



**Predicting the spread of medusahead in CA:
importance of climate and dispersal vectors**

Emily Farrer, Robyn Reeder,
George Roderick & Katharine Suding

UC Berkeley 2014



& goatgrass, yellow starthistle, artichoke thistle

Predicting the spread of medusahead^v in CA: importance of climate and dispersal vectors

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- Understanding what controls invasive species spread and being able to predict spread
 - Identify areas for early detection surveys
 - Prioritize weeds for management
- Dispersal vectors may be key





Medusahead (*Elymus caput-medusae*)



Barb goatgrass (*Aegilops triuncialis*)



Yellow starthistle (*Centaurea solstitialis*)

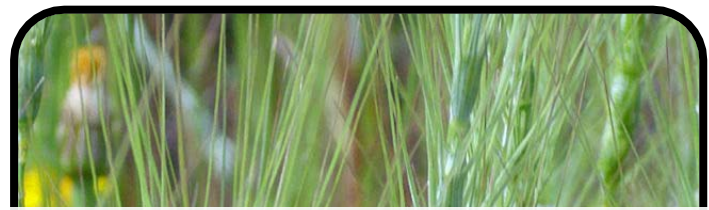


Artichoke thistle (*Cynara cardunculus*)

Are dispersal factors important in predicting the spread of noxious rangeland weeds in CA?



Medusahead (*Elymus caput-medusae*)



Barb goatgrass (*Aegilops triuncialis*)



Yellow starthistle (*Centaurea solstitialis*)



Artichoke thistle (*Cynara cardunculus*)

Methods

- GPS info (Calflora, Consortium of CA Herbaria, GBIF)

1. Environment-only model

- precipitation, temperature, soil texture, slope, aspect

2. Environment + dispersal model

- road density
- beef cattle density

- LRT to compare models, R^2 to quantify difference
- Best models extrapolated to all of CA
- Modeling assumptions

Hypothesis 1: Adding dispersal to distribution models will increase model fit

Hypothesis 2: Importance of dispersal varies by species

Medusahead
Goatgrass

>

Yellow starthistle
Artichoke thistle



Results

	R ² environment	R ² env + dispersal	LRT
Medusahead	0.45	0.46	24.3 ₃ ***
Goatgrass	0.65	0.67	21.8 ₃ ***
Yellow starthistle	0.43	0.47	466.2 ₃ ***
Artichoke thistle	0.57	0.63	79.0 ₃ ***

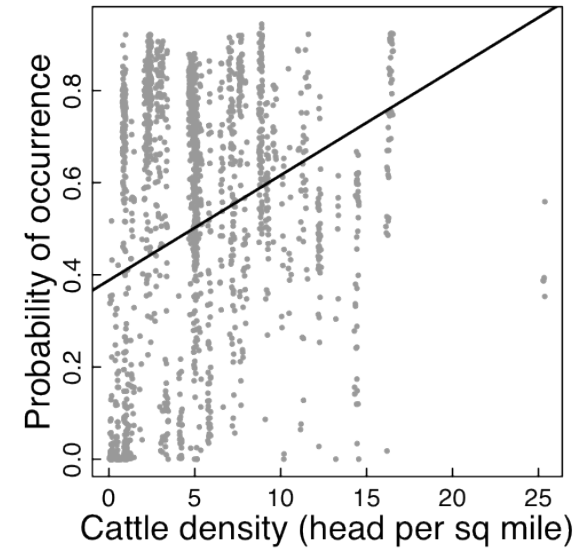
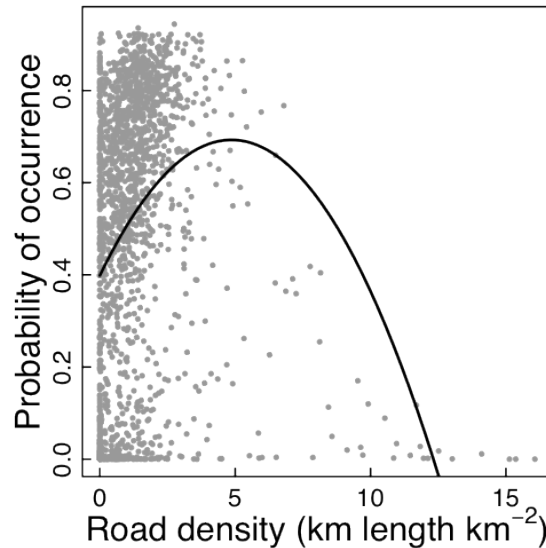
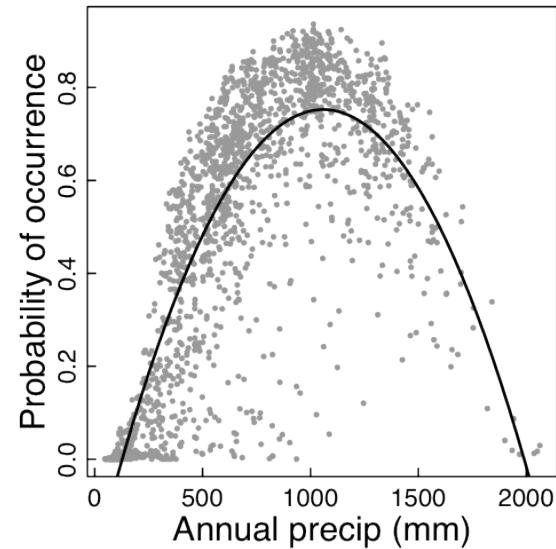
Should be included in the model but...

not a huge contribution to explaining occurrence

Medusahead



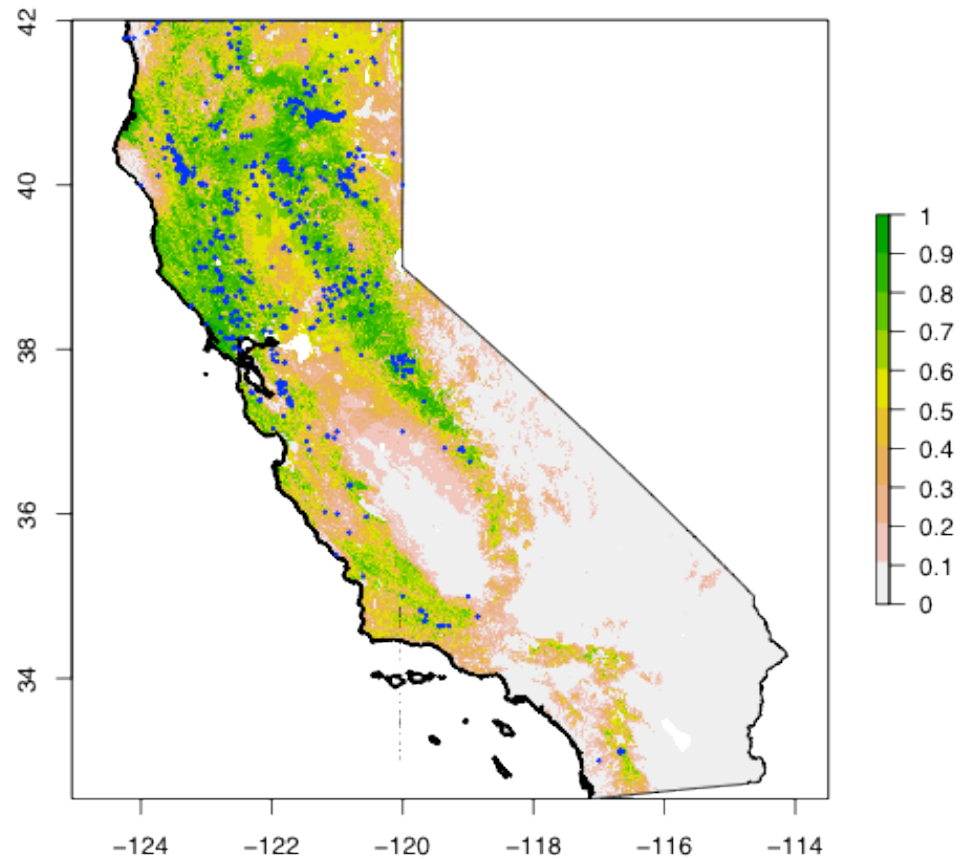
Temperature	∩	***, ***
Precipitation	∩	***, ***
Soil texture		
loam	+	*
clay loam	+	*
loamy sand	-	*
Slope	-	***
Road density	∩	*, **
Cattle density	+	**



Medusahead



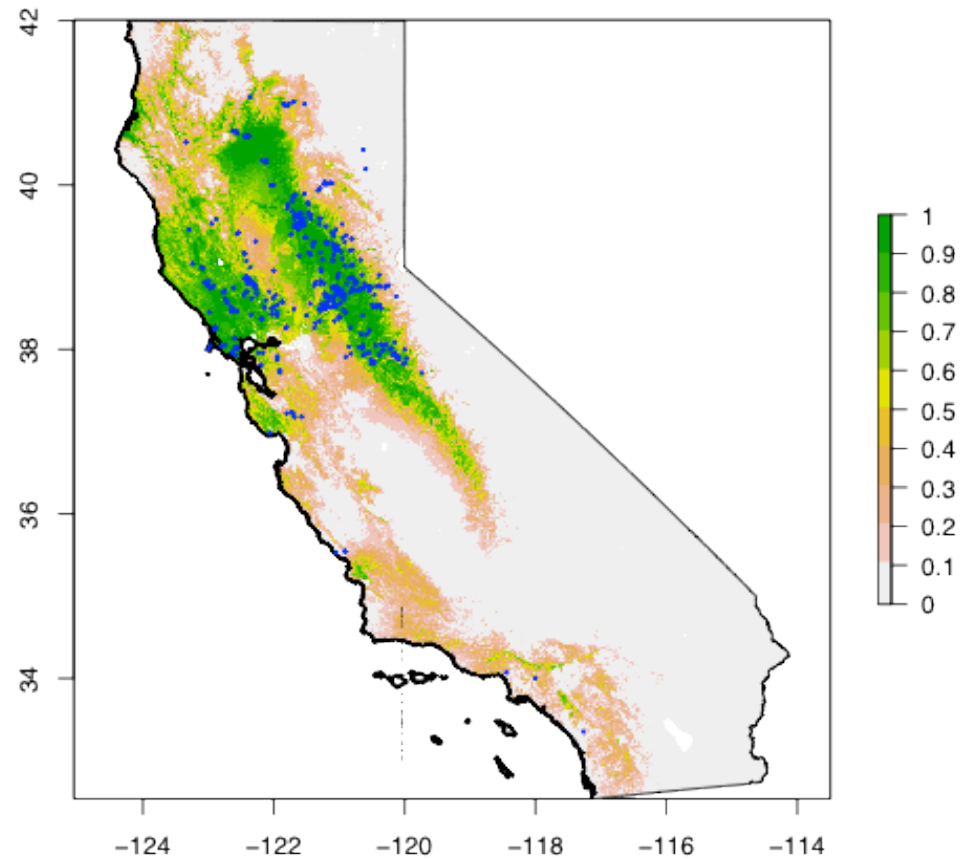
Temperature	∩	***, ***
Precipitation	∩	***, ***
Soil texture		
loam	+	*
clay loam	+	*
loamy sand	-	*
Slope	-	***
Road density	∩	*, **
Cattle density	+	**



Goatgrass



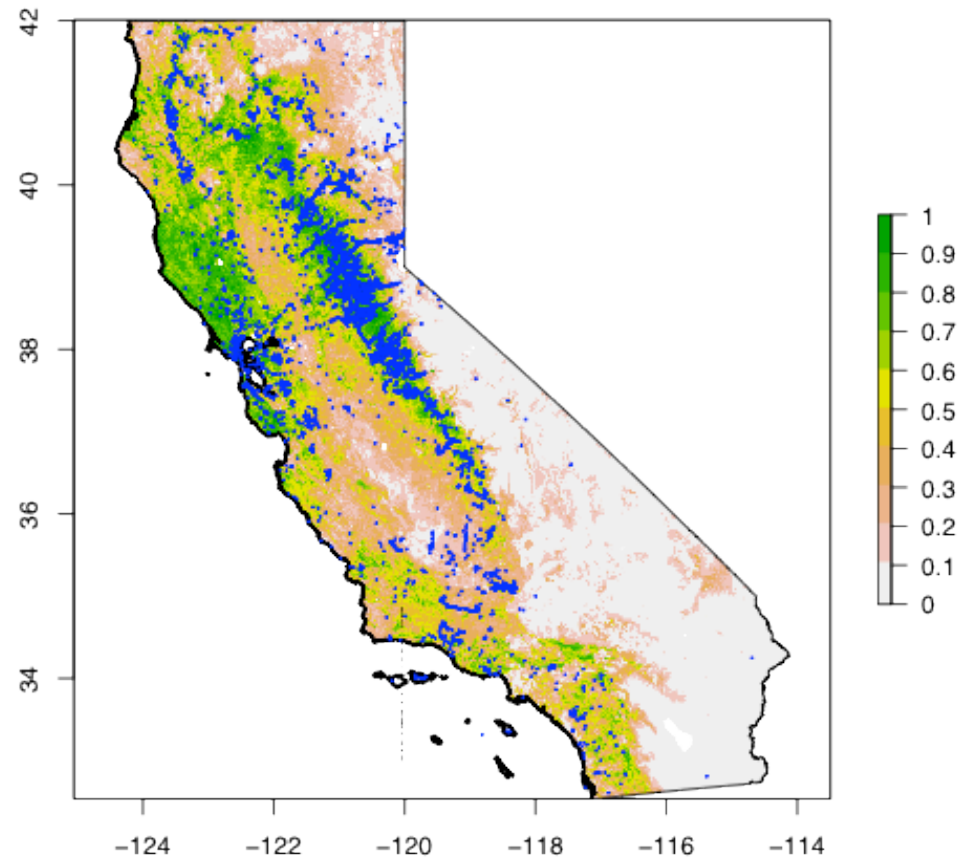
Temperature	∩	***, *
Precipitation	∩	***, ***
Soil texture sandy loam	-	*
Slope	-	*
Road density	∩	** , *
Cattle density	+	***



Yellow starthistle



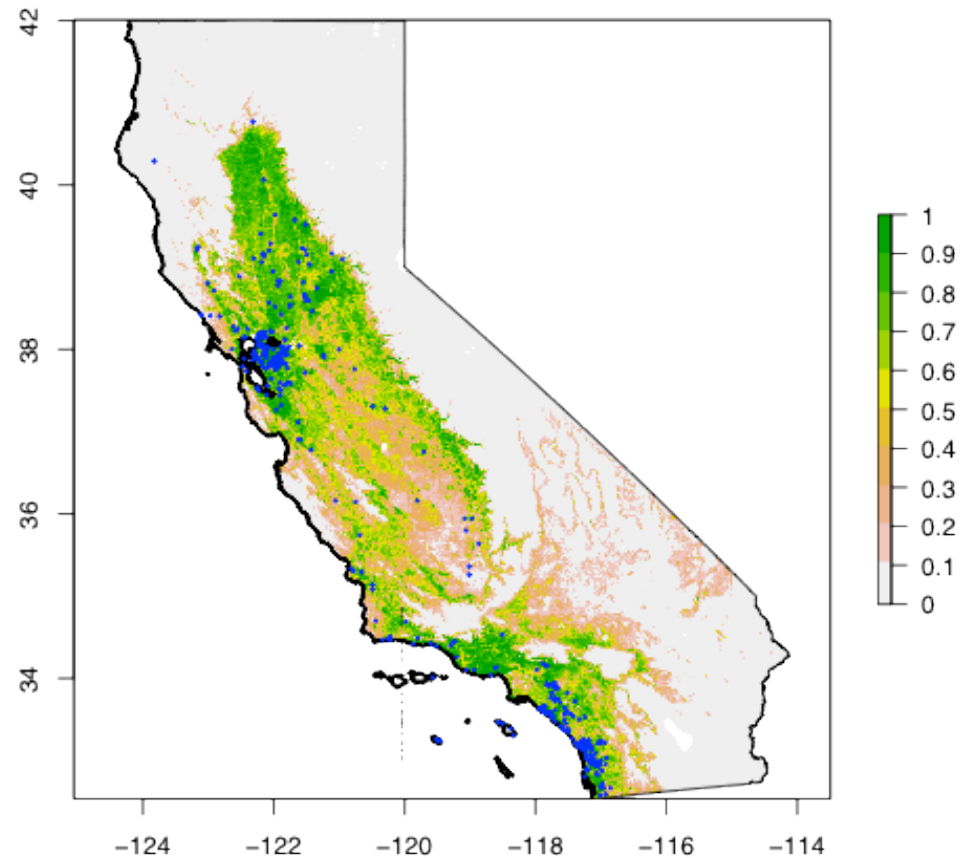
Temperature	∩	***, ***
Precipitation	∩	***, ***
Soil texture		
clay loam	-	***
loamy sand	-	***
sand	-	**
Slope	-	**
Road density	∩	***, ***
Cattle density	+	**



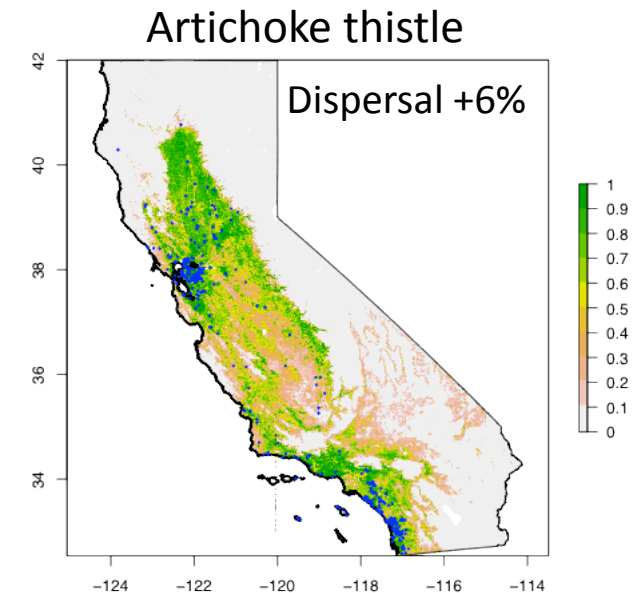
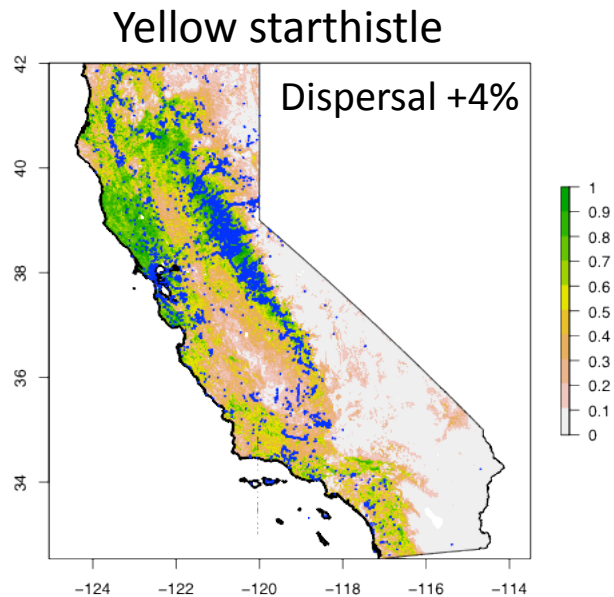
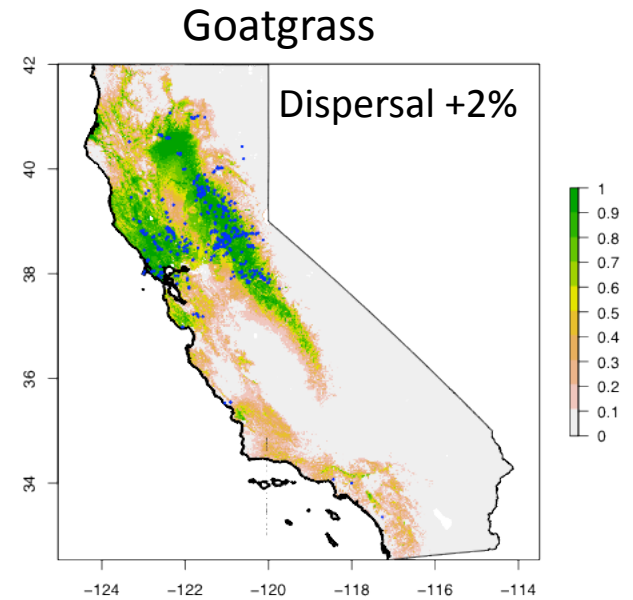
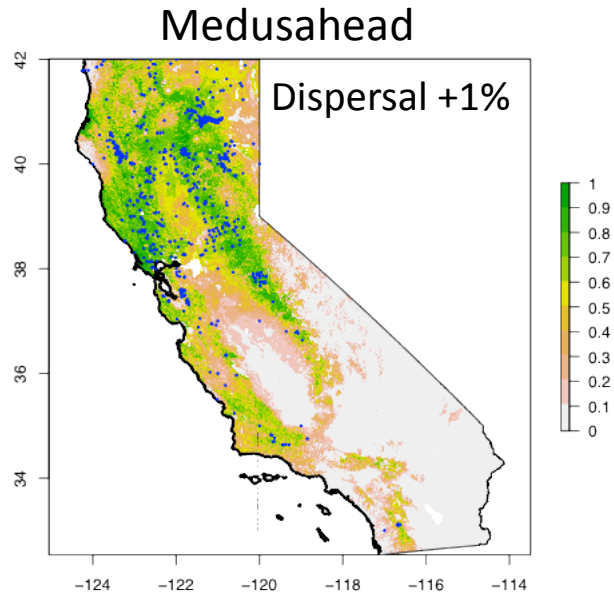
Artichoke thistle



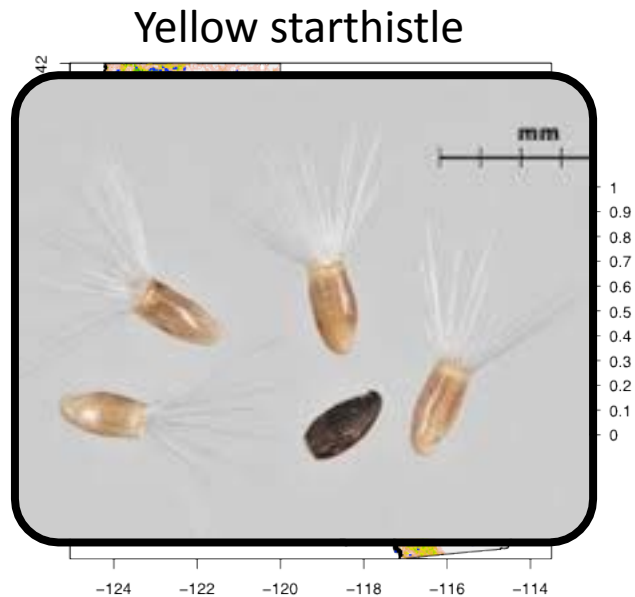
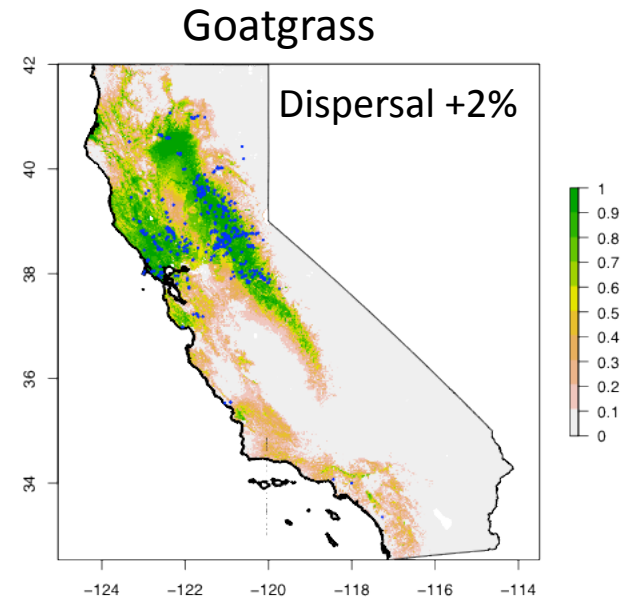
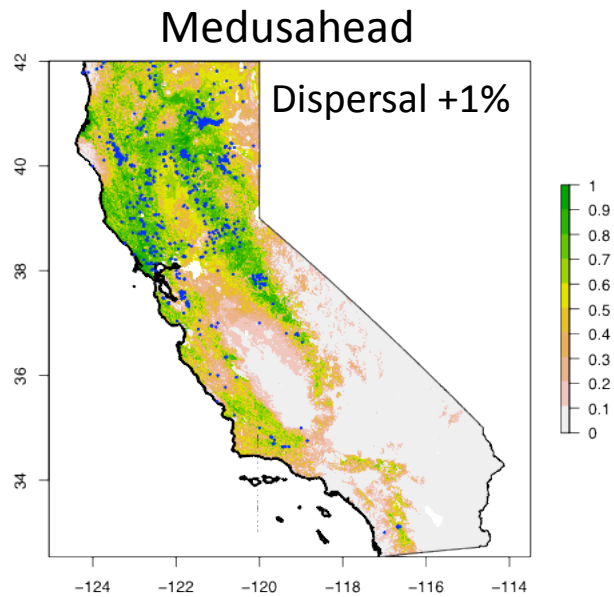
Temperature	∩	***, ***
Precipitation	∩	***, ***
Soil texture sandy loam	-	*
Slope	+	***
Road density	∩	***, ***



- ✓ H1: Dispersal increased model fit (but not huge impact on explanatory power)
- ✗ H2: Medusahead, Goatgrass > Yellow starthistle, Artichoke thistle



- ✓ H1: Dispersal increased model fit (but not huge impact on explanatory power)
- ✗ H2: Medusahead, Goatgrass > Yellow starthistle, Artichoke thistle



Implications

Limiting dispersal vectors may help reduce the spread of these invasives

- Public outreach
- Quarantine cattle prior to transport

Prevention is the most cost-effective method of invasive species control

- Is this approach useful?



Acknowledgements



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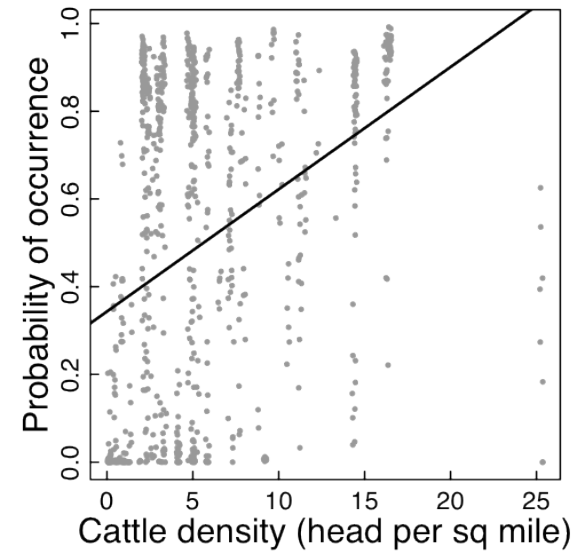
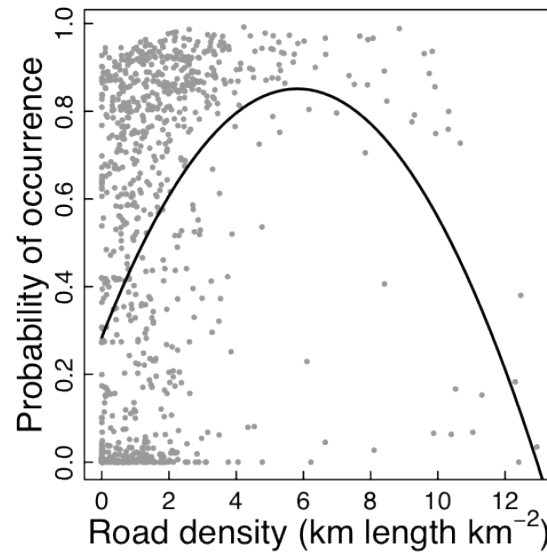
Suding lab

Evolab

Goatgrass



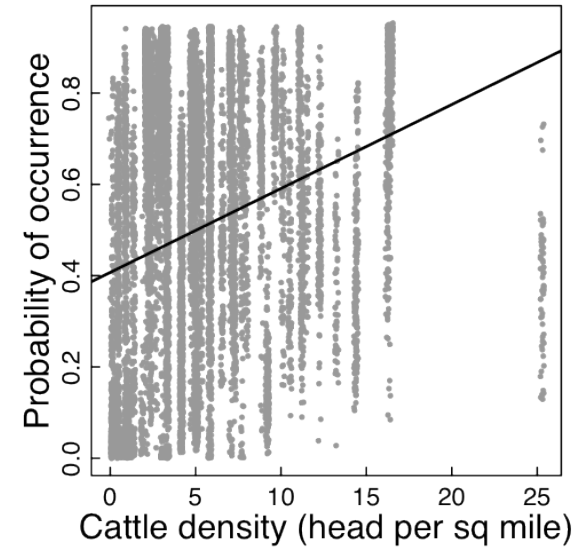
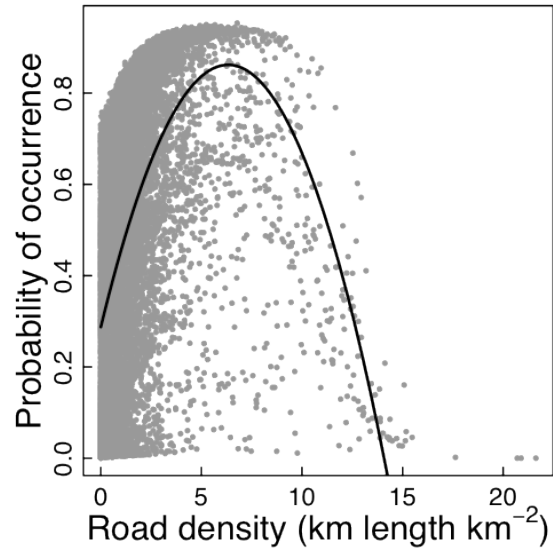
Temperature	∩	***, *
Precipitation	∩	***, ***
Soil texture sandy loam		*
Slope		*
Road density	∪	** , *
Cattle density	+	***



Yellow starthistle



Temperature	☺	***, ***
Precipitation	☺	***, ***
Soil texture		
clay loam		***
loamy sand		***
sand		**
Slope		**
Road density	☺	***, ***
Cattle density	+	**



Artichoke thistle



Temperature	∩	***, ***
Precipitation	∩	***, ***
Soil texture sandy loam		*
Slope	+	***
Road density	∪	***, ***

