

Your University Logo

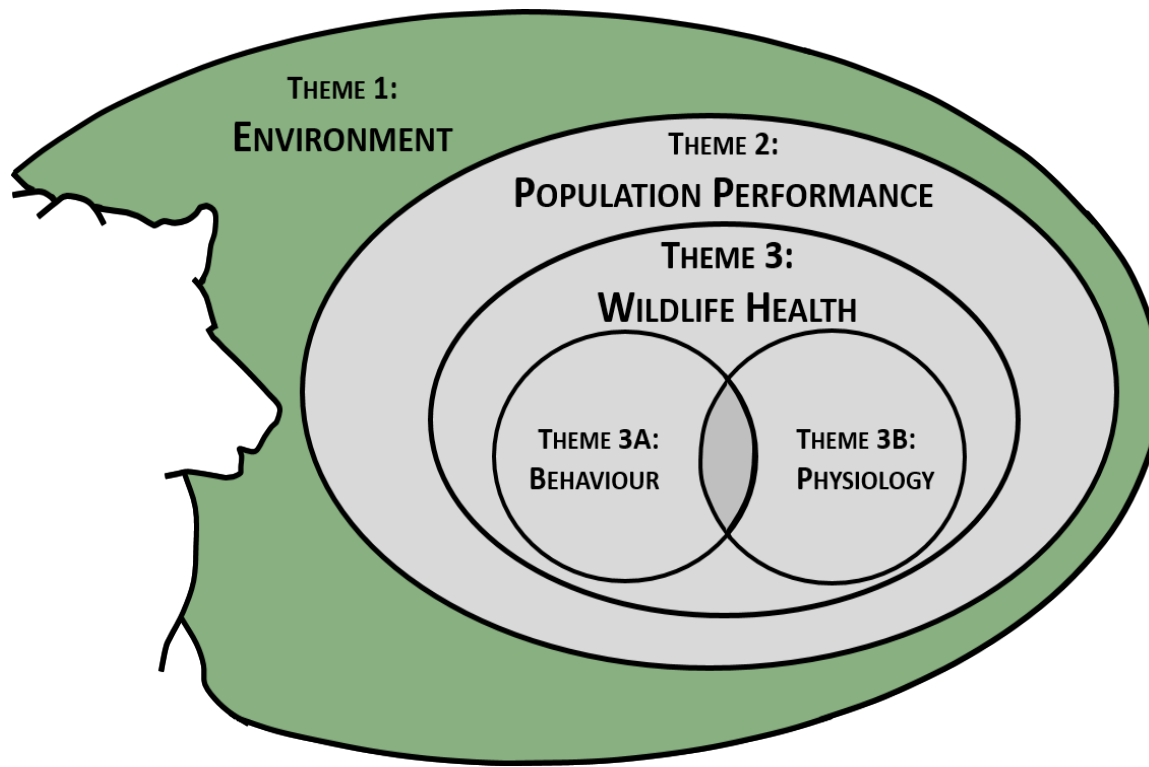


# Grizzly-PAW: Grizzly Population Assessment in yellowWhead: Integrated Approaches Toward Conserving Grizzly Bears On A Human-Dominated Landscape Of Western Alberta.

Annual General Meeting – 3

Sean Kearney

Calgary, AB | October 18, 2019



# RESEARCH QUESTION

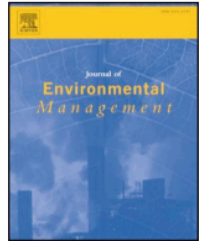
Q1.1 What are the temporal and spatial dynamics of fine-scale anthropogenic and non-anthropogenic disturbances over the Yellowhead management area and can they be characterized across the region?



Contents lists available at [ScienceDirect](#)

## Journal of Environmental Management

journal homepage: [www.elsevier.com/locate/jenvman](http://www.elsevier.com/locate/jenvman)



### Research article

# EcoAnthromes of Alberta: An example of disturbance-informed ecological regionalization using remote sensing

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<sup>a</sup> Department of Forest Resources Management, University of British Columbia, Vancouver, BC, Canada

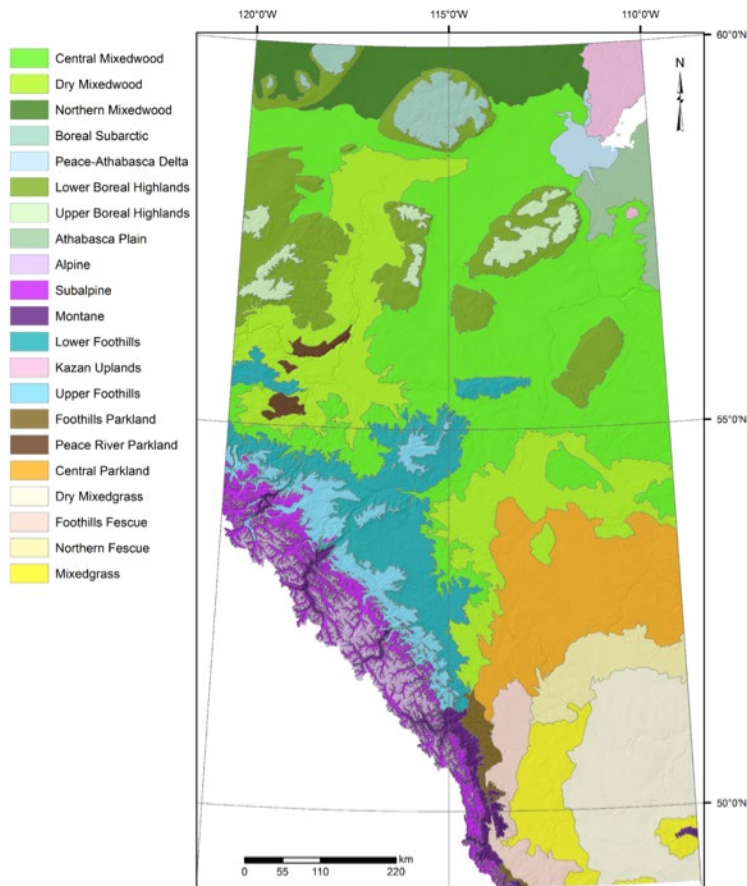
<sup>b</sup> fRI Research, Hinton, AB, Canada

<sup>c</sup> School of Geographic Sciences and Urban Planning, Arizona State University, Tempe, AZ, USA



# Ecological regionalization

Goal: To identify unique areas with similar capacities to support ecosystem health and function

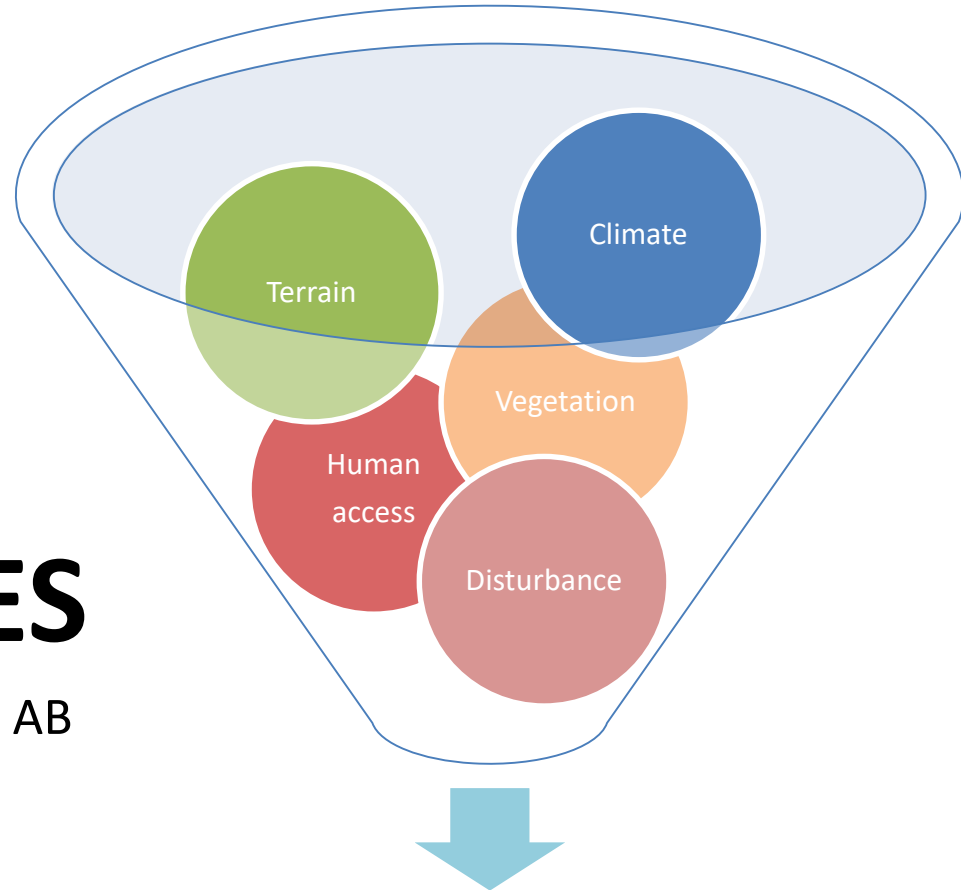


Temperature

Precipitation

Growing season (DD > 5)

# MODEL INPUTS (N = 19)



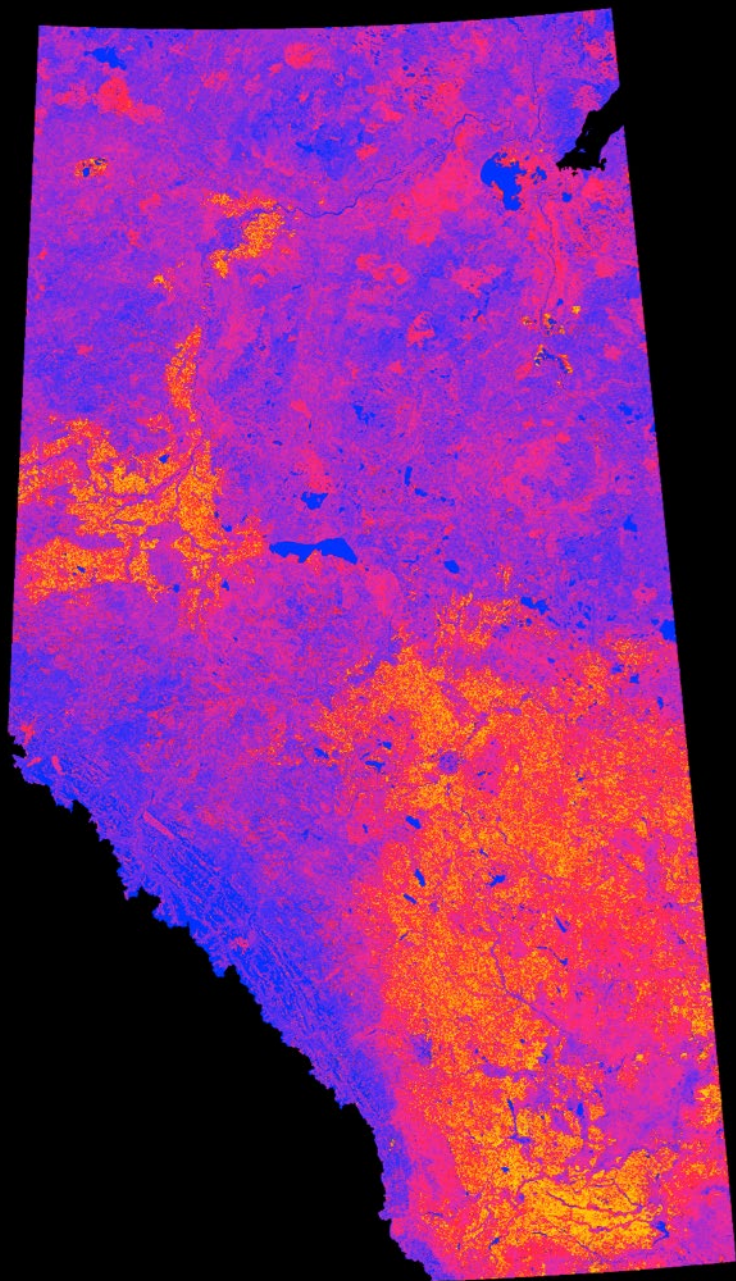
## ECO-ANTHROMES

A wall-to-wall regionalization (30 m) for AB  
for the period 2006 – 2015

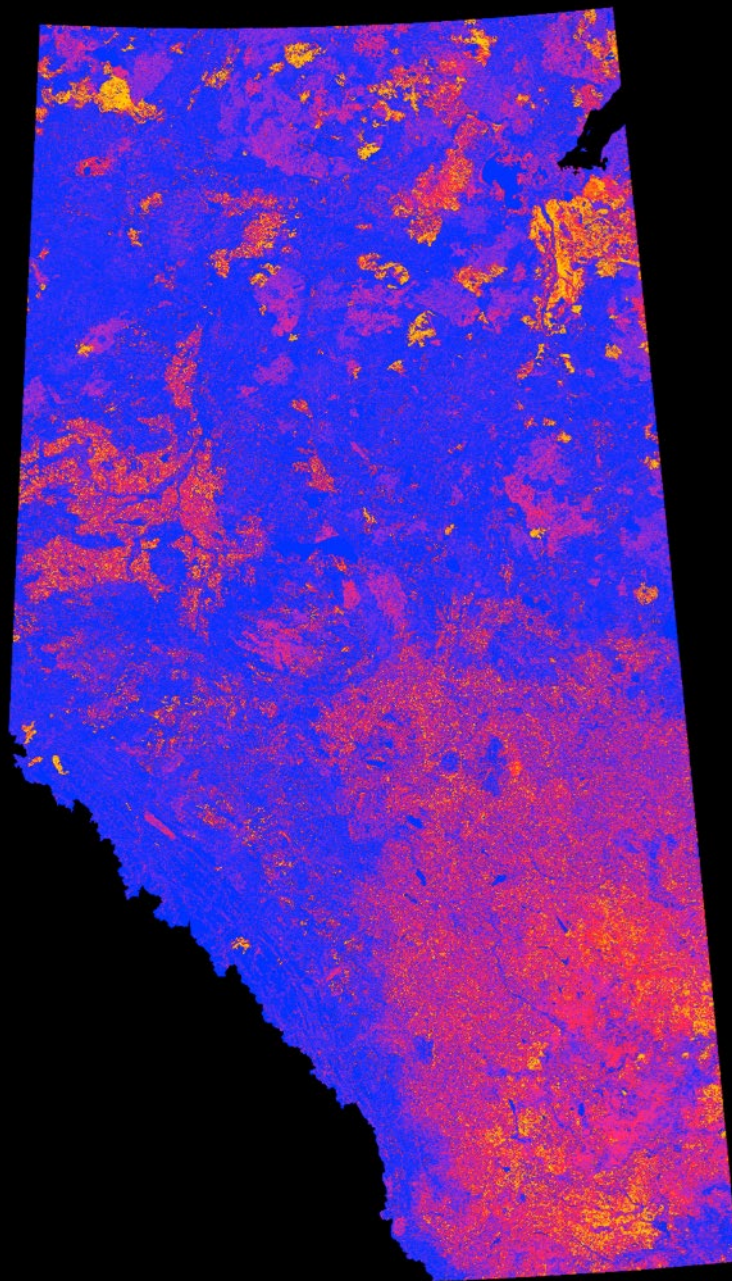
Two-step clustering  
algorithm



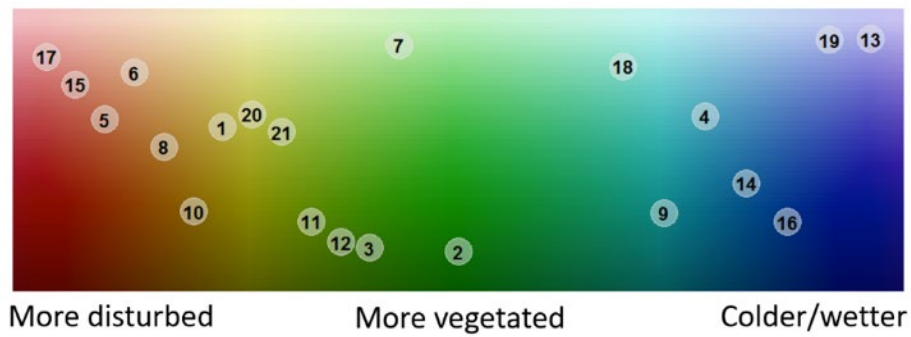
Standard deviation of GRN



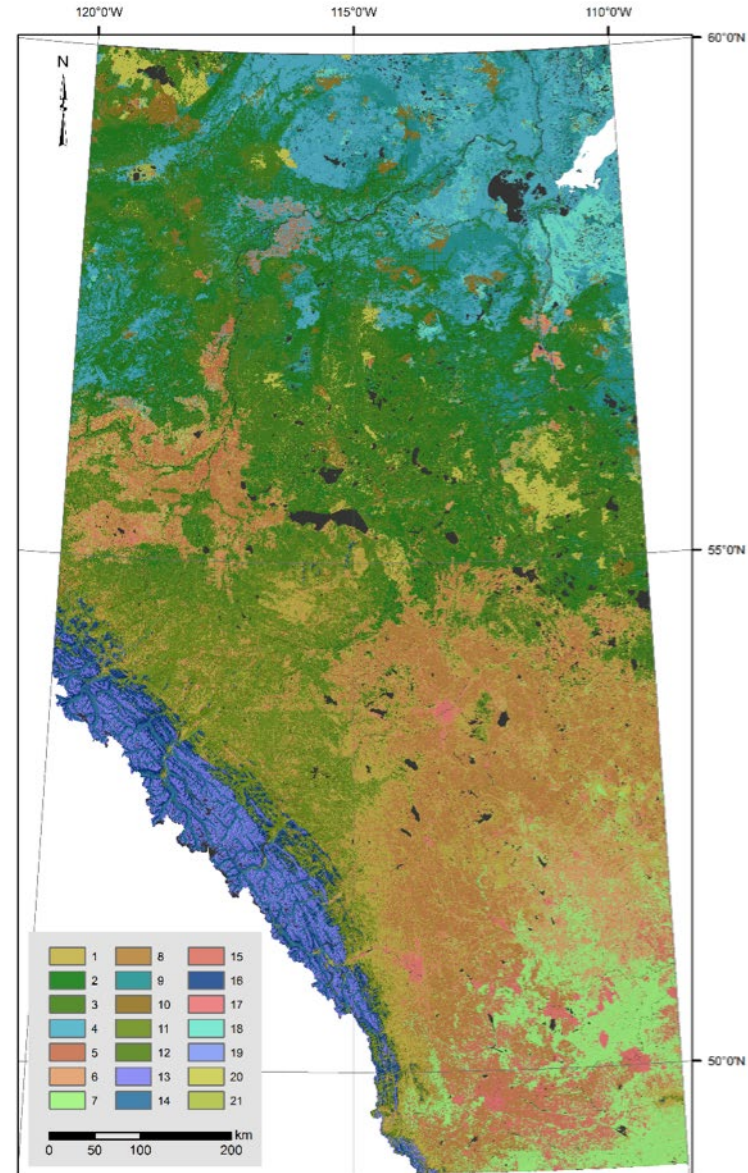
Standard deviation of NBR



# EcoAnthromes

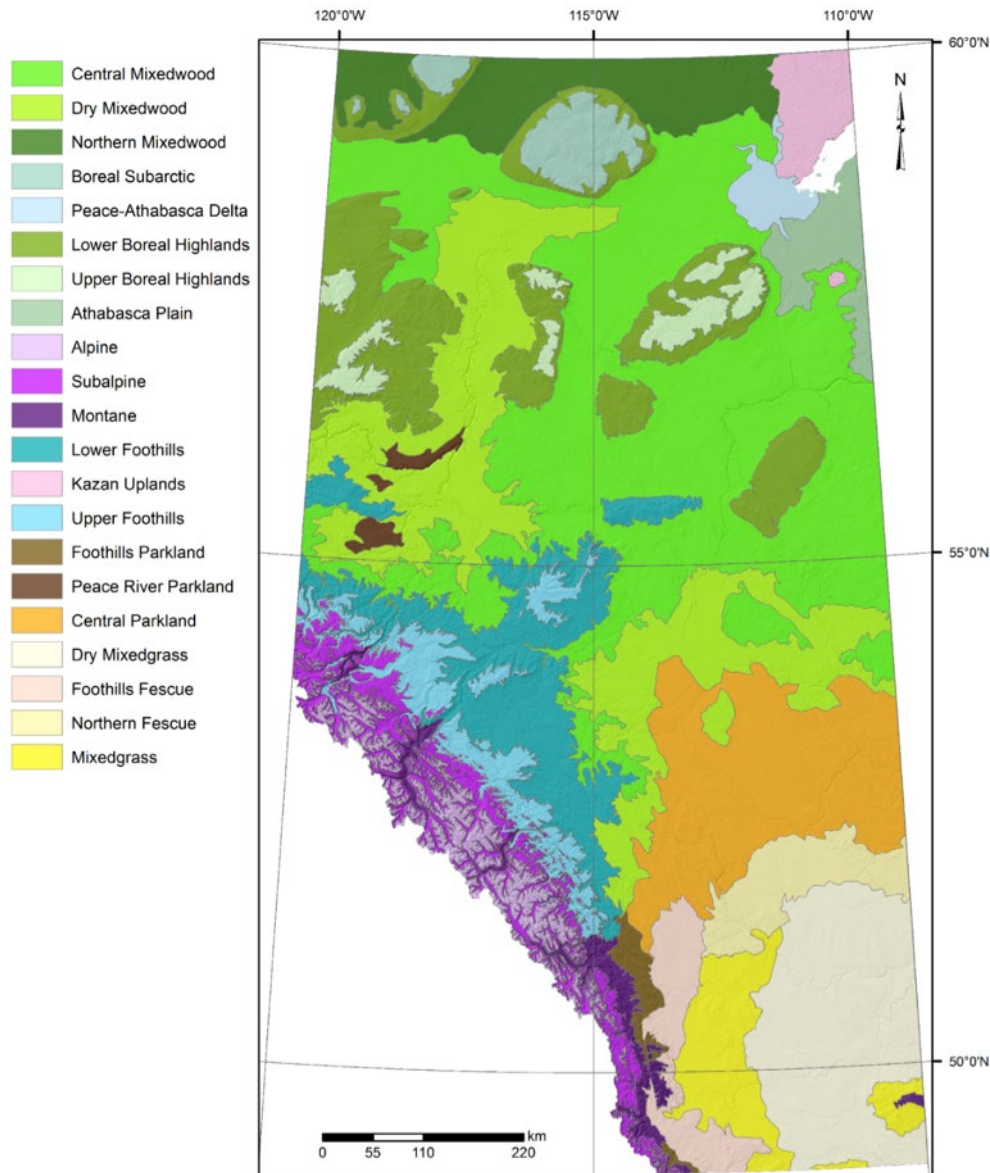


More forested

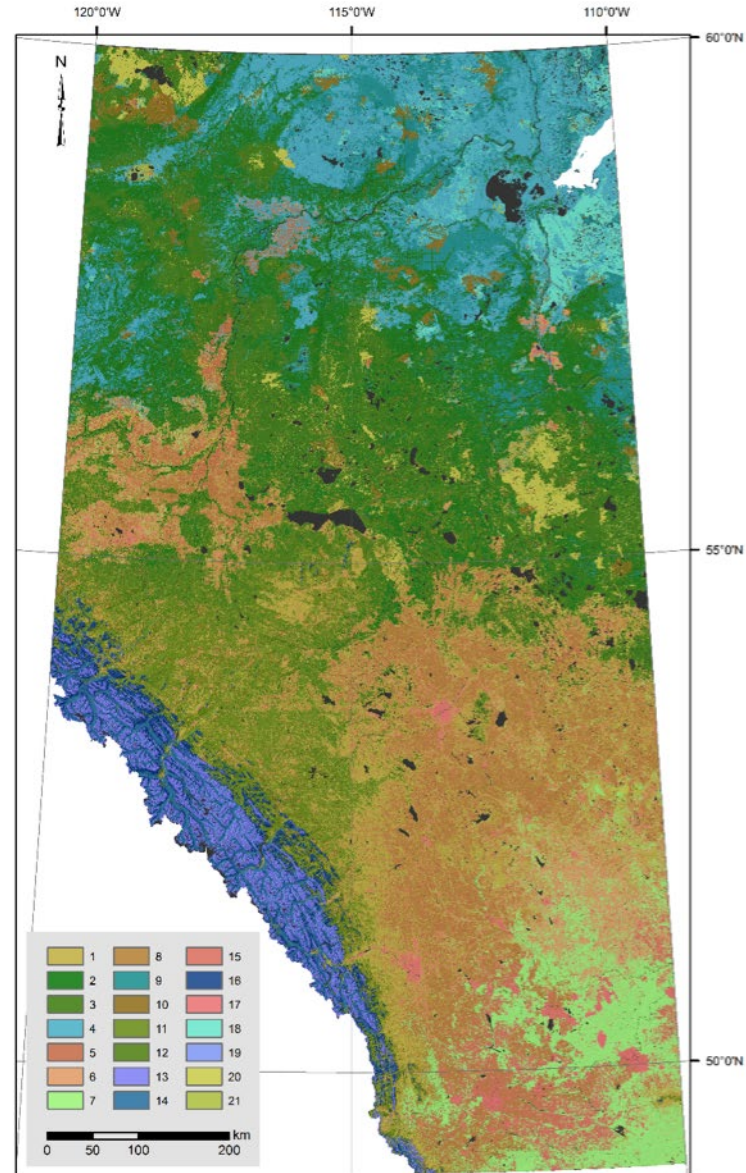




# Natural Subregions of Alberta



# EcoAnthromes





**Table 3. Explained variance of environmental and land-cover/disturbance variables by regionalization**

Results of regression analysis for each dependent variable, with each regionalization used separately as the independent variable.  $R^2$  is the coefficient of determination and RSE is the residual standard error of each regression test. Variable descriptions and units are provided in Section 2 and in Table 1.

	Variable	Natural Subregions		EcoAnthromes	
		$R^2$	RSE	$R^2$	RSE
ENVIRONMENT	<i>Climate</i>				
	MAP	0.81	55.69	0.66	71.34
	MAT	0.84	0.83	0.75	1.01
	TD	0.82	2.09	0.74	2.50
	SHM	0.83	6.25	0.59	9.47
	DD > 5	0.92	80.96	0.73	144.64
	DD < 0	0.80	236.43	0.74	267.01
	<i>Terrain</i>				
	INSOL	0.72	61,247	0.63	68,086
	TWI	0.54	0.77	0.45	0.83
LAND COVER & DISTURBANCE	TPI	0.22	59.11	0.61	39.42
	SED	0.13	46.69	0.57	33.78
	<i>Land Cover and Vegetation</i>				
	BRT	0.48	541.79	0.69	409.36
	GRN	0.40	440.28	0.64	334.10
	WET	0.45	439.41	0.73	300.39
	NBR	0.45	0.15	0.72	0.11
	FOR	0.39	0.31	0.84	0.16
	<i>Disturbance</i>				
	GRN-sd	0.38	164.49	0.72	106.39
OTHER	NBR-sd	0.15	0.06	0.71	0.03
	<i>Human activity</i>				
	NTL	0.24	149.01	0.30	100.82
OTHER	ACC	0.49	120.98	0.50	131.24
	<i>Other metrics</i>				
	Fire (FIRE)	0.13	124.25	0.40	104.03
	Harvest (HRVST)	0.05	65.24	0.07	64.33
OTHER	Species Intactness (SPP)	0.52	14.5	0.63	12.5



# Automated rural road detection and classification

Photo: Aaron Huey/National Geographic



**ROAD NETWORK**  
(accurate and up-to-date)

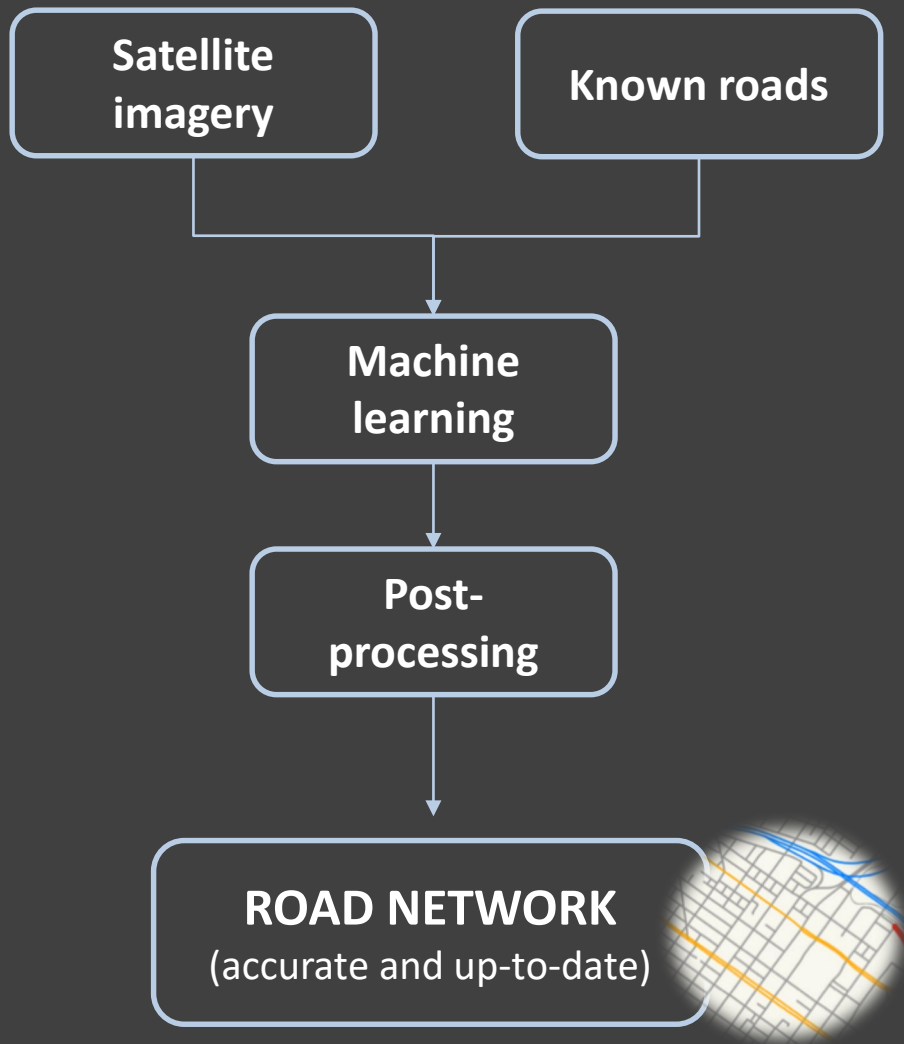


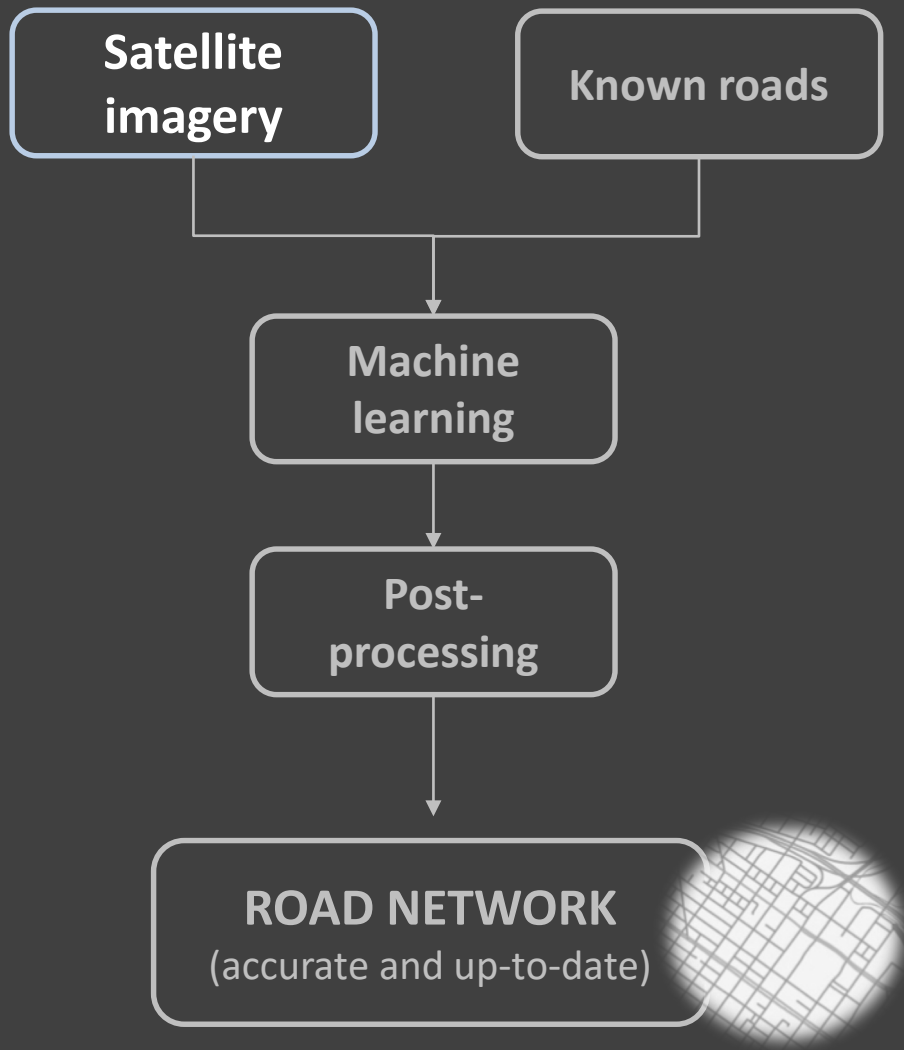
**INTENSITY OF USE**  
(traffic, timing, ...)

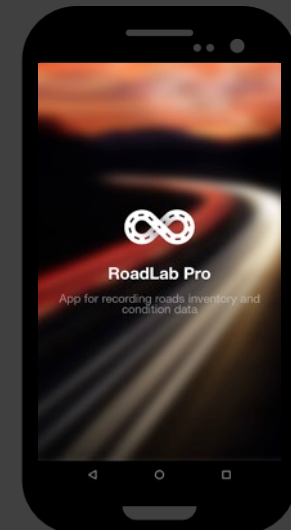
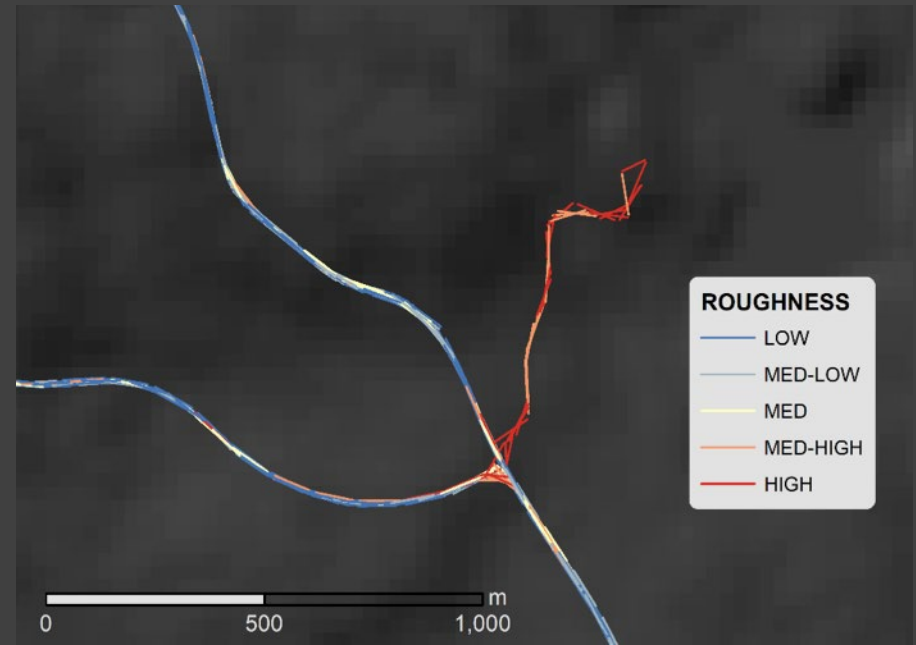
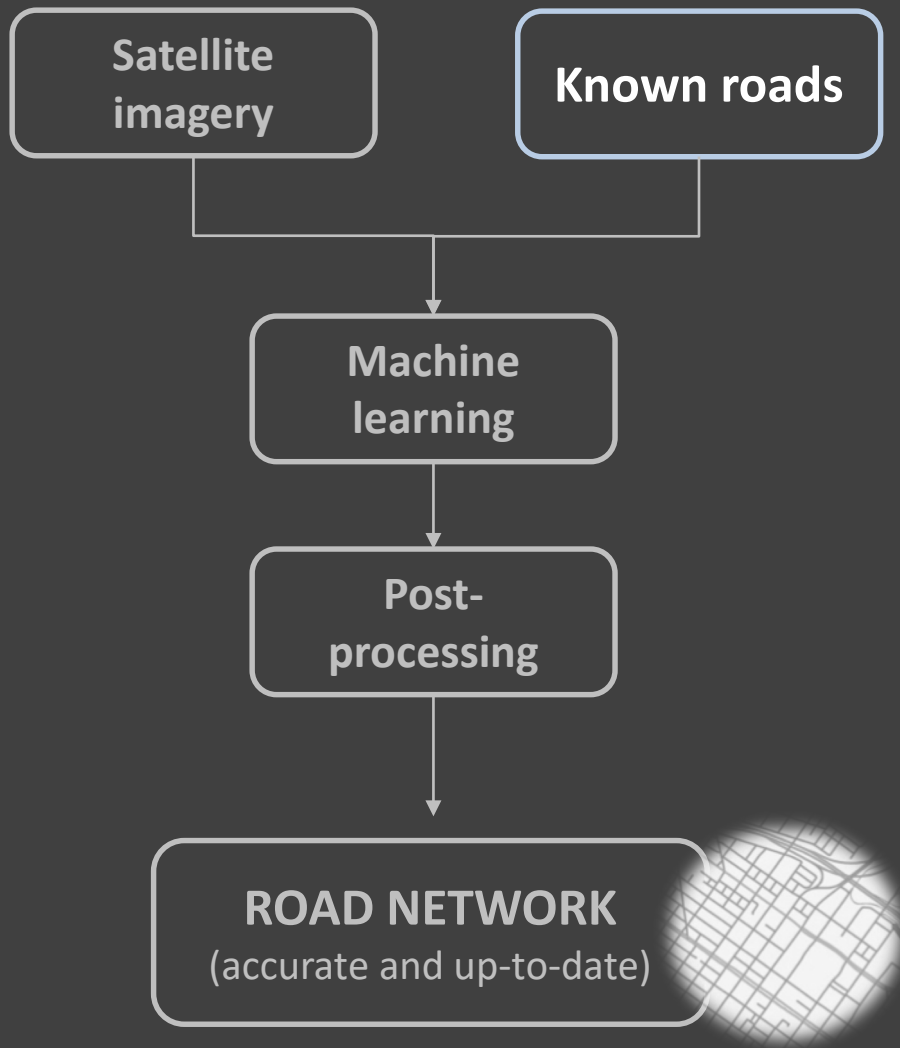


**TYPE OF USE**  
(recreation, industrial, ...)



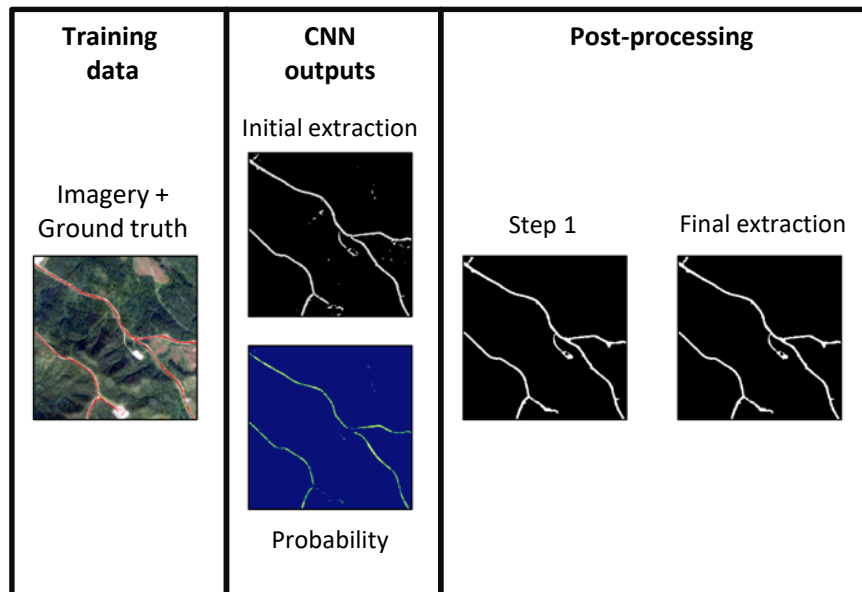




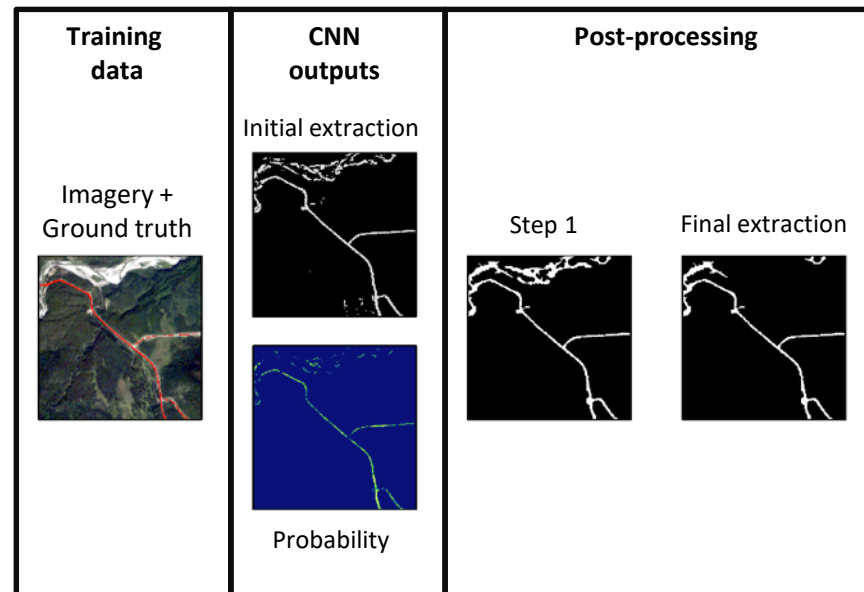




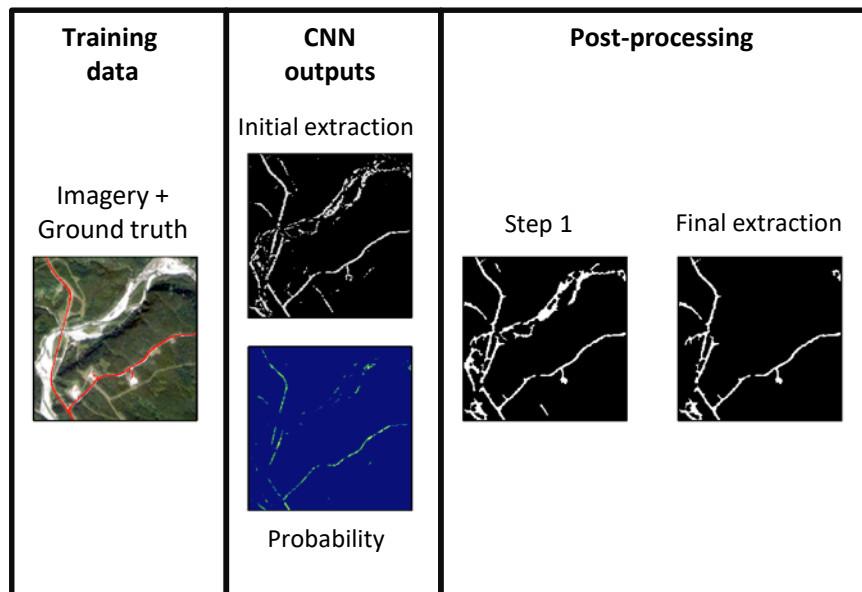
## GOOD RESULTS



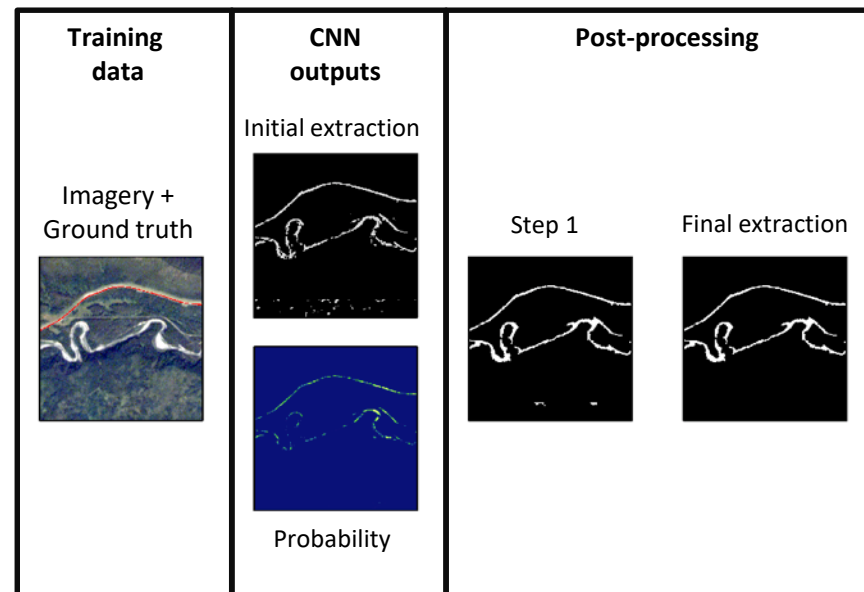
## GOOD RESULTS AFTER POST-PROCESSING



## OK RESULTS AFTER POST-PROCESSING



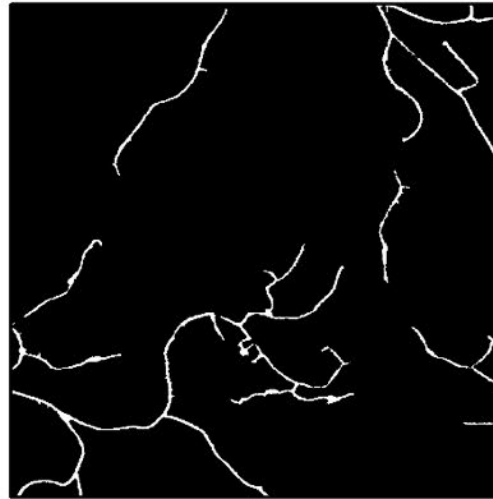
## POOR RESULTS EVEN AFTER POST-PROCESSING



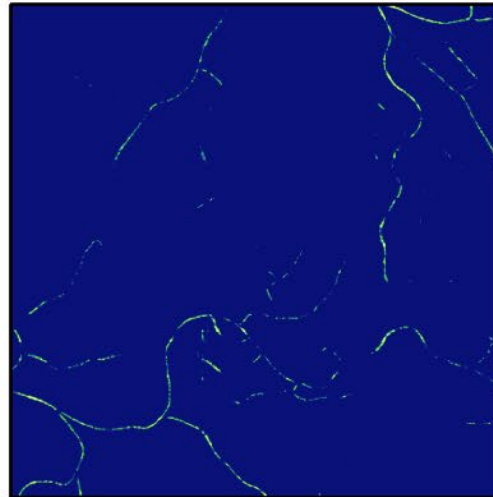
## Imagery



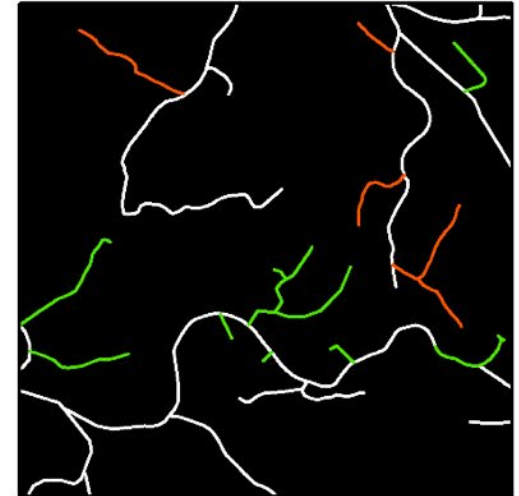
## Final prediction



## Probability



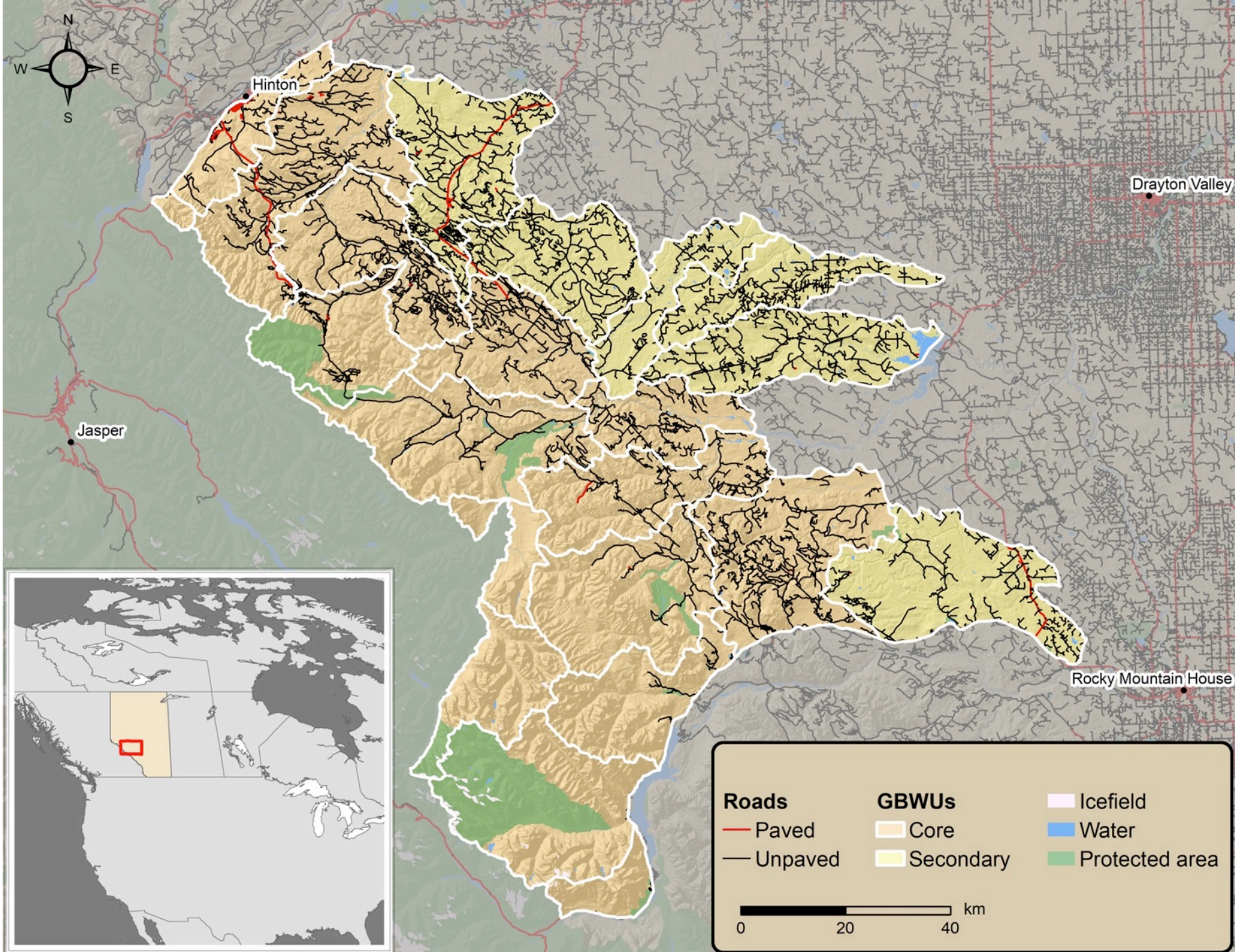
## Updated network



### Road network

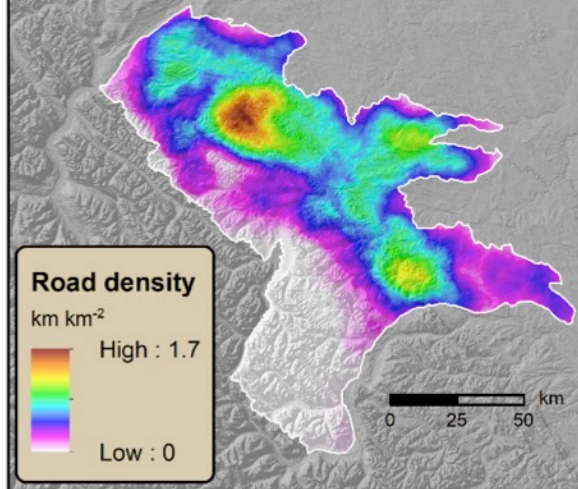
- No change
- Added
- Removed



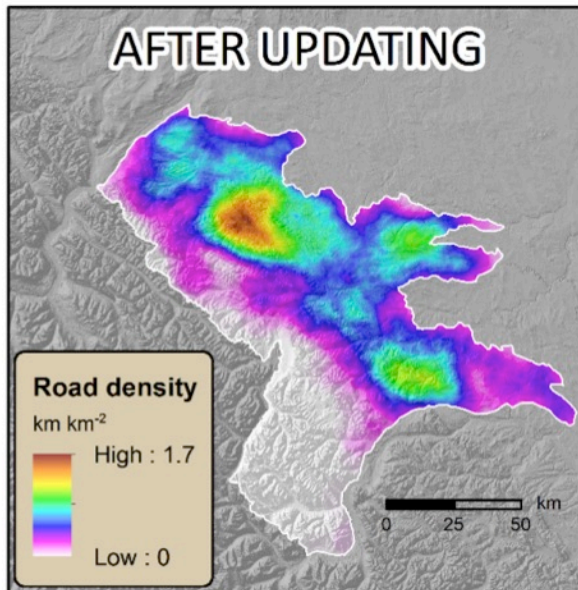




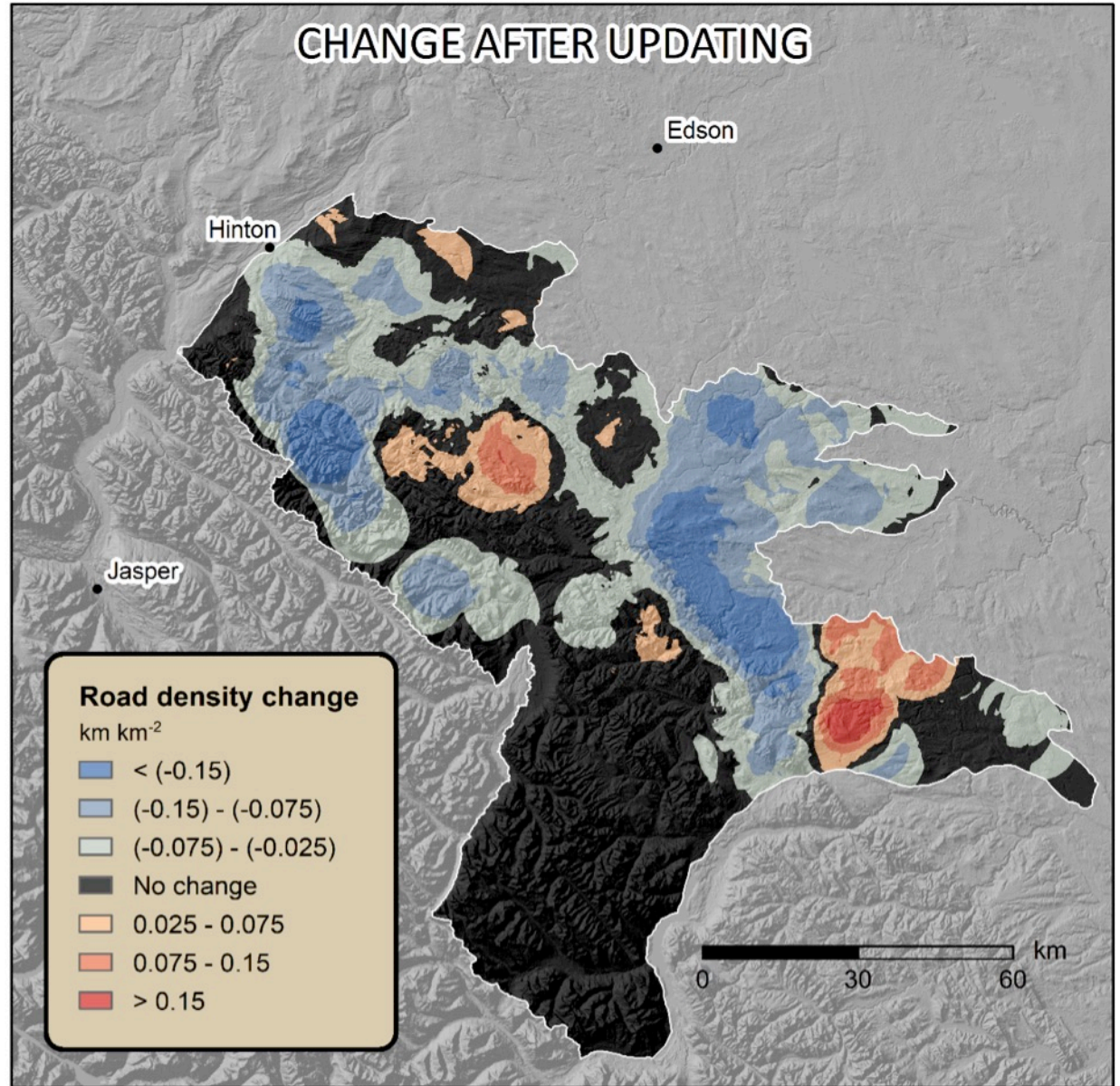
## BEFORE UPDATING



## AFTER UPDATING



## CHANGE AFTER UPDATING

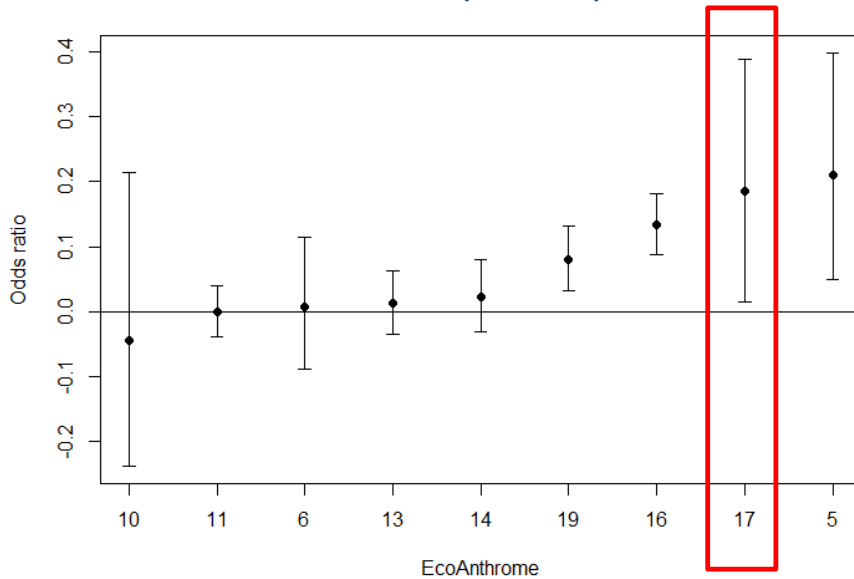


# Thank You for Attending

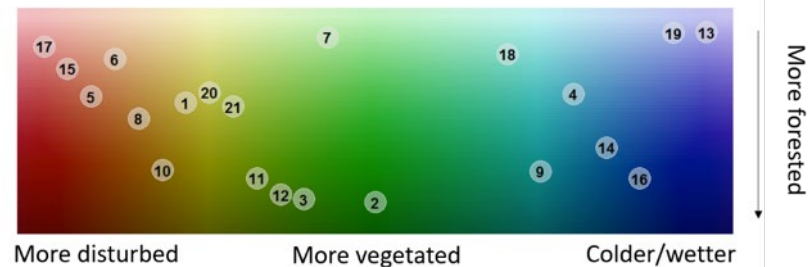
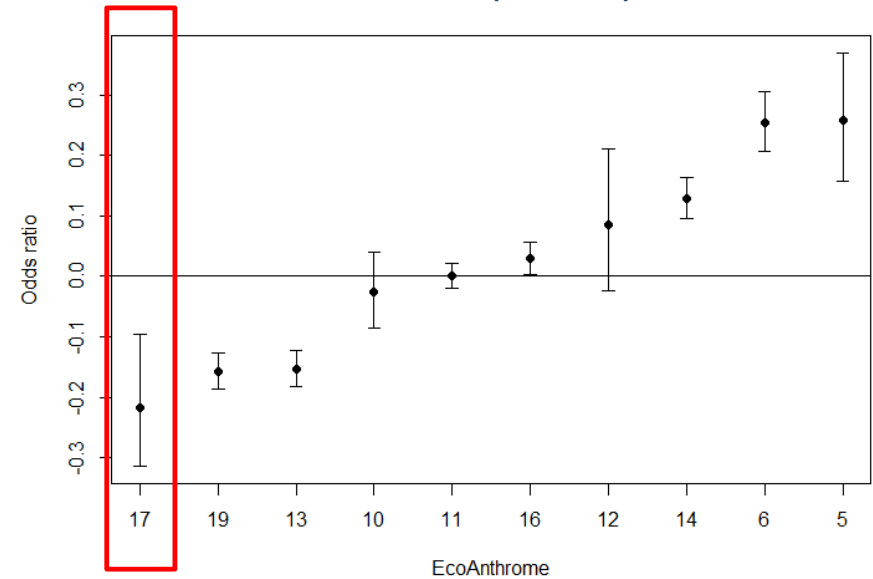


# Adult grizzly bear movement in spring (2006 – 2015)

Female (n = 34)

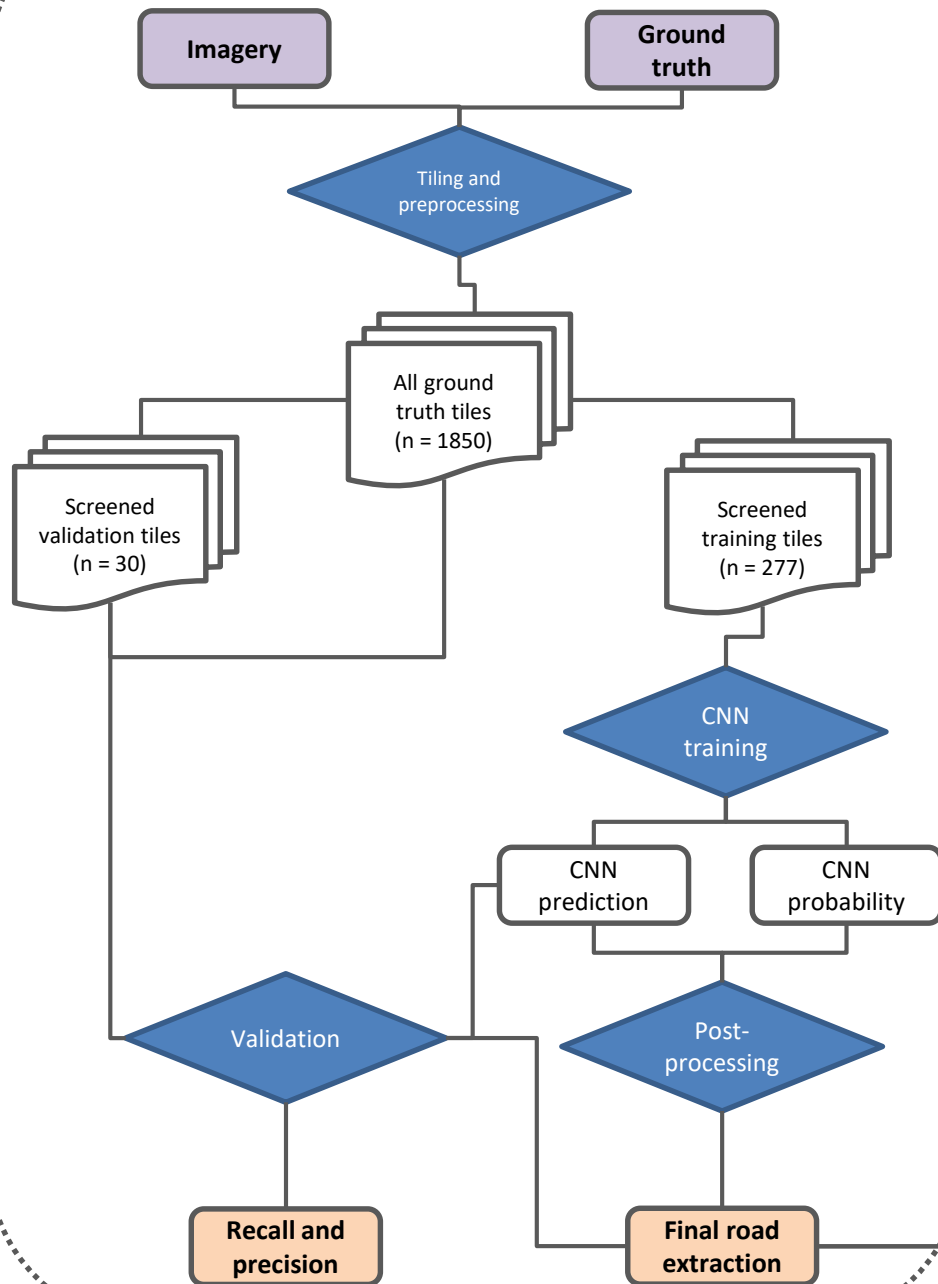


Male (n = 25)

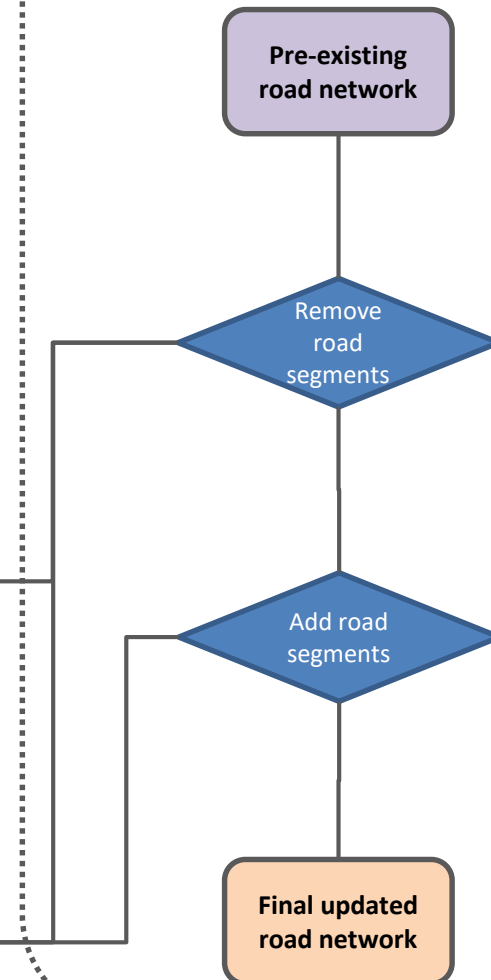


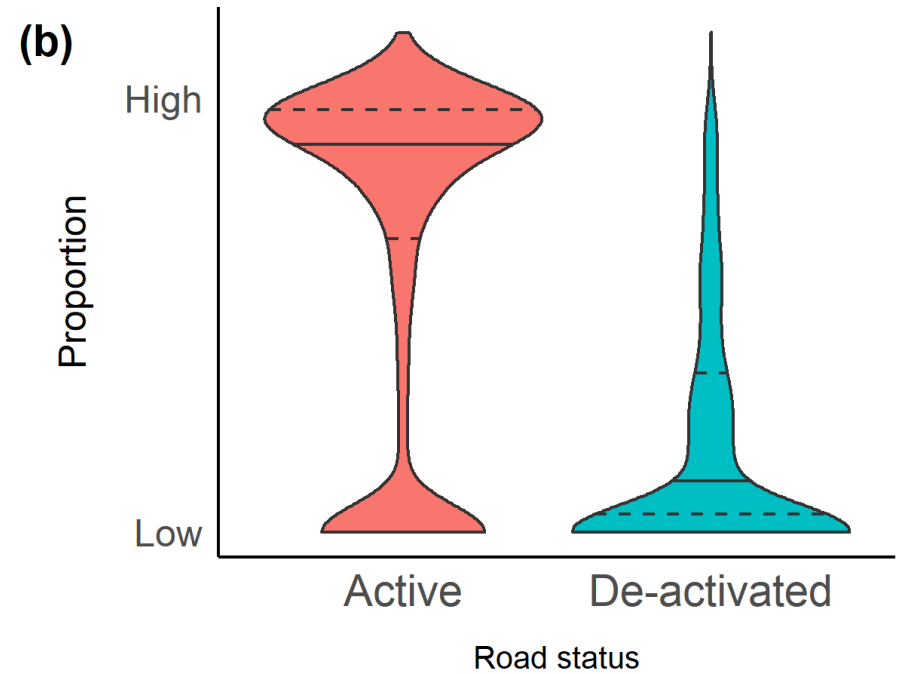
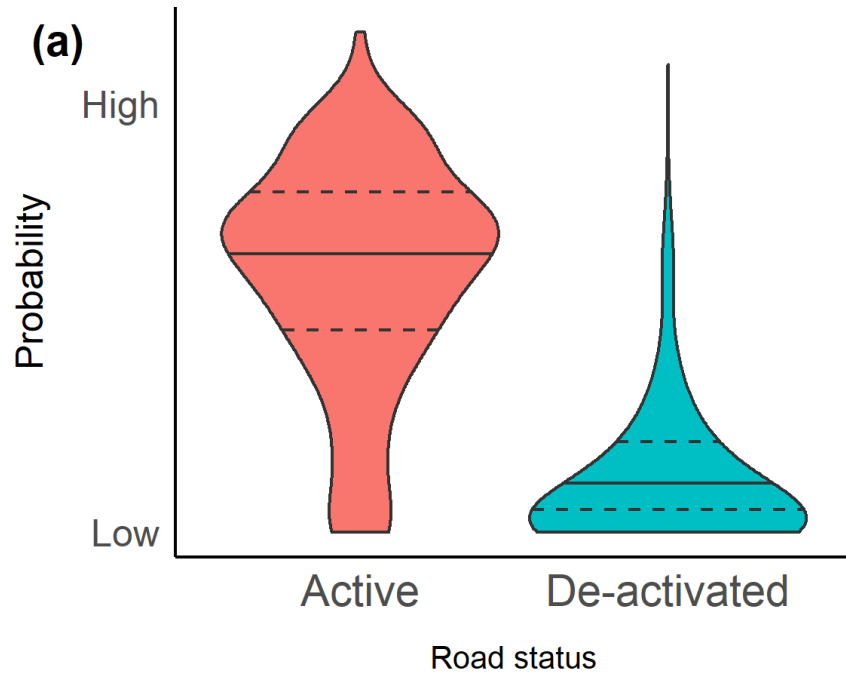


# Road extraction



# Road network updating





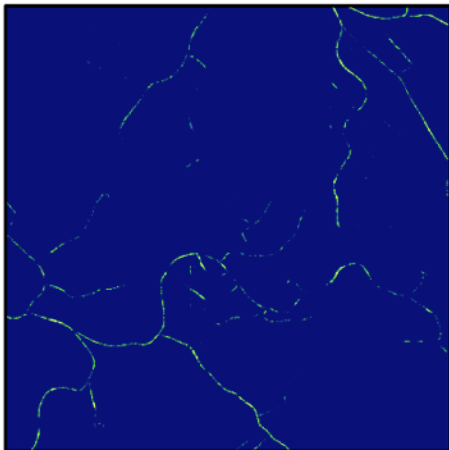
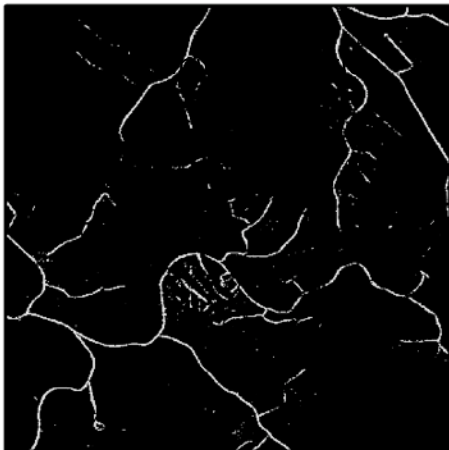
## Input data

Imagery



## CNN outputs

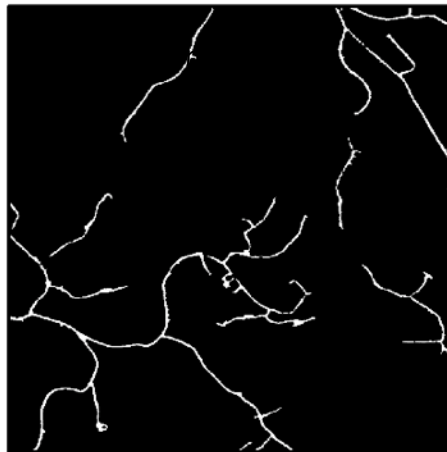
Prediction



Probability

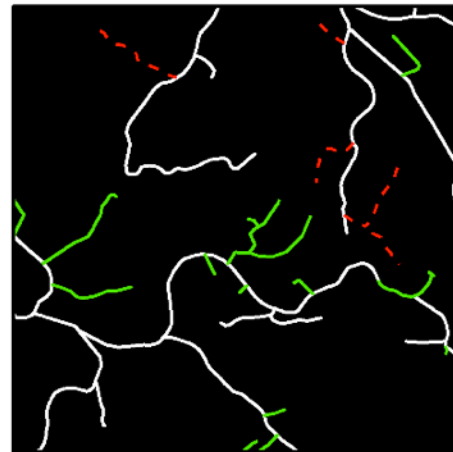
## Post-processing

Final extraction



## Road network updating

Final network



### Road network

- No change
- Added
- - - Removed