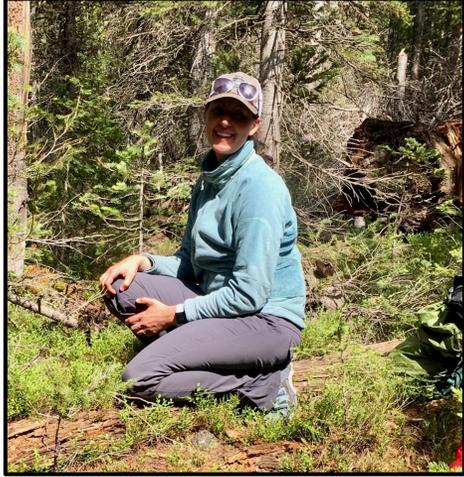




WYNDD
Wyoming Natural
Diversity Database

ECOLOGY PROGRAM UPDATE 2026



Paige
Copenhaver-Parry, PhD
Ecology Program
Manager



Shelby Byerly, PhD
Assistant Research
Scientist



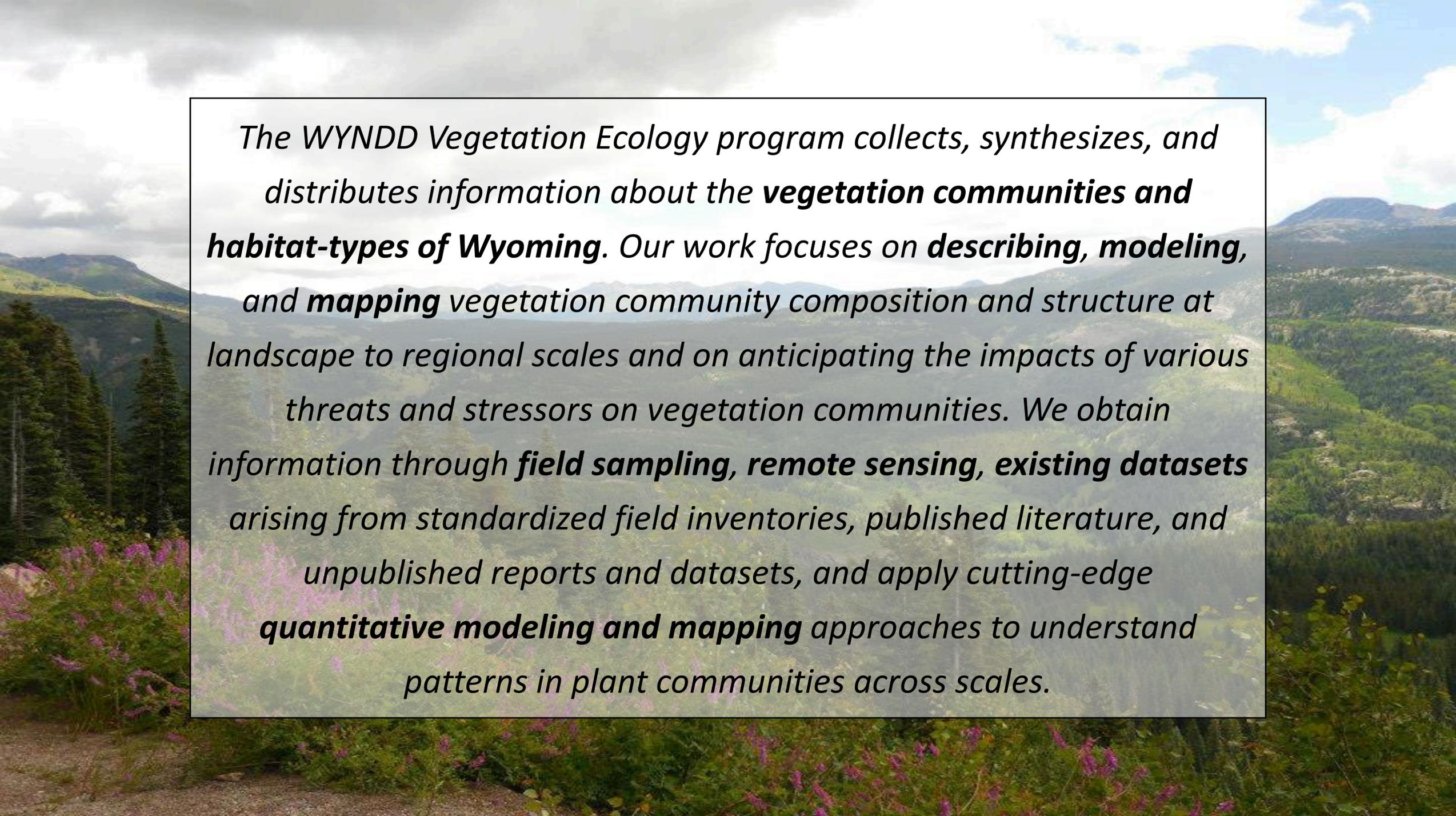
Morgan Frost, PhD
Postdoctoral
Researcher



Tanner Gordon
MS Student



Brad Parry, MS
Ecology Data
Manager



*The WYNDD Vegetation Ecology program collects, synthesizes, and distributes information about the **vegetation communities and habitat-types of Wyoming**. Our work focuses on **describing, modeling, and mapping** vegetation community composition and structure at landscape to regional scales and on anticipating the impacts of various threats and stressors on vegetation communities. We obtain information through **field sampling, remote sensing, existing datasets** arising from standardized field inventories, published literature, and unpublished reports and datasets, and apply cutting-edge **quantitative modeling and mapping** approaches to understand patterns in plant communities across scales.*

Forecasting changes in the distribution and composition of Wyoming's terrestrial plant communities

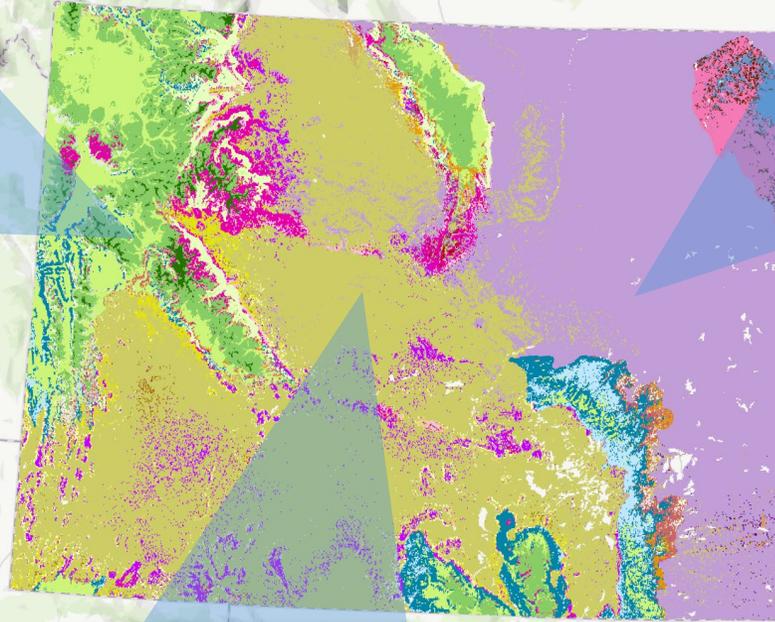
Partners: *Ian Abernethy, UW WYNDD Wyoming Game and Fish Department*



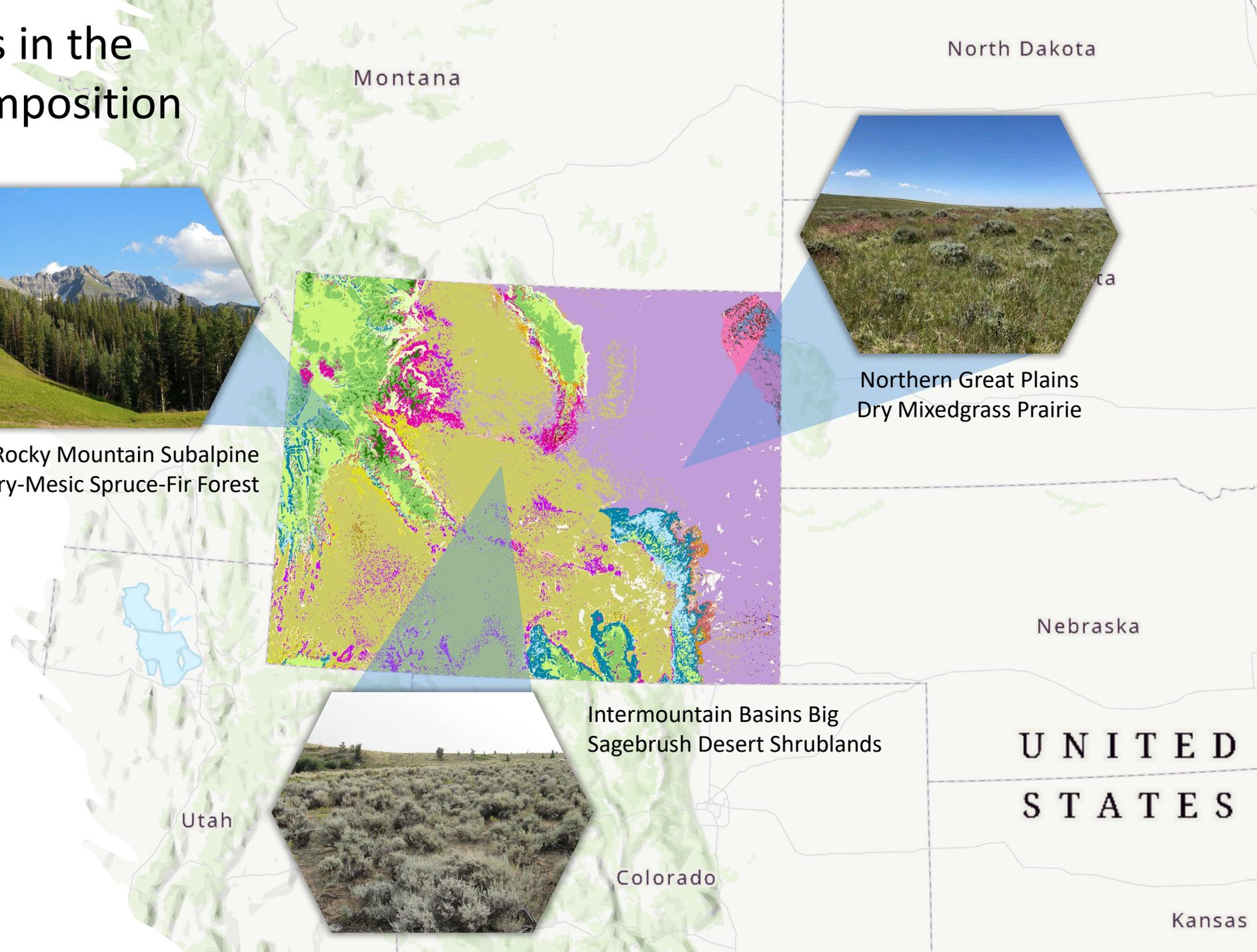
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest



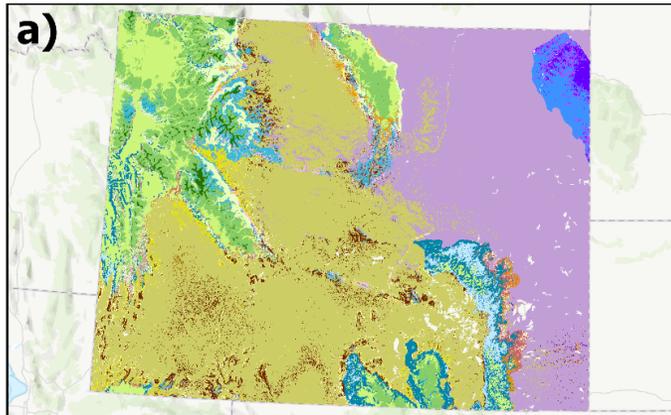
Northern Great Plains Dry Mixedgrass Prairie



Intermountain Basins Big Sagebrush Desert Shrublands



CURRENT



Plains

- Northern Great Plains Sand Prairie
- Northern Great Plains Dry Mixedgrass Prairie
- Northern Great Plains Mesic Mixedgrass Prairie
- Northern Great Plains Mesic Forest and Woodland
- Great Plains Bur Oak Forest & Woodland

Basins and Foothills

- Intermountain Basins Big Sagebrush Desert Shrubland
- Intermountain Basins Big Sagebrush Steppe
- Intermountain Shadscale - Saltbush Scrub
- Intermountain Dwarf Saltbush - Sagebrush Scrub
- Intermountain Low & Black Sagebrush Steppe & Shrubland
- Intermountain Semi-Desert Steppe & Shrubland
- North American Desert Alkaline-Saline Wet Scrub
- Great Basin-Intermountain Ruderal Dry Shrubland & Grassland
- Intermountain Semi-Desert Grassland
- Intermountain Basins Curl-leaf Mountain-mahogany Woodland and Scrub
- Central Rocky Mountain Montane-Foothill Shrubland
- Rocky Mountain Foothill-Rock Outcrop Limber Pine - Juniper Woodland

Mountains

- Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- Central Rocky Mountain-Interior Montane Grassland & Meadow
- Rocky Mountain Montane-Subalpine Limber Pine Woodland
- Black Hills-Northwestern Great Plains Ponderosa Pine Forest & Woodland
- Southern Rocky Mountain Mesic-Moist Mixed Conifer Forest
- Rocky Mountain-Interior Subalpine-Montane Aspen Forest
- Central Rocky Mountain Douglas-fir Mesic Forest
- Rocky Mountain Lodgepole Pine Forest & Woodland
- Rocky Mountain Subalpine Dry-Mesic Spruce - Fir Forest
- Central Rocky Mountain Whitebark Pine - Subalpine Larch Forest & Woodland

LOW EMISSIONS

HIGHER EMISSIONS

MID-CENTURY

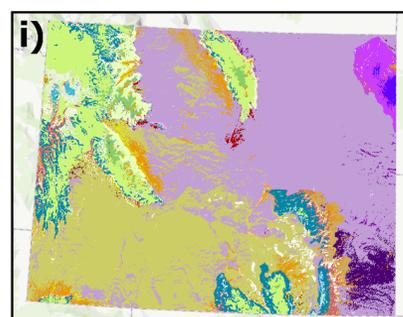
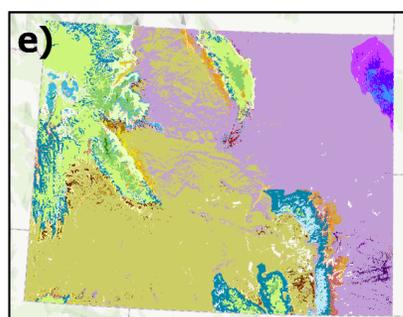
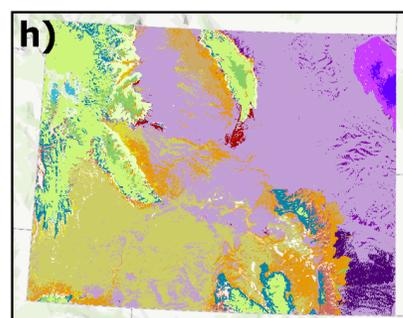
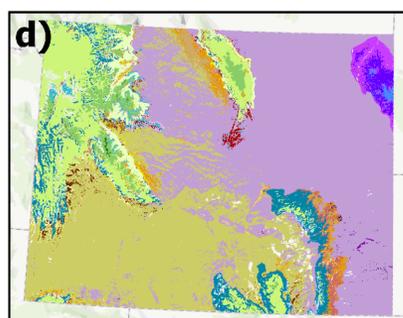
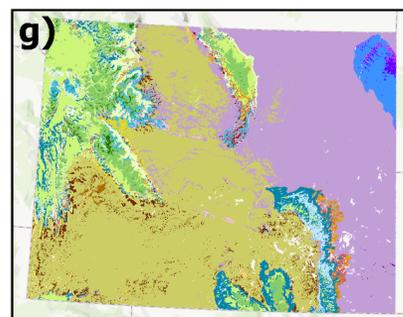
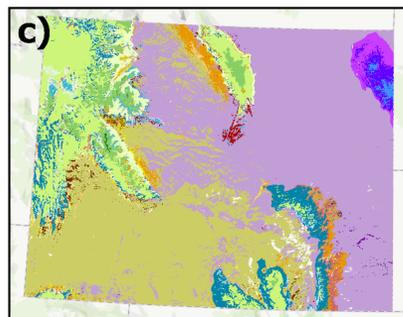
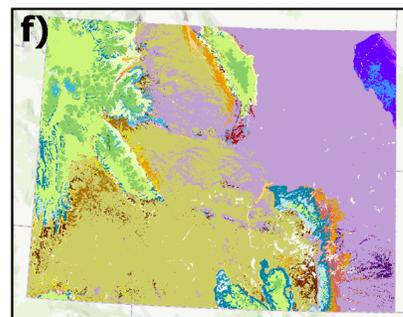
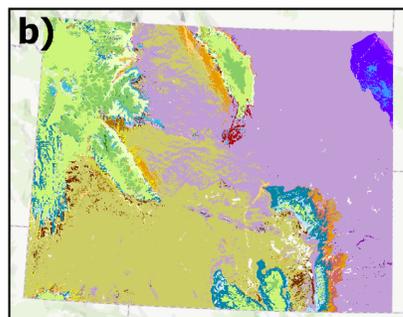
END-OF-CENTURY

GFDL-ESM4

MPI-ESM1-2-HR

GFDL-ESM4

MPI-ESM1-2-HR

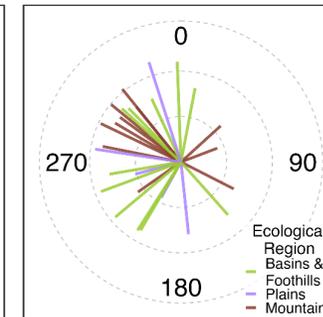
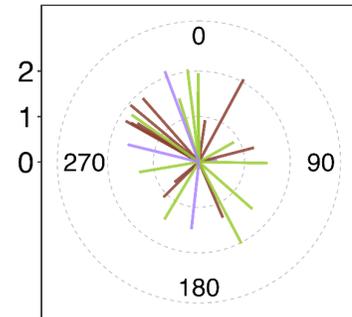
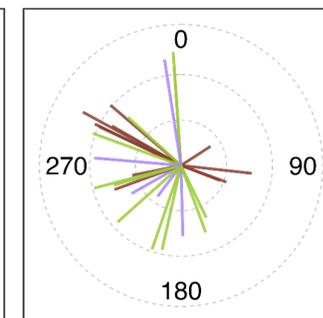
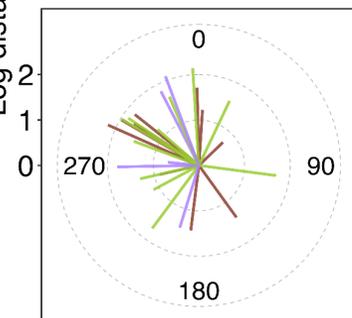
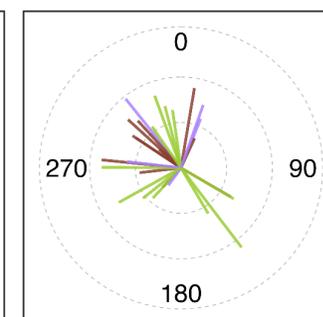
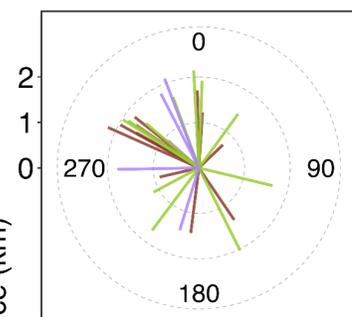
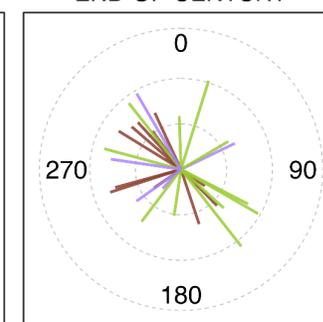
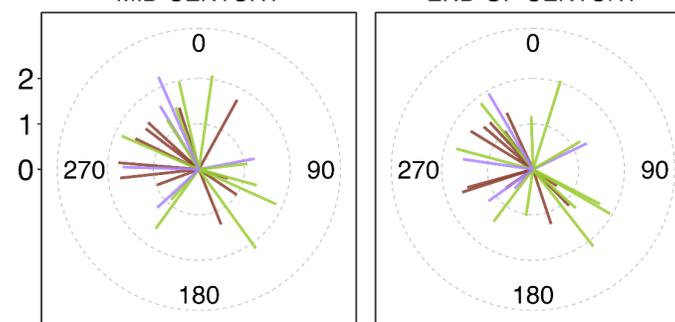


MID-CENTURY

END-OF-CENTURY

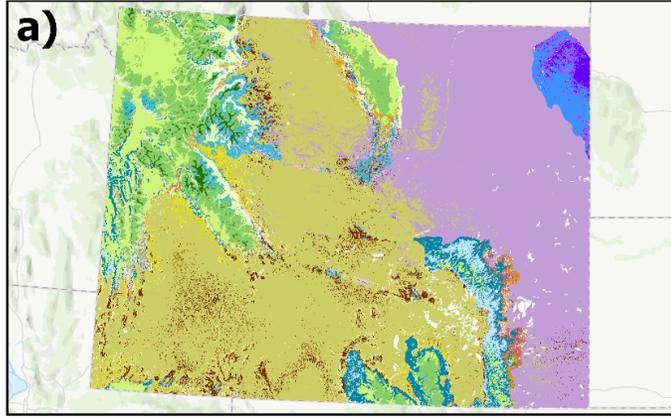
Log distance (km)

Bearing (°)



Ecological Region
Basins & Foothills
Plains
Mountains

CURRENT



LOW EMISSIONS

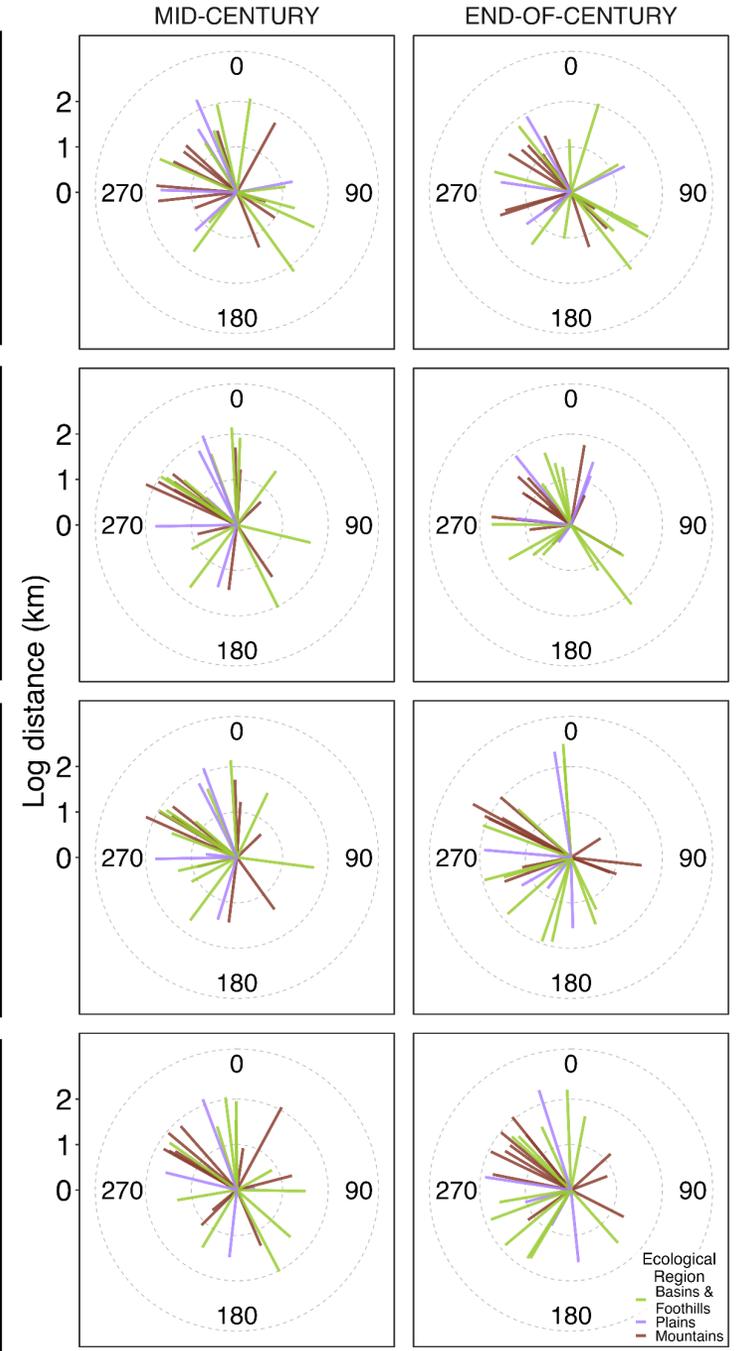
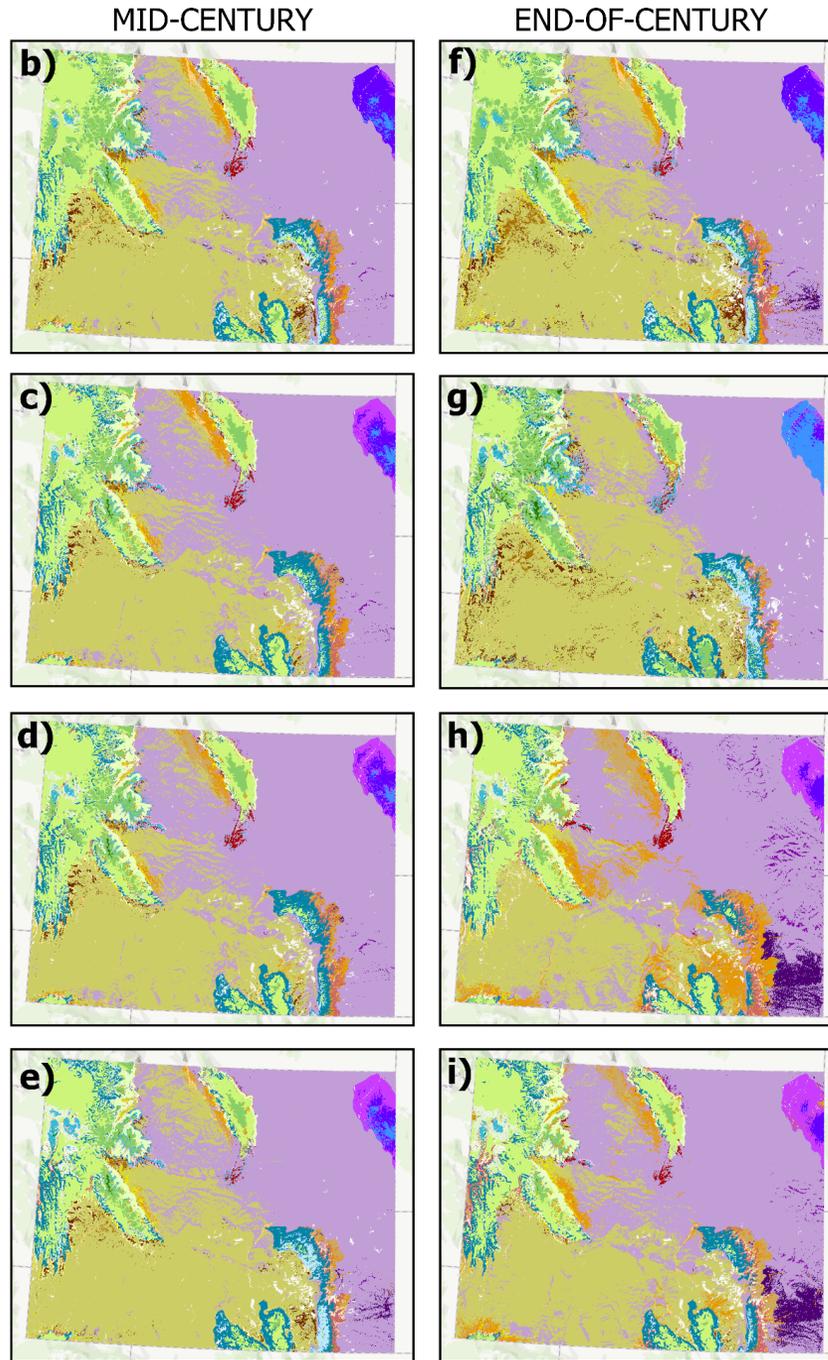
HIGHER EMISSIONS

GFDL-ESM4

MPI-ESM1-2-HR

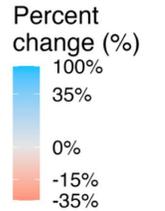
GFDL-ESM4

MPI-ESM1-2-HR



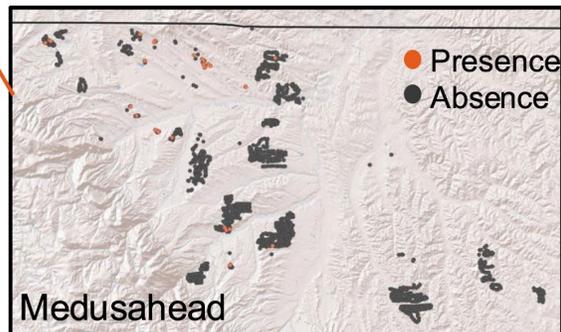
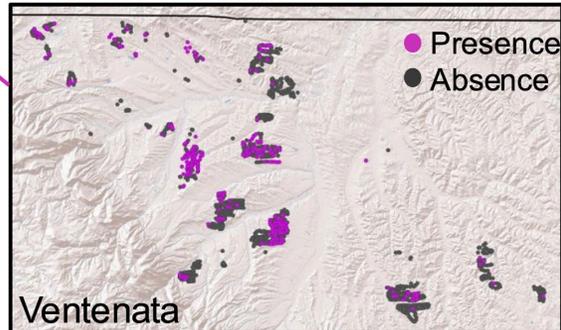
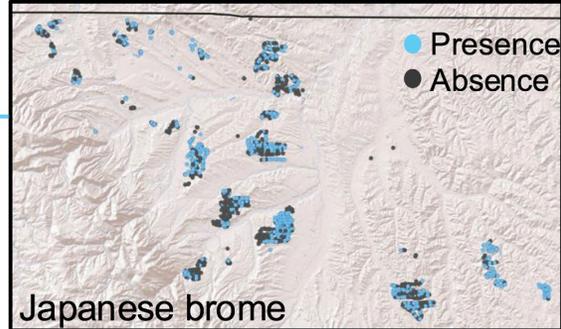
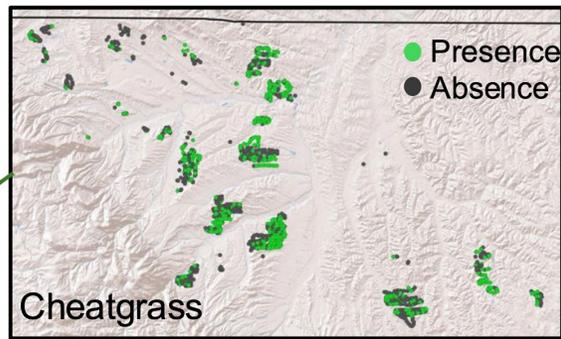
Bearing (°)

		MID-CENTURY				END-OF-CENTURY			
		MPI-ESM1-2-HR		GFDL-ESM4		MPI-ESM1-2-HR		GFDL-ESM4	
		Low	Higher	Low	Higher	Low	Higher	Low	Higher
Plains	Northern Great Plains Sand Prairie	27.93(19.35)	32.53(14.92)	20.62(16.16)	34.05(15.82)	15.75(12.51)	51.47(2.08)	35.66(19.23)	66.11(14.52)
	Northern Great Plains Dry Mixedgrass Prairie	16.28(15.92)	22.86(18.38)	21.43(16.26)	25.10(18.36)	16.06(16.21)	33.64(20.95)	20.65(16.04)	39.02(21.39)
	Northern Great Plains Mesic Mixedgrass Prairie	12.65(10.90)	24.22(10.28)	12.38(10.77)	18.79(9.38)	3.77(7.80)	41.05(14.11)	24.36(8.92)	46.57(14.52)
	Northern Great Plains Mesic Forest & Woodland	27.12(19.67)	18.33(23.48)	28.46(26.80)	20.33(24.10)	38.12(22.18)	30.27(28.49)	29.73(29.03)	29.18(27.16)
	Great Plains Bur Oak Forest & Woodland	12.49(23.15)	2.50(24.80)	8.80(29.52)	7.09(26.14)	29.10(24.65)	-16.98(20.71)	7.04(28.02)	-14.46(24.57)
Basins & Foothills	Intermountain Basins Big Sagebrush Desert Shrubland	6.17(21.88)	22.91(27.99)	18.65(28.15)	27.49(30.49)	9.88(23.41)	31.77(30.13)	11.74(25.46)	24.59(30.00)
	Intermountain Basins Big Sagebrush Steppe	-3.18(23.16)	-0.85(31.24)	-7.39(32.34)	-2.35(37.11)	-6.32(15.33)	5.34(44.94)	-7.25(27.54)	-2.04(43.18)
	Intermountain Shadscale-Saltbush Scrub	8.17(10.70)	27.10(36.69)	1.40(41.06)	-12.56(15.58)	16.72(23.82)	-	22.01(26.40)	-
	Intermountain Dwarf Saltbush-Sagebrush Scrub	20.07(18.24)	37.44(22.23)	44.21(20.60)	27.26(20.08)	19.54(15.13)	48.53(33.10)	47.51(20.19)	54.47(36.03)
	Intermountain Low & Black Sagebrush Steppe & Shrubland	-10.27(19.05)	-15.40(24.53)	-18.20(22.62)	-24.02(19.80)	-14.30(17.86)	-16.22(36.29)	-14.17(21.33)	-26.99(23.48)
	Intermountain Semi-Desert Steppe & Shrubland	33.48(34.81)	49.45(39.82)	38.65(33.81)	57.81(46.58)	15.61(31.65)	82.22(48.55)	34.33(28.44)	96.15(39.80)
	North American Desert Alkaline-Saline Wet Scrub	7.20(14.89)	7.10(16.43)	3.93(15.11)	6.84(19.24)	7.85(15.14)	7.93(20.79)	2.42(13.94)	14.25(17.89)
	Great Basin-Intermountain Ruderal Dry Shrubland & Grassland	44.90(24.31)	73.11(26.66)	47.41(31.44)	75.16(25.67)	24.84(22.12)	95.81(35.35)	43.58(26.60)	82.56(41.71)
	Intermountain Semi-Desert Grassland	-17.45(14.75)	-14.29(26.07)	-6.90(27.99)	-20.12(19.85)	-11.25(19.69)	-16.81(29.64)	-0.42(27.84)	-
	Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub	3.73(19.06)	16.47(22.13)	16.24(21.46)	38.59(22.22)	5.15(20.30)	49.85(24.71)	10.66(20.24)	55.81(26.23)
	Central Rocky Mountain Montane-Foothill Shrubland	10.53(28.28)	24.74(42.76)	36.28(36.88)	43.36(50.45)	6.07(24.07)	-6.75(58.42)	44.41(35.69)	-7.55(45.90)
	Rocky Mountain Foothill-Rock Outcrop Limber Pine-Juniper Woodland	2.99(19.17)	7.45(23.64)	17.25(27.98)	19.50(31.20)	7.74(21.80)	30.72(35.24)	12.44(26.44)	30.04(38.31)
	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	-0.37(19.61)	2.67(29.79)	-1.41(23.72)	9.17(32.77)	3.26(25.91)	-1.28(32.93)	-5.62(23.57)	19.26(45.33)
	Central Rocky Mountain-Interior Montane Grassland & Meadow	-15.85(11.82)	-13.03(9.44)	-0.81(32.30)	24.75(30.47)	-1.41(28.39)	-	-2.12(30.90)	-
	Rocky Mountain Montane-Subalpine Limber Pine Woodland	0.35(18.14)	3.68(30.63)	-3.92(28.43)	-2.52(29.11)	-4.23(18.19)	12.58(30.31)	-4.14(26.17)	9.74(29.19)
Black Hills-Northwestern Great Plains Ponderosa Pine Forest & Woodland	0.75(13.95)	1.29(16.94)	-8.71(14.54)	-5.55(14.43)	20.57(24.83)	3.45(13.60)	-8.67(13.92)	-9.92(8.14)	
Mountains	Southern Rocky Mountain Mesic-Moist Mixed Conifer Forest	7.02(22.81)	16.86(31.44)	11.52(23.70)	20.50(26.70)	4.02(19.52)	27.81(38.95)	10.27(24.62)	26.52(31.75)
	Rocky Mountain-Interior Subalpine-Montane Aspen Forest	3.80(22.25)	7.23(22.52)	10.79(22.77)	13.72(27.86)	8.62(19.42)	4.17(20.20)	6.83(21.98)	-6.38(25.34)
	Central Rocky Mountain Douglas-fir Mesic Forest	6.78(24.71)	9.81(27.15)	5.37(21.96)	14.41(28.36)	6.06(23.56)	23.74(32.27)	4.84(20.45)	23.47(32.73)
	Rocky Mountain Lodgepole Pine Forest & Woodland	2.29(36.75)	13.44(49.68)	4.26(32.08)	6.93(42.05)	-5.29(29.64)	32.13(68.52)	13.54(33.05)	21.95(54.18)
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest	-15.15(22.52)	-29.41(24.95)	-10.82(36.06)	-19.79(31.90)	-13.98(19.90)	-34.80(28.15)	-4.59(32.63)	-18.61(36.19)
Central Rocky Mountain Whitebark Pine-Subalpine Larch Forest & Woodland	-20.05(11.75)	-26.26(22.80)	-31.20(10.81)	-34.15(14.38)	-11.96(10.98)	-29.58(28.46)	-30.34(11.12)	-32.87(30.07)	

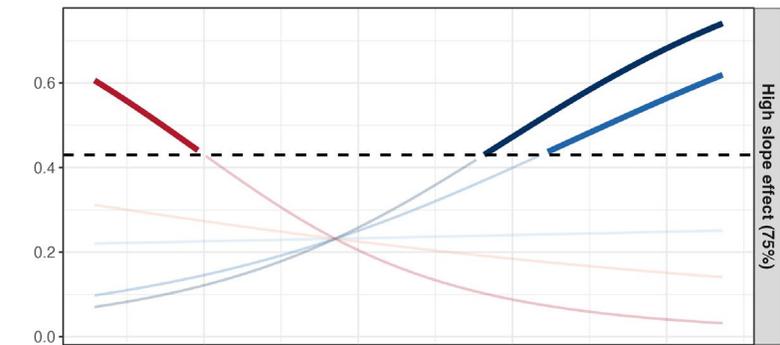
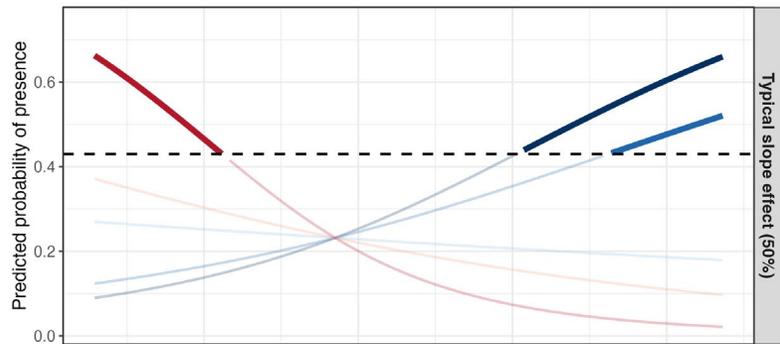
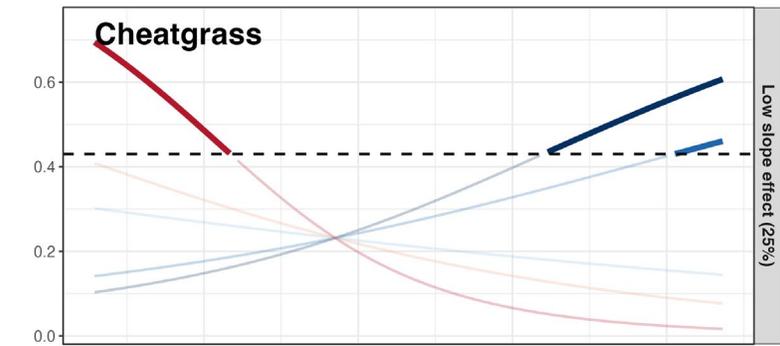


Adaptive Management Modeling of Invasive Annual Grasses in the Northern Great Plains

Partners: *Kelsey Brock, UW Dept of Plant Sciences, UW Extension*
Brian Mealor, Jaycie Arndt, UW Dept of Plant Sciences, UW Extension, IMAGINE
Amy Symstad, US Geological Survey
NPS Northern Great Plains Inventory and Monitoring Network

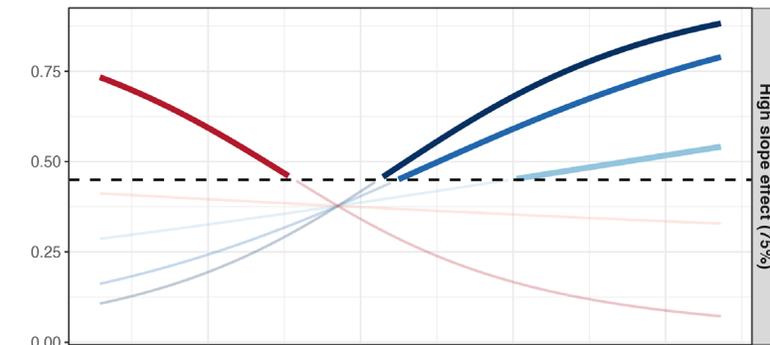
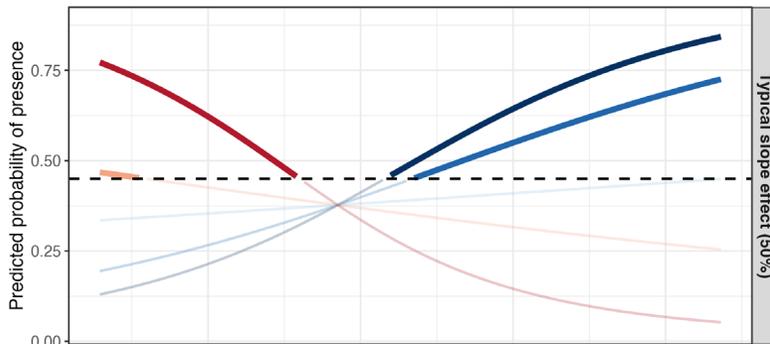
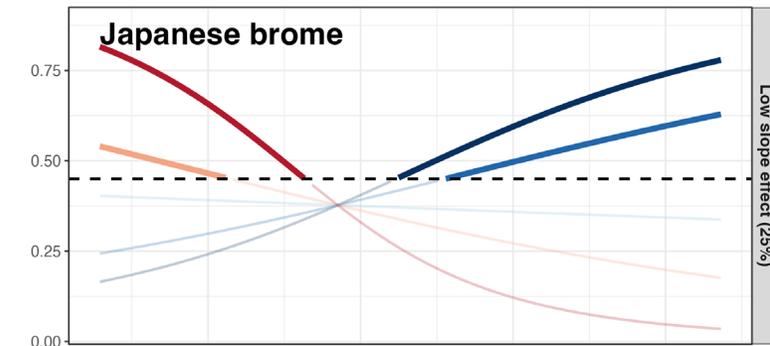


Wyoming



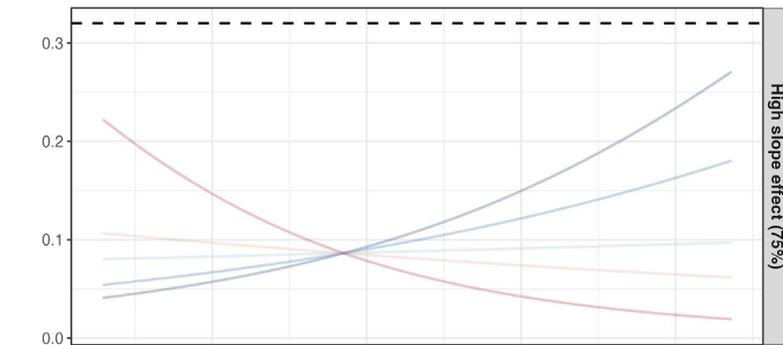
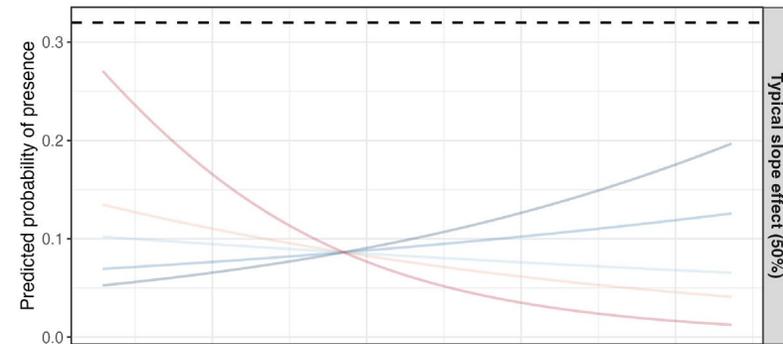
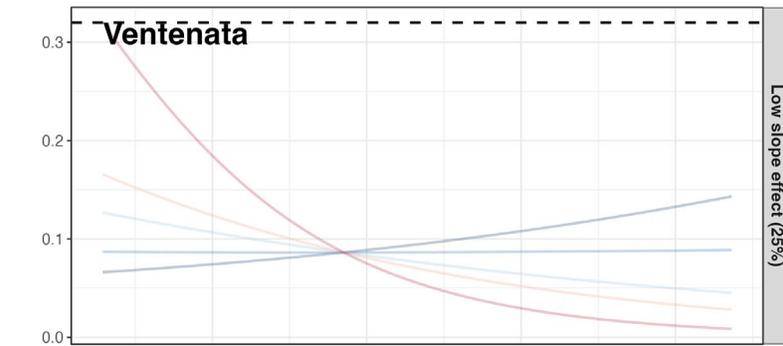
Fall max temp quantiles

- 1% (12.2 °C)
- 25% (13 °C)
- 50% (15.1 °C)
- 75% (16 °C)
- 99% (18.6 °C)



Fall mean temp quantiles

- 1% (4.7 °C)
- 25% (5.7 °C)
- 50% (6.9 °C)
- 75% (7.9 °C)
- 99% (10.3 °C)

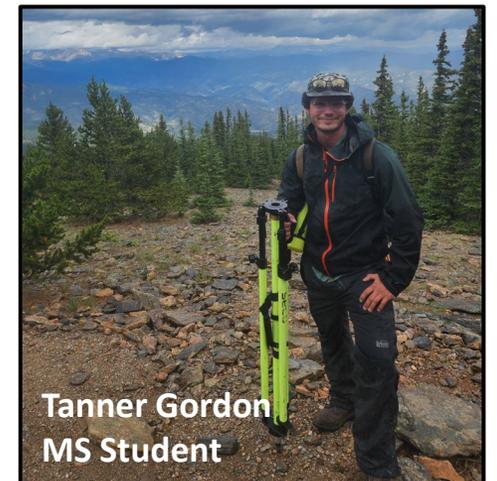
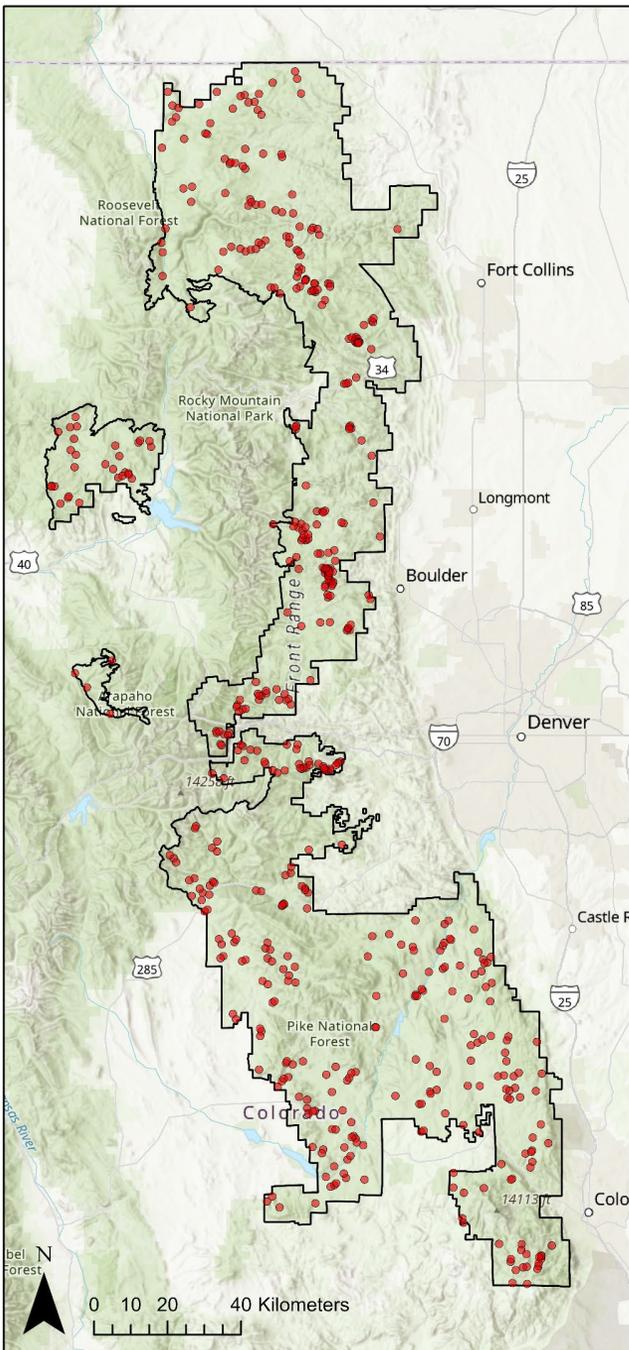


Fall mean temp quantiles

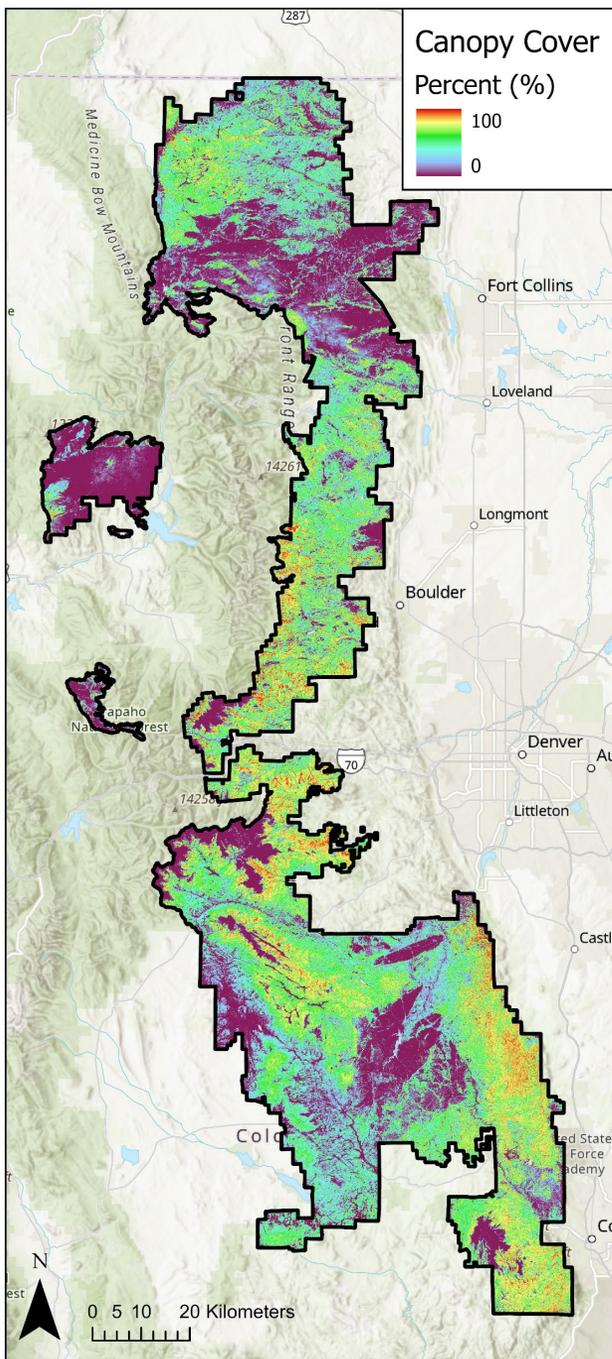
- 1% (4.7 °C)
- 25% (5.7 °C)
- 50% (6.9 °C)
- 75% (7.9 °C)
- 99% (10.3 °C)

LiDAR-based inventory of forest structure and fuels on the Colorado Front Range Wildfire Crisis Strategy Priority Landscape

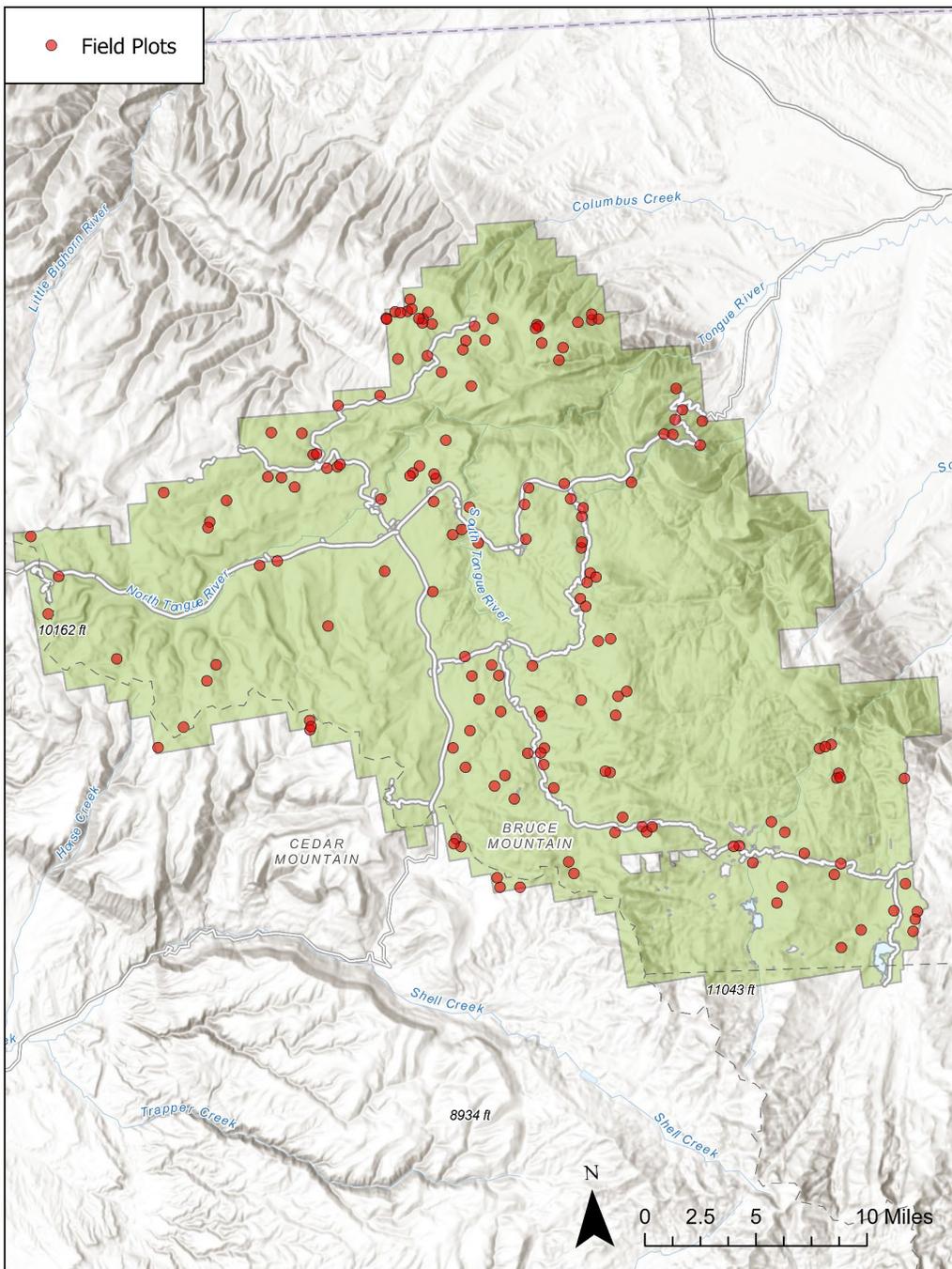
Partners: *USDA Forest Service, Region 2*
Arapaho and Roosevelt National Forests
Pike and San Isabel National Forests



Tanner Gordon
MS Student

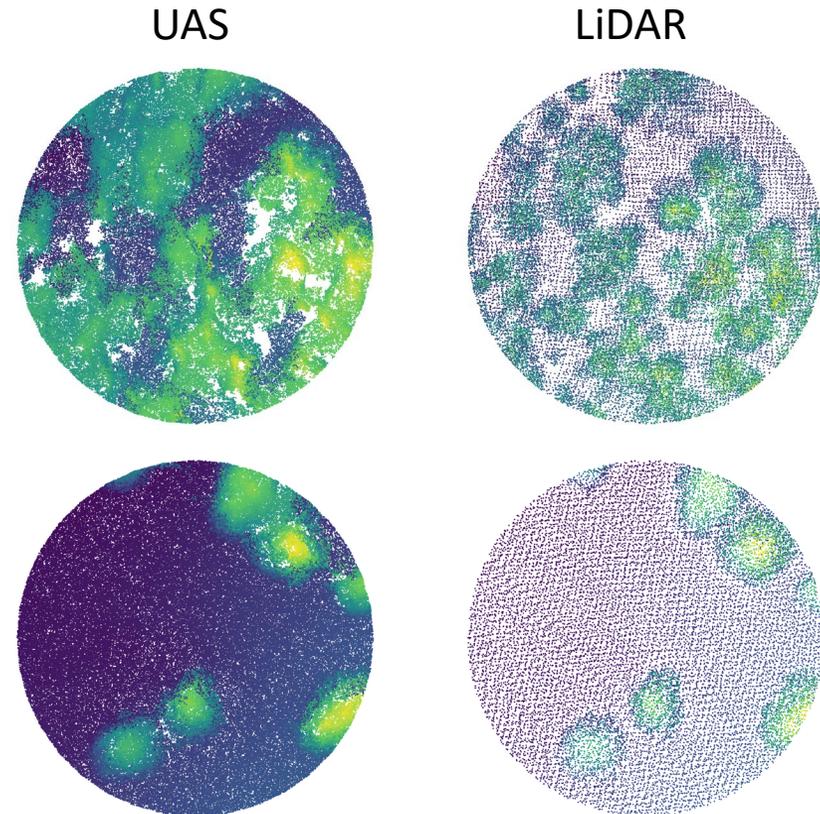


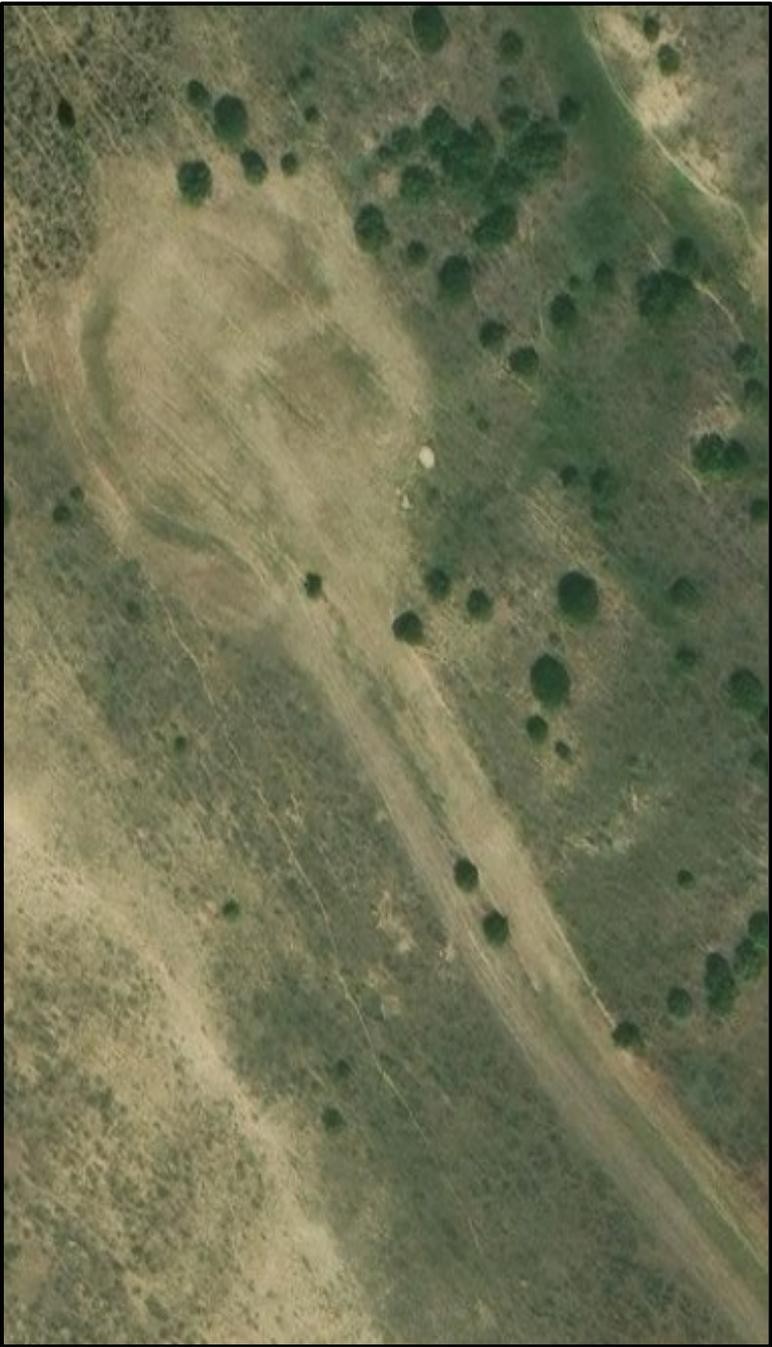
- Merchantable volume
- Live basal area
- Dead basal area
- Live trees per acre
- Dead trees per acre
- Quadratic mean diameter
- Stand density index
- Canopy fuel load
- Canopy bulk density
- Canopy base height
- Surface fuel loading
- Live tree biomass
- Total aboveground biomass
- Stand age
- Habitat structural stages
- Mature and old growth



Assessing the capability of UAS imagery derived point clouds for quantifying subalpine forest structure

Partners: *Matt Enger, Bighorn National Forest
Wade Tinkham, USDA Forest Service
Rocky Mountain Research Station*





Assessing vegetation change along reclaimed edges in the Powder River Basin

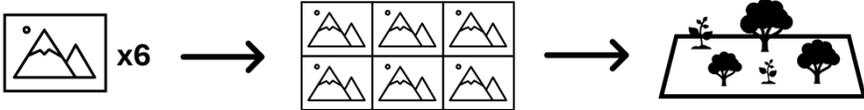
Partners: *LB Myers, EOG Resources*

Mike Curran, Abnova Ecological Solutions

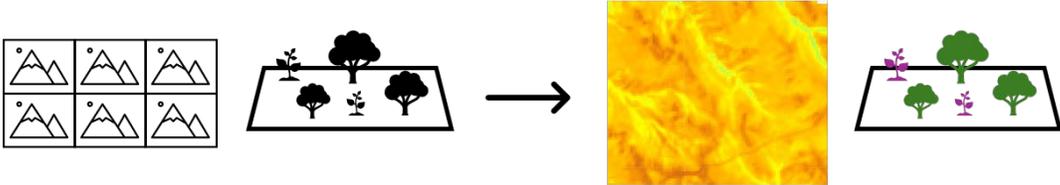
Step 1: Acquire high-resolution UAS imagery of re-seeded well pads and roads.



Step 2: Create orthomosaics and generate structure-from-motion point clouds.



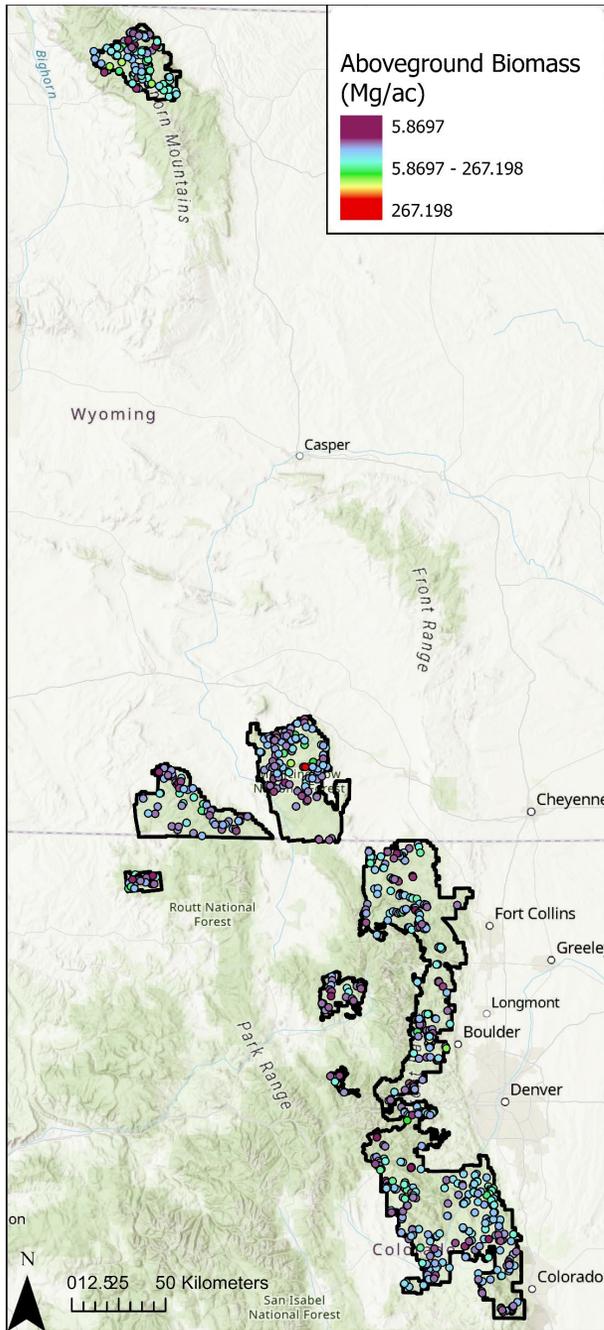
Step 3: Calculate vegetation indices (e.g., NDVI, fractional vegetation cover) from orthomosaics and point clouds. Classify vegetation by lifeform (shrubs/trees vs. forbs/grasses).



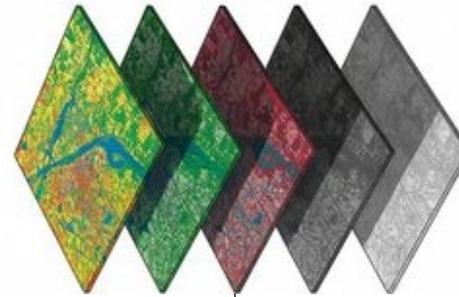
Step 4: Develop and apply statistical models to evaluate how the influence of distance from disturbed edges on vegetation indices and lifeform metrics varies with topography and reclamation characteristics.

High-resolution, wall-to-wall, annual maps of forest carbon from geostatistical models

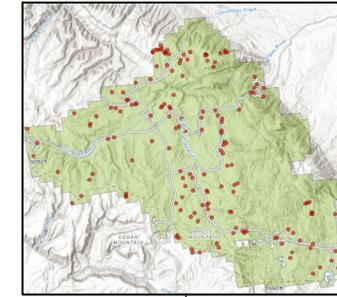
Partners: *Elliot Shannon, Michigan State University*
Wyoming NASA EPSCoR



Landsat-derived spectral indices

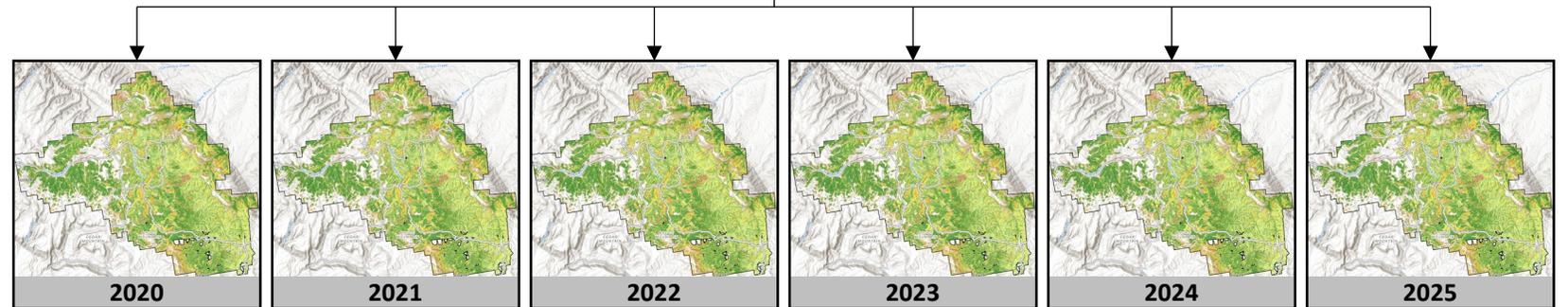


Field plot AGB measurements



BAYESIAN GEOSTATISTICAL MODEL

Prediction



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