MODELING POTENTIAL HABITAT OF BROMUS TECTORUM IN OREGON

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Background

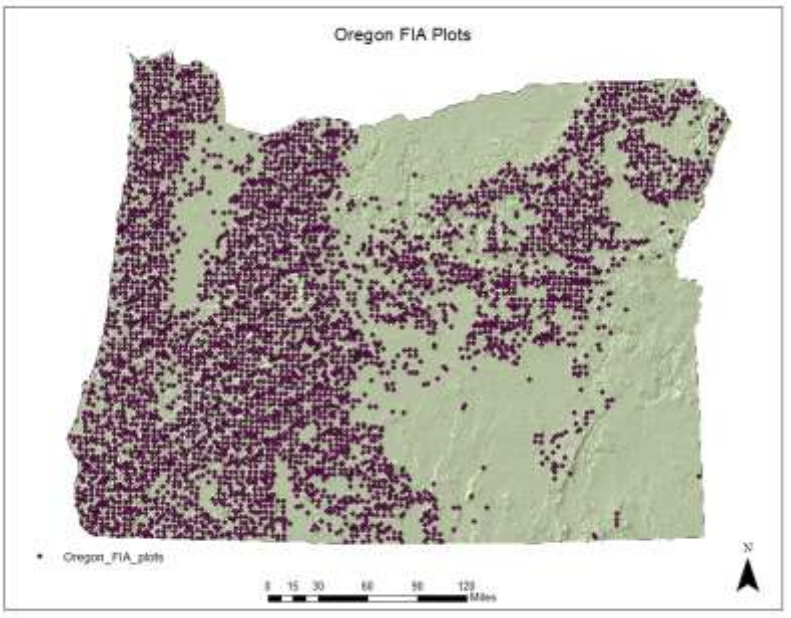
- Cheatgrass (*Bromus tectorum L.)* was first introduced in the US in the late 1800's as a packing material
- By the 1930's it was the dominate grass in the Pacific Northwest and the Intermountain West regions
- Currently covers over 100 million acres nationwide

Problem Statement

- Non-native species are a leading cause of habitat degradation.
- Control and eradication of these problematic species account for millions of dollars spent every year.
- How can we assist land managers in identifying areas of potential population locations, specifically *Bromus tectorum*?

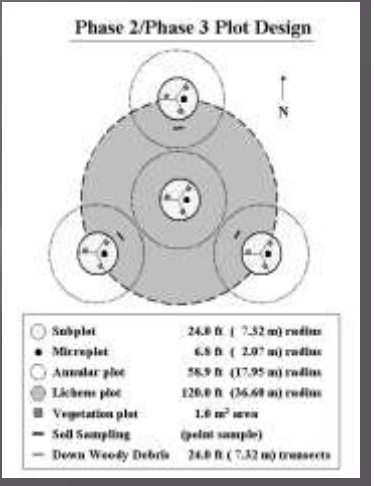
Methods

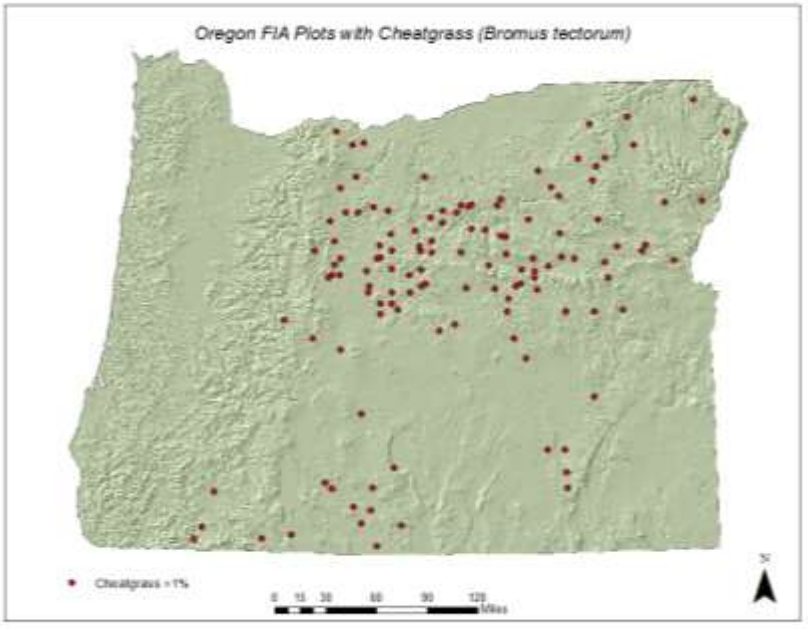
- Data layers
  - USFS FIA data for Oregon from 2003-2007
  - Annual precipitation
  - Oregon roads
  - Oregon DEM
  - EPA level IV Ecoregions of Oregon
  - Modified Oregon state boundary



Methods

- Queried FIA database for all plots in Oregon
  - All plant species per plot
  - Linked FIA plant codes to a list of invasive species for the state of Oregon.
  - Created a summary of invasive plants for all FIA plots
  - Selected the species with the highest count (i.e. cheatgrass)



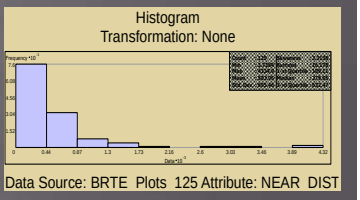


Methods

- Annual precipitation
  - Identified ideal growing conditions for Bromus tectorum: 6 – 22'' annually
  - Classified the raster into 3 zones:
    - < 5.99''
    - 6 – 22''
    - > 22.01''
  - Converted to vector
  - Calculated area of each zone and to perform Union

Methods

- Disturbance
  - Ran the Near tool to identify which roads were near *Bromus tectorum* plots
  - Created a histogram to see whether or not there was a trend between plots and proximity to roads
  - Ranked the roads based on their proximity into 3 zones
  - Converted to a raster to classify into 3 zones and then back into a vector to calculate area and to perform a Union



Data Source: BRTE_Plots_125 Attribute: NEAR_DIST

Zone Boundaries
0 – 21, 622′
21,623′ – 68,596′
68,596′ – 190,131′

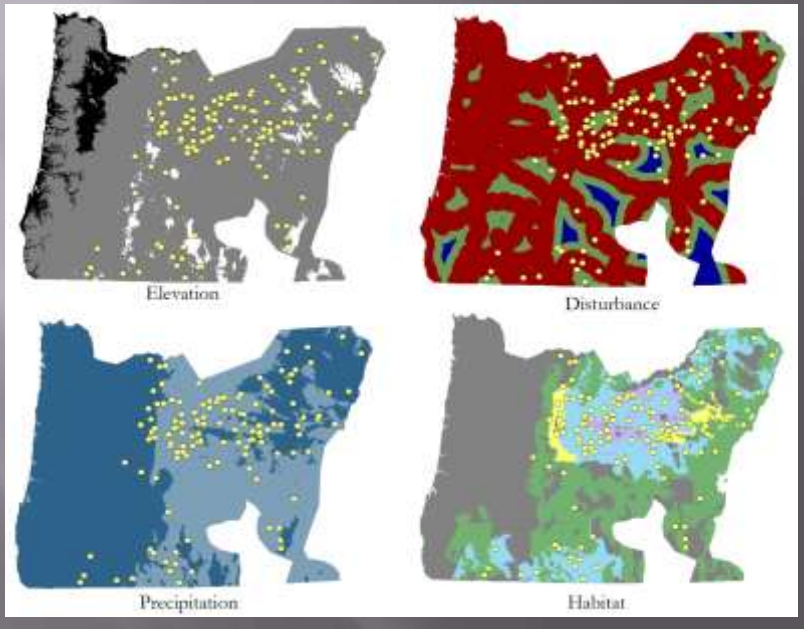
Methods

- Elevation
  - Reclassified the raster into 3 zones:
    - <499′
    - 500′ – 6000′
    - >6001′
  - Converted to vector to calculate area of each zone and to perform Union
- Modified Oregon state boundary
  - Accounted for areas of Oregon with low plot density.
  - Digitized and erased areas in the Southeast, South and North Central Oregon.

Methods

- EPA Ecoregions of Oregon
  - Converted polygon to raster to determine pixel count for each area (used to calculate % of Area (POA))
  - Spatial Join of Ecoregion categories to Cheatgrass plot shapefile for count of cheatgrass per Ecoregion (used to determine % occurrence of frequency (POF))

Rasters!



Frequency Ratio Table Precipitation

Range	% Area	% Occurrence Frequency	Frequency Ratio
<5.99"	0	0	0
6.0-22"	68.8	46.8	0.7
>22.01	31.2	53.2	1.7

Frequency Ratio Table Elevation

Range	% Area	% Occurrence Frequency	Frequency Ratio
<499	12.1	0	0
500-6000	83.9	98.4	1.2
>6001	4.0	1.6	0.4

Frequency Ratio Table Disturbance

Range	% Area	% Occurrence Frequency	Frequency Ratio
1	72.3	78.4	1.1
2	20.7	19.2	0.9
3	7.0	2.4	0.3

Frequency Ratio Table Ecoregions

Type	% Area	% Occurrence Frequency	Frequency Ratio
Canyons and Dissected Highlands	1.198716335	1.6	1.334761155
Canyons and Dissected Uplands	1.208155047	0.8	0.662166667
Cascade Crest Montane Forest	2.109551976	1.6	0.758454884
Continental Zone Foothills	4.118424364	3.2	0.77699618
Continental Zone Highlands	1.706833627	4	2.343520737
Deschutes River Valley	1.736722879	7.2	4.14573913
Deschutes/John Day Canyons	0.734646363	1.6	2.17791863
Fremont Pine/Fir Forest	1.76818525	3.2	1.809765125
High Lava Plains	11.27768689	4	0.354682661
Inland Siskiyous	2.72306821	1.6	0.587572501
John Day/Clarno Highlands	2.719921973	16.8	6.176647773
John Day/Clarno Uplands	5.54524289	20.8	3.750962837
Klamath Juniper Woodland/Devils Garden	0.866788321	1.6	1.845894737
Klamath/Goose Lake Basins	1.137364712	0.8	0.70338036
Maritime-Influenced Zone	1.518059401	5.6	3.688920207

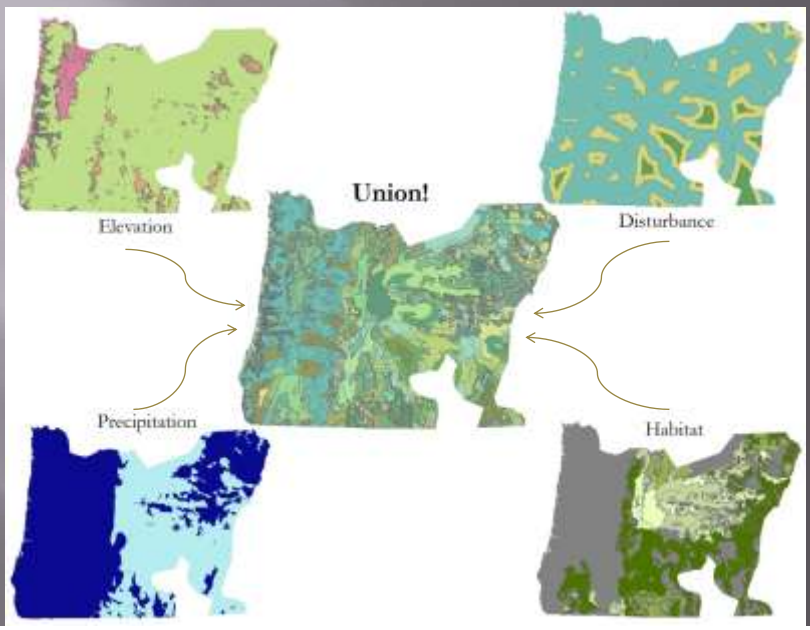
Frequency Ratio Table Ecoregions Cont.

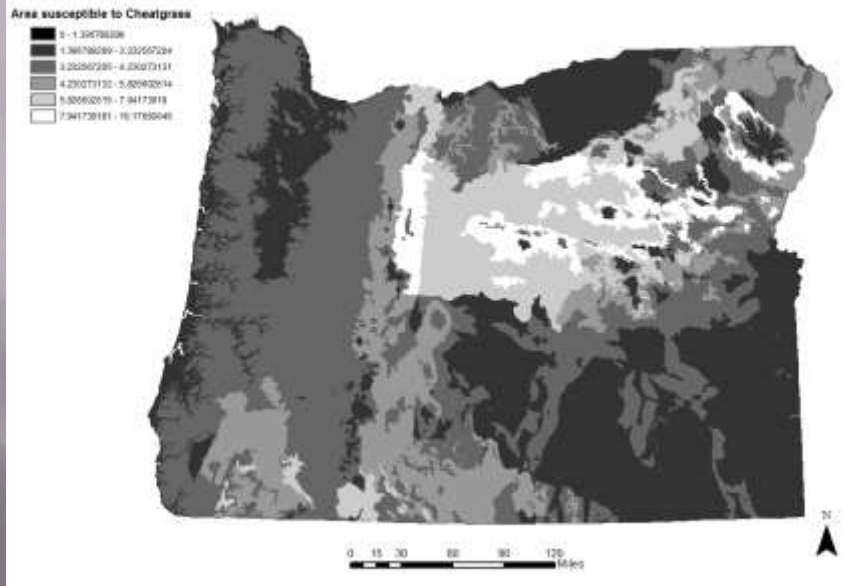
Type	% Area	% Occurrence Frequency	Frequency Ratio
Melange	1.360747546	6.4	4.70329711
Mesic Forest Zone	2.474515479	0.8	0.323295613
Oak/Conifer Foothills	0.522275359	1.6	3.063518072
Owyhee Uplands and Canyons	1.93178958	0.8	0.414123779
Ponderosa Pine/Bitterbrush Woodland	1.187704505	5.6	4.714977483
Pumice Plateau	4.675308331	3.2	0.684446837
Rogue/Illinois/Scott Valleys	0.32563554	0.8	2.4567343
Southern Cascades Slope	0.523848477	1.6	3.054318318
Umatilla Plateau	2.153599295	2.4	1.11441344
Wallowas/Seven Devils Mountains	0.578907626	2.4	4.14573913

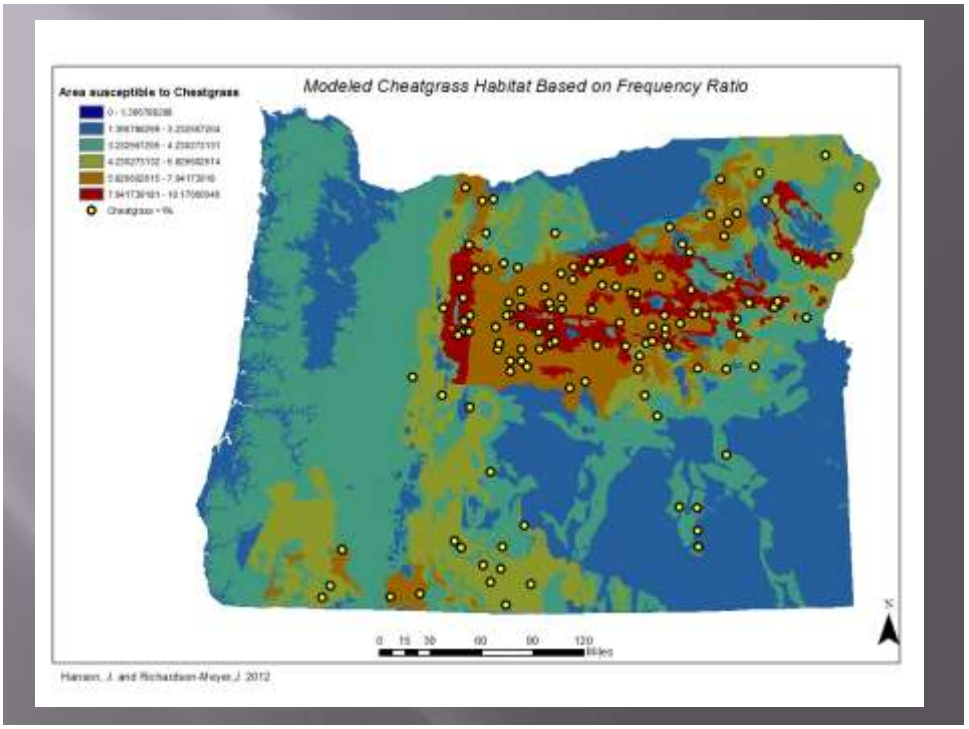
Methods

- Union tool
  - Elevation
  - Precipitation
  - Disturbance
  - Ecoregions
- Calculated total frequency ratios for new Union vector
- Converted to raster & classified based on total frequency ratio values

Conversion to Vector







Problems

- There's a possibility of correlation between elevation data and ecoregion data
- FIA protocol records only >1% of species coverage per subplot
- Roads layer is a surrogate for the disturbance variable
- Areas omitted from analysis were coarse
- No way to verify because all data was used to create model

What's Next…

- Leave out ~30 points to verify model
- Use soil data in place of ecoregion
- Perform a logistical regression and additional variables for *Bromus tectorum* habitat (ie. Canopy cover, specific disturbance history, etc.)

References & Datasources

References

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- Zouhar, Kris. 2003. Bromus tectorum. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
- US Forest Service GSD Update, September 2011

Data

- Pacific Northwest Forest Inventory and Analysis Database: Cheatgrass abundance, FIA plot coordinates (actual coordinates masked) & Annual Precipitation data
- I:\Students\Data\GIS\Oregon\DEM & Roads data

Questions?