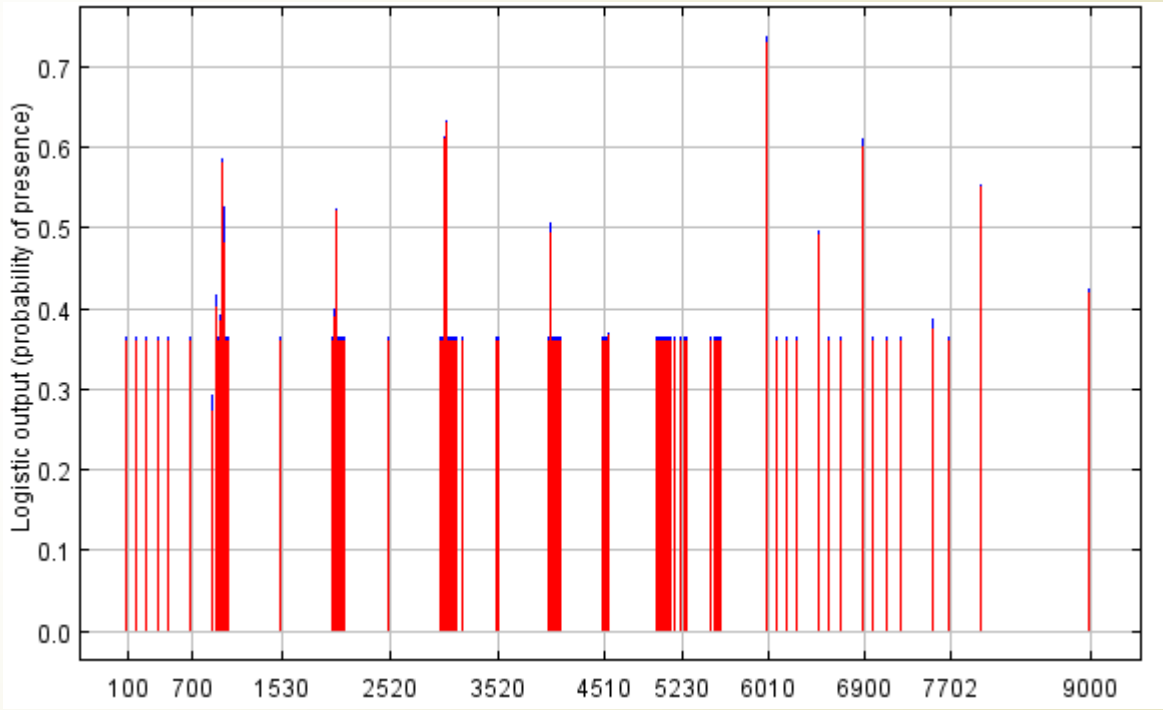


Predictor Layer	Contribution
Annual Mean Temperature	28.1%
Annual Precipitation	16.4%
Min. Temperature of Coldest Month	14.7%
Precipitation of Driest Quarter	14.3%
Mean Temperature of Wettest Quarter	13.9%
Mean Temperature of Coldest Quarter	7%
Precipitation of Driest Month	5.6%

10 m results



Percent Slope



Vegetation Community

10 m results

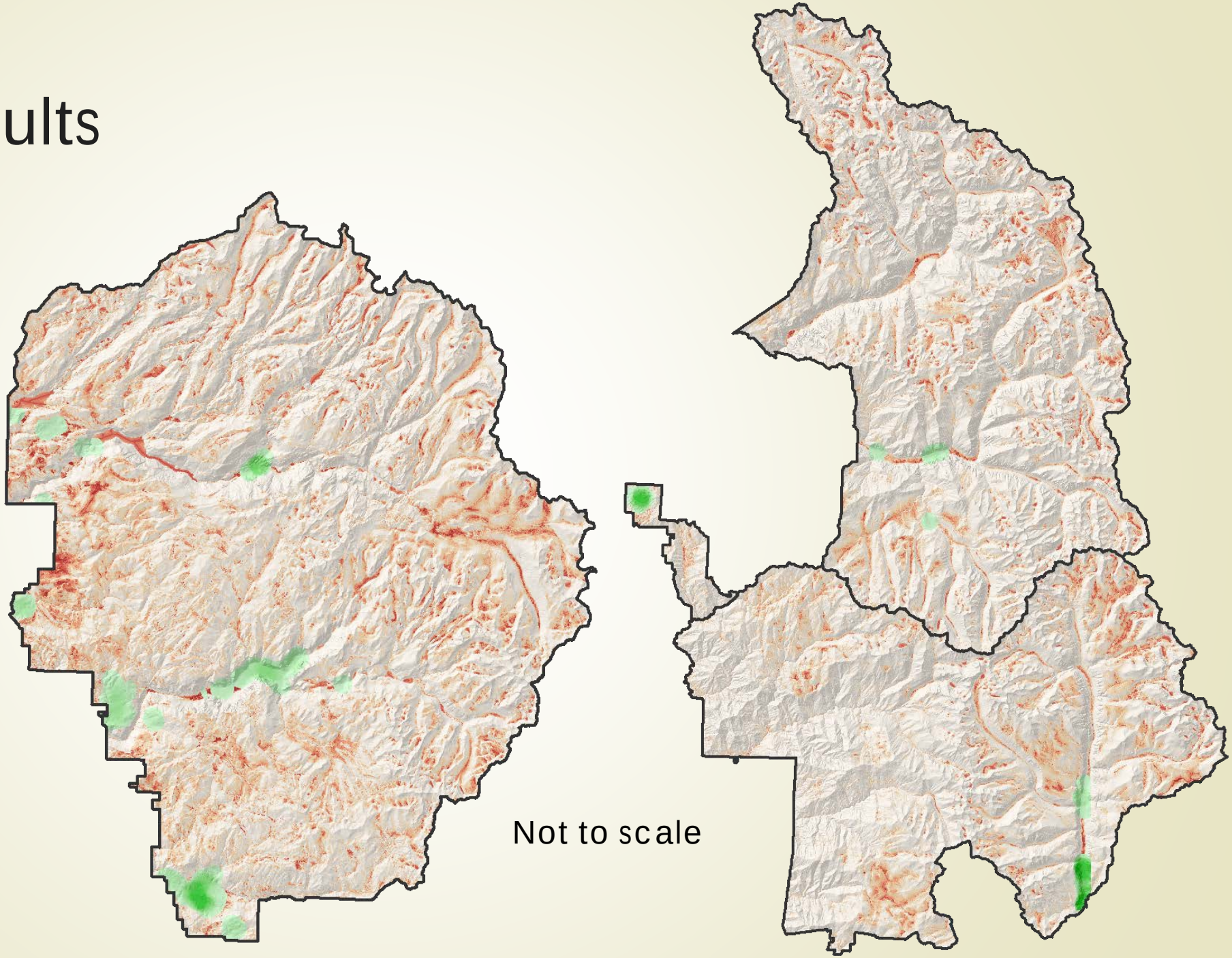
H. lanatus
Presence Points
Per Km^2

High : 130

Low : 1

Habitat
Suitability
Likelihood

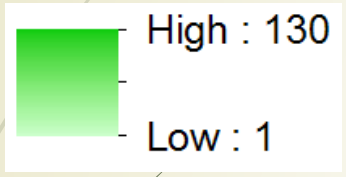
- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9



Not to scale

10 m results

H. lanatus
Presence Points
Per Km^2



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Suitability
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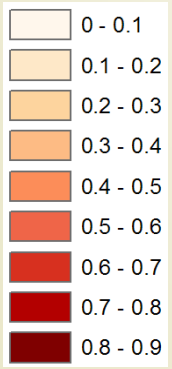
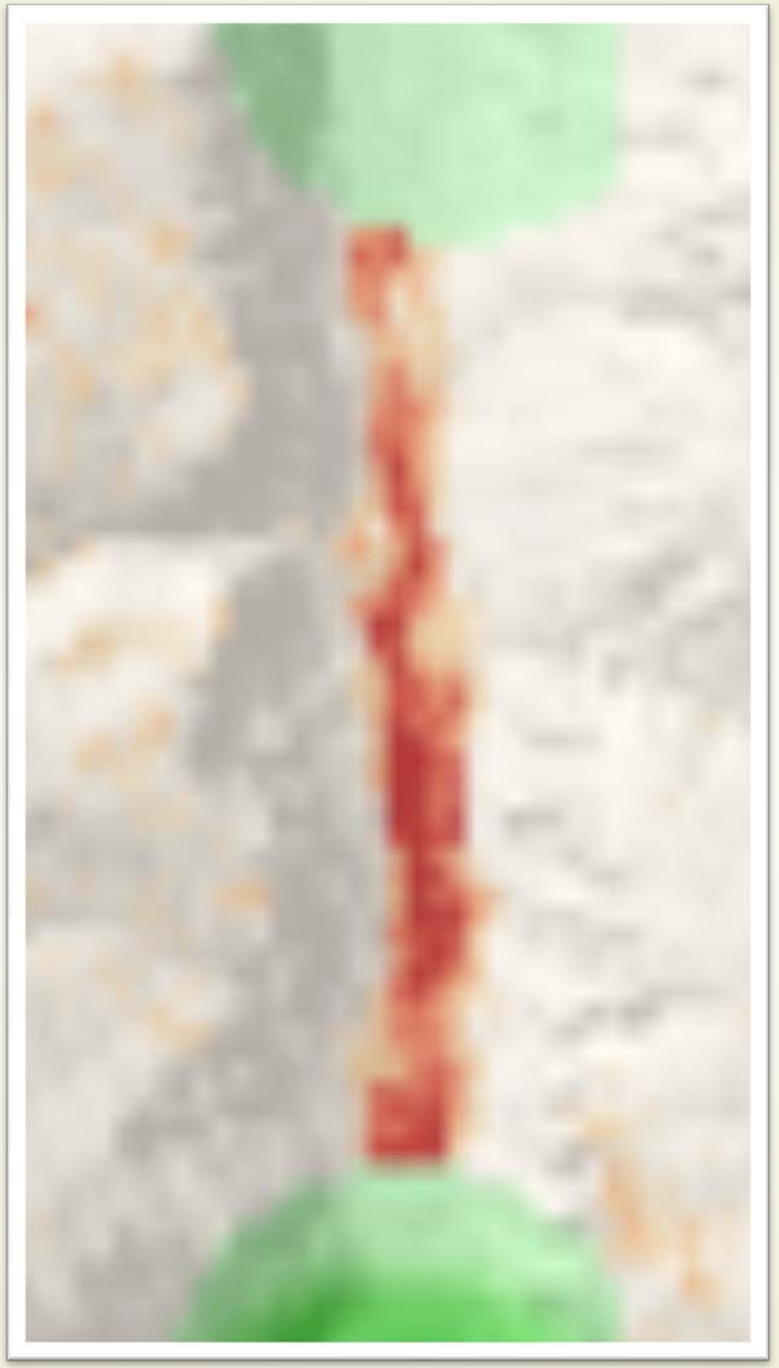
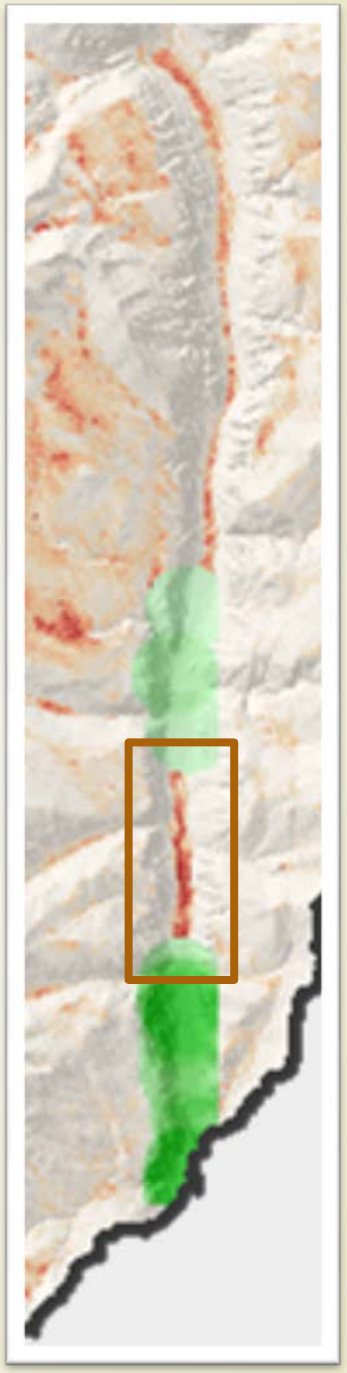
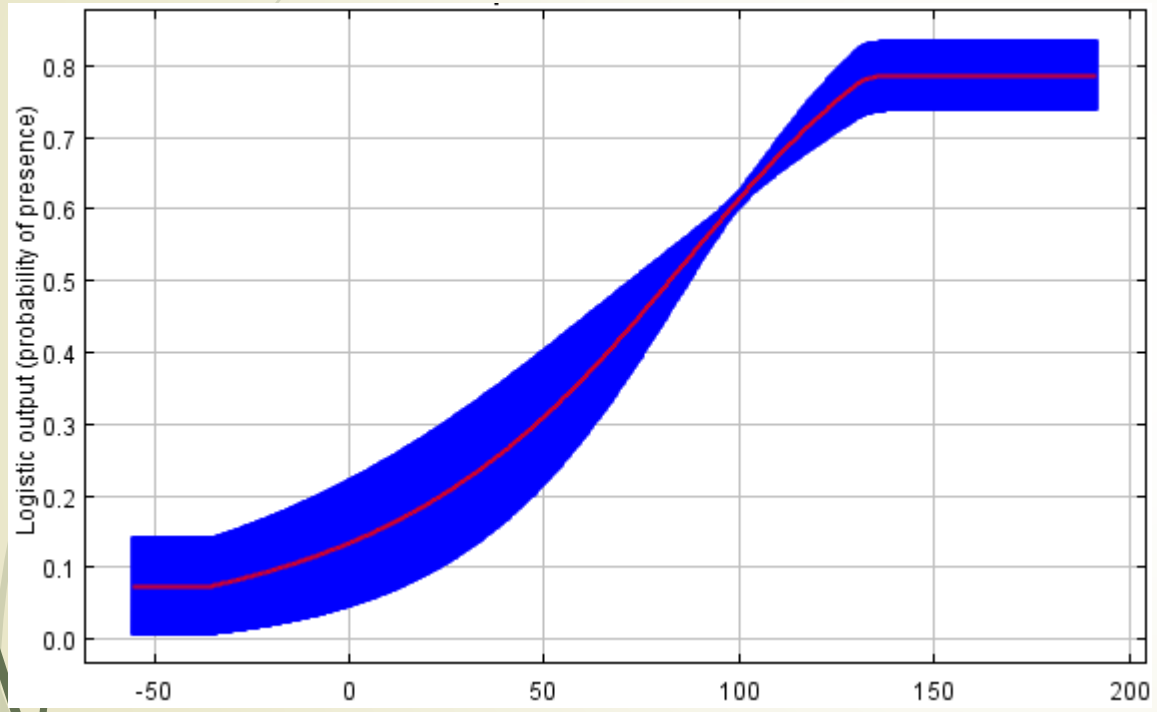


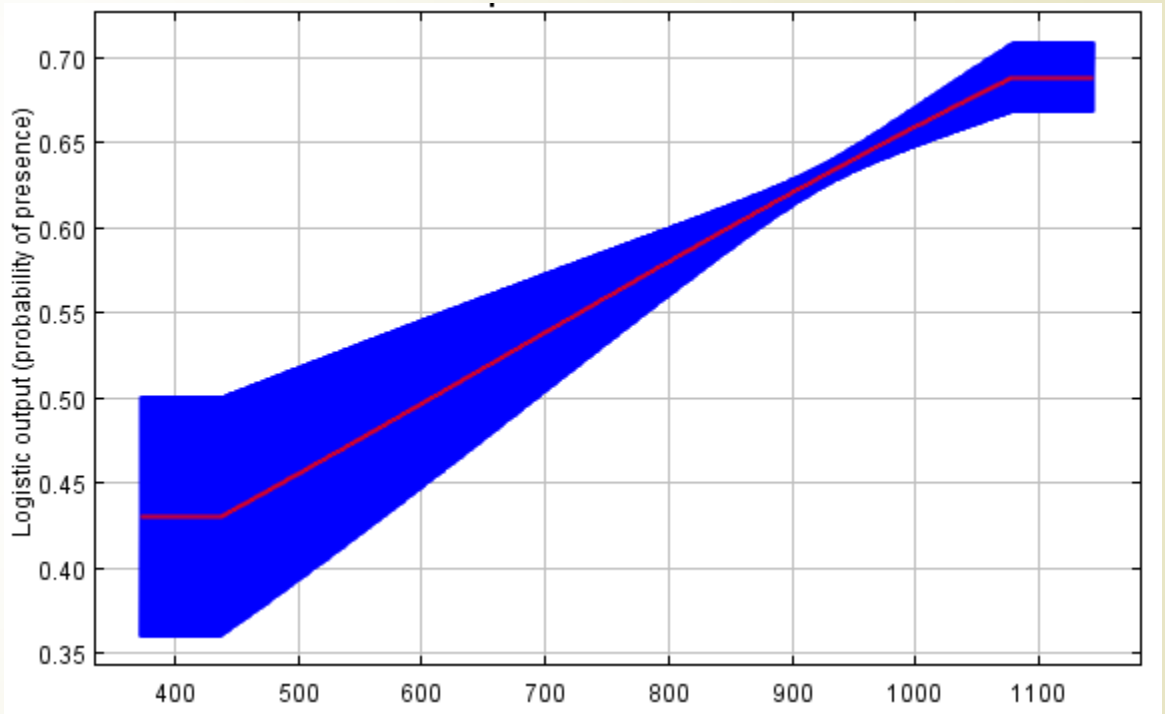




900 m results

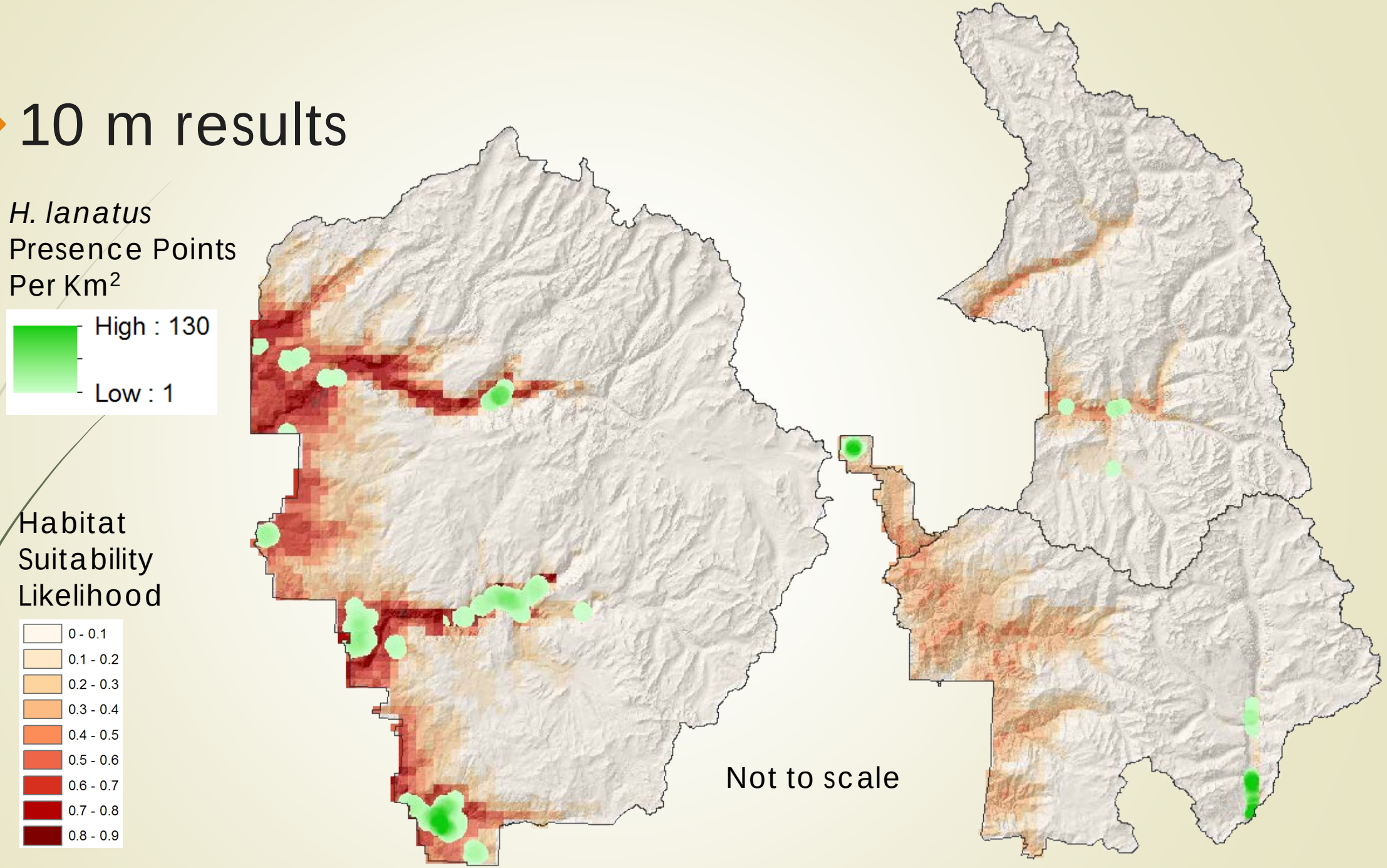


Annual Mean Temperature



Annual Mean Precipitation

10 m results


H. lanatus
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Not to scale

Pros and Cons

Model	10 meter	900 meter
Pros	• High resolution, more useful for field surveys	• Ability to forecast for climate change • Quick to process data
Cons	• No ability to forecast • Memory intensive	• Coarse resolution

Caveats

- Presence data is biased (it's collected by humans!)
- Lack of presence does not necessarily mean habitat is *unsuitable*
- Predictions are only as accurate as the input data (instrument error, human error)
- Habitat suitability is only a piece of the puzzle…

Future Research

- Use a better indicator of soil moisture, such as topographic wetness index (TWI)
- Use soil data (coming soon!)
- Higher resolution climate data
- Combine with a “risk of introduction” model (proximity to trail, river, helipad…)

Acknowledgements

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