Modeling habitat locations for Kincaid's Lupine (Lupinus sulphureus ssp. Kincaidii) in Yamhill, Polk, Benton and Lane Counties

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GEOG 593
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Kincaid's Lupine
(Lupinus sulphureus ssp. Kincaidii)

- **Herbaceous Oregon native**
- Larval host of 'threatened' Fender's blue butterfly
- Listed as 'threatened'

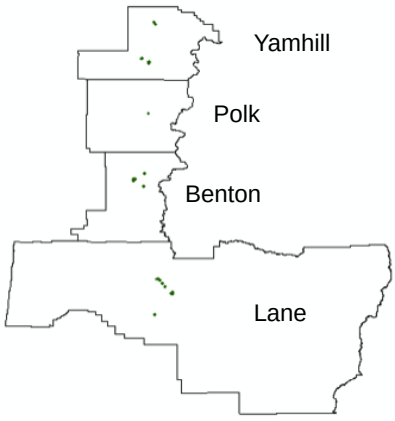
- **Critical habitat areas** (U.S.F.W.S.)
- Protection of listed species

Kincaid's Lupine Habitat

- Habitat: 40m-1250m, well drained soils, 48 soil types
- Aspect?, Slope?
- Elimination of prairie habitat, Agricultural practices, Road improvement & Excessive canopy cover
- % canopy cover, % human disturbance, % grass cover, aspect and % slope

Datasets

- **Critical habitat areas** of Kincaid's Lupine in Yamhill, Polk, Benton and Lane counties (U.S.F.W.S. Critical habitat Portal)
- 170 acres (max) , 0.37 acres (min) and 25 acres (mean)
- Critical habitat Area > 5 acres
- **18 'habitat polygons'**

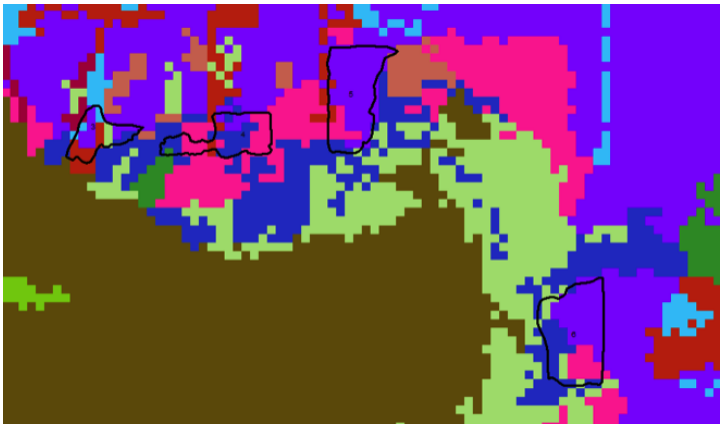


Datasets

- Oregon 30m DEM (PSU; I-drive)
- Oregon Landuse Raster dataset (PSU; I-drive)
- Oregon counties layer (Oregon Geospatial Data Clearinghouse)

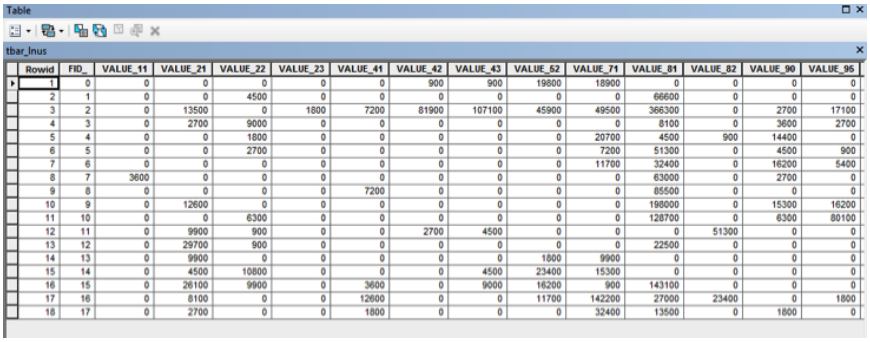
Landuse data analysis

Tabulate Area : Identifies different 'class' types within each 'zone'



Landuse data analysis

Tabulate Area Output



Table

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Rowid	FID_	VALUE_11	VALUE_21	VALUE_22	VALUE_23	VALUE_41	VALUE_42	VALUE_43	VALUE_52	VALUE_71	VALUE_81	VALUE_82	VALUE_90	VALUE_95
1	0	0	0	0	0	0	900	900	19800	18900	0	0	0	0
2	1	0	0	4500	0	0	0	0	0	0	66600	0	0	0
3	2	0	13500	0	1800	7200	81900	107100	45900	49500	366300	0	2700	17100
4	3	0	2700	9000	0	0	0	0	0	0	8100	0	3600	2700
5	4	0	0	1800	0	0	0	0	0	20700	4500	900	14400	0
6	5	0	0	2700	0	0	0	0	0	7200	51300	0	4500	900
7	6	0	0	0	0	0	0	0	0	11700	32400	0	16200	5400
8	7	3600	0	0	0	0	0	0	0	0	63000	0	2700	0
9	8	0	0	0	0	7200	0	0	0	0	85500	0	0	0
10	9	0	12600	0	0	0	0	0	0	0	198000	0	15300	16200
11	10	0	0	6300	0	0	0	0	0	0	128700	0	6300	80100
12	11	0	9900	900	0	0	2700	4500	0	0	0	51300	0	0
13	12	0	29700	900	0	0	0	0	0	0	22500	0	0	0
14	13	0	9900	0	0	0	0	0	1800	9900	0	0	0	0
15	14	0	4500	10800	0	0	0	4500	23400	15300	0	0	0	0
16	15	0	26100	9900	0	3600	0	9000	16200	900	143100	0	0	0
17	16	0	8100	0	0	12600	0	0	11700	142200	27000	23400	0	1800
18	17	0	2700	0	0	1800	0	0	0	32400	13500	0	1800	0

Landuse data analysis

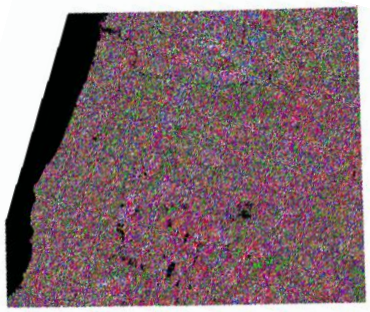
% canopy cover : deciduous forest, evergreen forest, mixed forest

% human disturbance: high intensity residential, commercial industrial roads and row crops

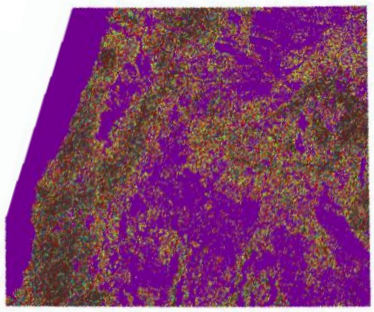
% grass cover: grasslands and pasture

DEM analysis

Aspect
(Flat & 8 cardinal directions)



Percent slope



DEM analysis

'Zonal Statistics as table' : Calculates statistics for each 'zone'

Table

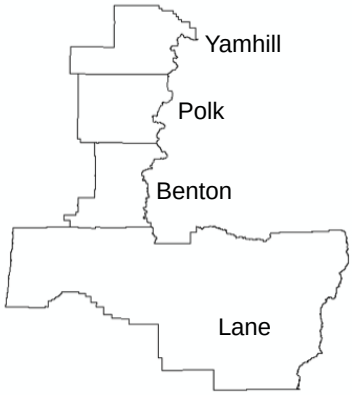
asp_rec_zt

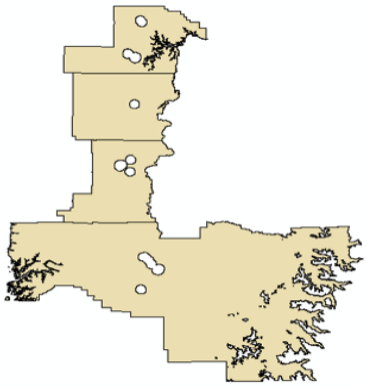
Rowid	FID *	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM	VARIETY	MAJORITY	MINORITY	MEDIAN
1	0	45	40500	4	6	2	5	0.557773	225	3	5	4	5
2	1	79	71100	1	8	7	4.493671	1.582127	355	8	4	8	4
3	2	770	69300	1	8	7	4.183117	3.051332	3221	8	1	4	3
4	3	29	26100	4	7	3	5.413793	0.810161	157	4	5	4	5
5	4	47	42300	1	8	7	5.12766	1.645329	241	7	5	2	5
6	5	74	66600	1	5	4	3.418919	1.345732	253	5	4	2	4
7	6	73	65700	1	8	7	6.575343	1.488935	480	5	7	1	7
8	7	77	69300	3	8	5	6.545455	1.446406	504	6	8	3	7
9	8	103	92700	2	4	2	3.650486	0.496761	376	3	4	2	4
10	9	269	24210	1	8	7	3.821561	2.909691	1028	5	8	4	3
11	10	246	22140	1	8	7	7.199187	1.862379	1771	6	8	3	8
12	11	77	69300	1	3	2	2.142857	0.527535	165	3	2	1	2
13	12	59	53100	3	5	2	3.813559	0.468484	225	3	4	5	4
14	13	24	21600	1	8	7	3.125	2.847697	75	3	1	8	2
15	14	65	58500	1	8	7	4.569231	1.616922	297	8	5	2	5
16	15	232	20880	1	8	7	6.741379	1.722672	1564	5	7	5	7
17	16	252	22680	1	7	6	4.067461	1.164715	1025	7	3	1	4
18	17	58	52200	1	8	7	6.482759	1.831161	376	6	8	4	7

- Majority Aspect
- Mean Percent Slope
- 'habitat' summary table

Random selection of 'non-habitat'

- **Study area**: Yamhill, Polk, Benton & Lane counties
- **'Erase'** : 18 'Habitat' polygons (1.5mile buffer)
- **'Erase'** : Elevation <40m & >1250m



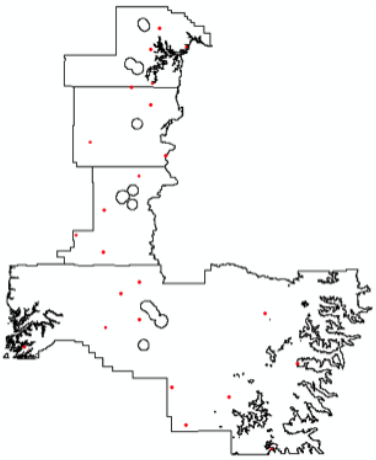


Random selection of 'non-habitat'

'Create Random points': Creates random points at user defined constraining extent and min. allowed distance between points

- MAD = 10,000m
- 23 random points
- Mimic shape and mean area of 'habitat' polygons

• 'Buffer' around 23 random points (radius 179m)
• 'Feature to Envelope': creates polygon around any geometry



'Non-habitat' polygons

- **Variables calculated**
- Percent canopy
- Percent human disturbance
- Percent grass cover
- Majority Aspect
- Mean Slope

- **'non-habitat' summary table**

Final Summary Table

Habitat

Non-habitat

row id	percent canopy	percent human disturbance	percent grass cover	majority aspect	mean slope
1	4.44444	0	46.6667	5	41.3672
2	0	6.32911	93.6709	4	8.38211
3	28.3117	0.25974	60	1	12.8526
4	0	34.4828	31.0345	5	0.568777
5	0	6.38298	59.5745	5	0.451811
6	0	4.05405	87.8378	4	0.611357
7	0	0	67.1233	7	0.764366
8	0	0	90.9091	8	0.779943
9	7.76699	0	92.233	4	9.01781
10	0	0	81.7844	8	4.00969
11	0	2.84553	58.1301	8	2.33528
12	10.3896	75.3247	0	2	14.0959
13	0	1.69492	42.3729	4	4.01636
14	0	0	45.8333	1	7.93462
15	7.69231	18.4615	26.1538	5	7.8748
16	6.03448	4.74138	68.9655	7	14.5024
17	5.55556	10.3175	74.6032	3	11.0821
18	3.44828	0	87.931	8	10.8242
19	70.8333	0	0	1	23.7126
20	75.6944	0	0	7	39.0466
21	97.9167	0	0	2	21.9356
22	70.1389	0	0	4	34.3398
23	100	0	0	7	24.7302
24	100	0	0	5	32.3625
25	67.4242	21.9697	0	1	36.4176
26	99.3056	0	0	1	51.9757
27	71.5278	0.694444	0	2	15.9584
28	100	0	0	5	36.8023
29	15.2778	36.8056	38.8889	3	1.97882
30	75	2.08333	0	6	29.1311
31	100	0	0	4	38.6043
32	6.25	63.8889	14.5833	8	1.23582
33	43.0556	0	0	3	40.9406
34	0	55.5556	0	7	15.6214
35	0	29.8611	14.5833	3	6.17351
36	0.694444	80.5556	11.1111	5	4.53823
37	0	60.4167	39.5833	5	3.60823
38	0	0	100	8	2.34081
39	0	17.3611	82.6389	2	2.46191
40	45.1389	41.6667	2.77778	4	17.7798
41	0	25.6944	57.6389	7	2.36862

Added 'habitat' field (0,1)
18 habitat
23 non-habitat

Binary Logistic Model

- **Dependent variable/Response : Habitat (0,1)**

- **Independent Variables**
- Percent canopy
- Percent human disturbance
- Percent grass cover
- Majority Aspect
- Mean Slope

Binary Logistic Model

- Less than 10% error: percent canopy cover and percent human disturbance

- Landcover variables significantly influence Kincaid's lupine's habitat

- Terrain variables do not significantly influence habitat selection

- Binary Logistic Model run again with 2 independent variables

Binary Logistic Model

- **Model generated**

*Z = 2.09645 – (0.0748823*percent canopy) – (0.09802*percent human disturbance)*

Z = Dependent variable

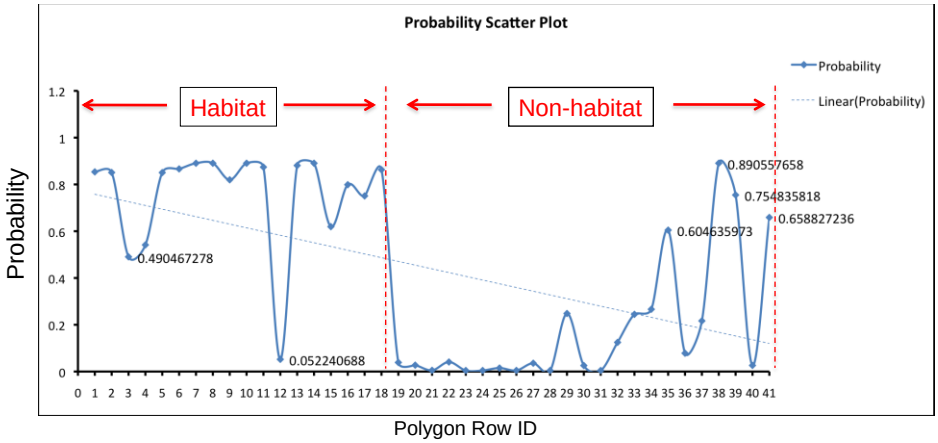
- **Probability (p)**

p = 1/ (1 + e(^(-z))

- **Model Evaluation**

Z & p values calculated for all 41 polygons

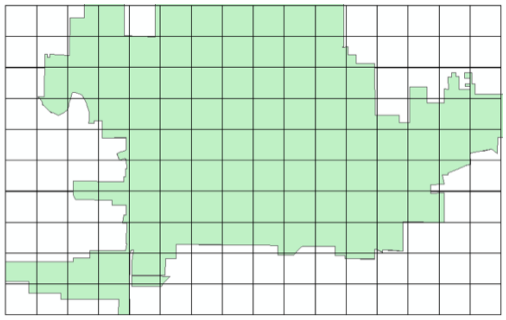
Model Evaluation

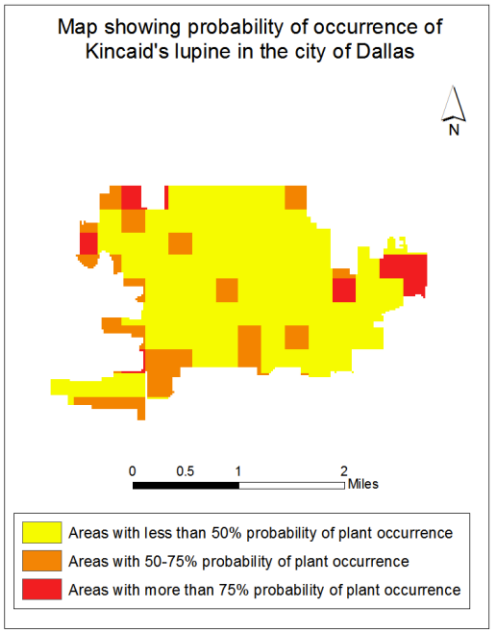


- Model captures variations of input polygon data
- Errors in model: misclassification of landcover data, assumptions etc.

Determine Habitat suitability

- City of Dallas (Polk county)
- **'Create Fishnet'**: creates a grid based on user defined 'constraining extent' and 'dimensions'
- Each grid cell – zone or polygon





References

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- Severns, P., Propagation of a Long-Lived and Threatened Prairie Plant, Lupinus sulphureus ssp. Kincaidii, Restoration Ecology, Vol. 11, No. 3, Pg. 334–342, 2003
- Websources - U.S.F.W.S. critical habitat portal online, Oregon Geospatial Data Clearinghouse, Portland State University: I drive, Multi-Resolution Land Characteristics Consortium (MRLC)

Thanks for listening!

Questions?

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