

RSFs and feral swine movement

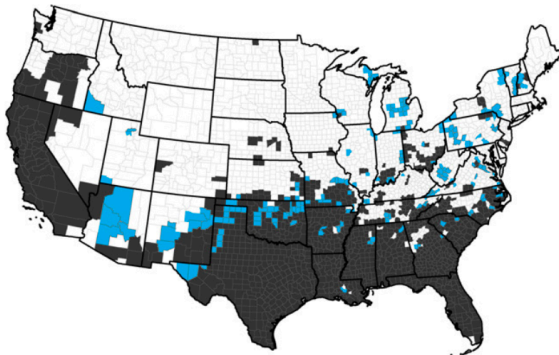
CSU lab meeting

April 4, 2018

A tiny bit about feral swine

I. Endemic in the Southeast and California and spreading northward

(d) 2009–2012



A tiny bit about feral swine

1. Endemic in the Southeast and California and spreading northward
2. Limited by water availability and temperature/snow cover



A tiny bit about feral swine

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3. Eat just about anything



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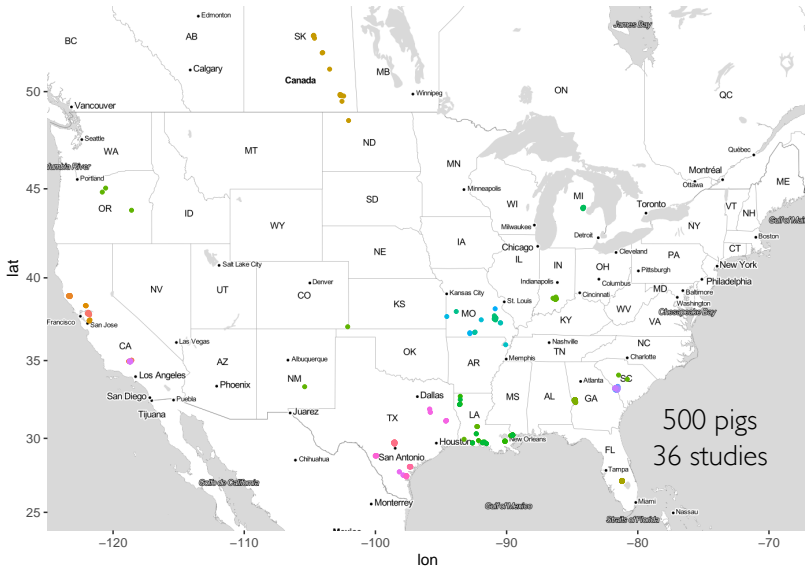
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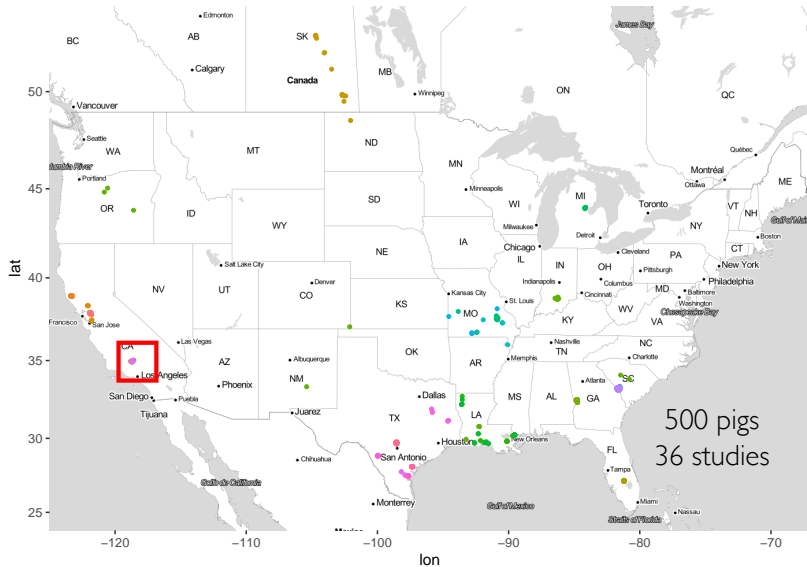
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3. How does the availability of natural forage resources affect how pig's use anthropogenic forage resources?

The data



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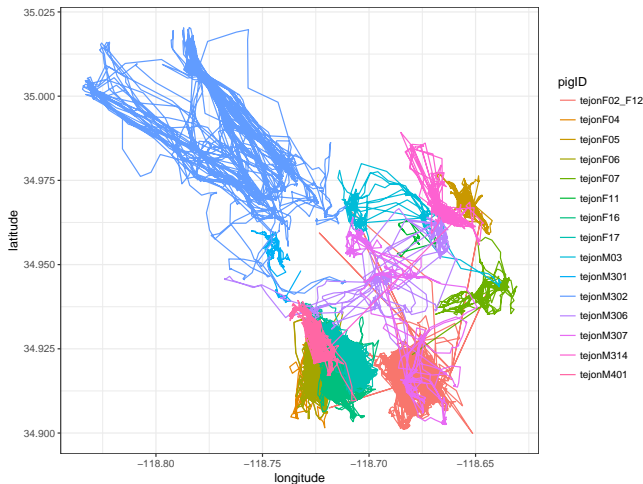
Linking resource selection with movement data: Tejon, CA

How does pig movement reflect resource selection and vice versa?

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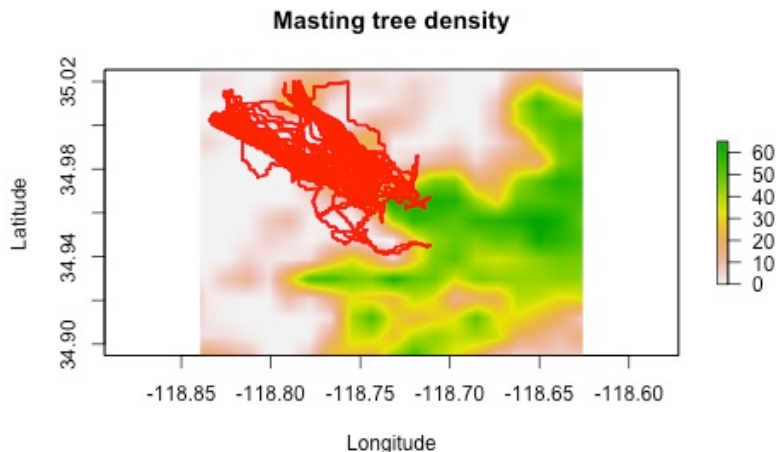
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- 13 pigs: 8 female and 7 male



Linking resource selection with movement data: Tejon, CA

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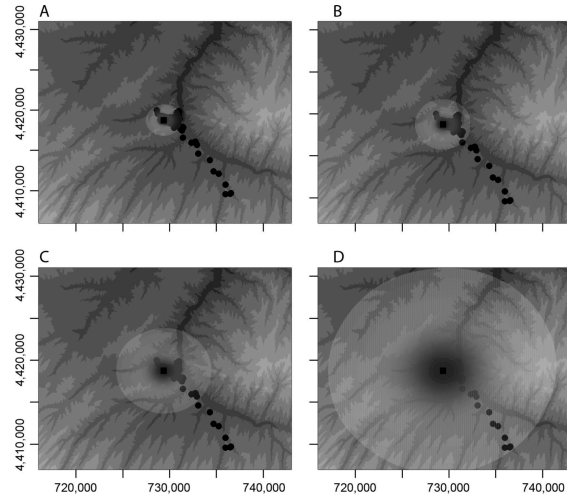


Linking resource selection with movement data: Tejon, CA

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- $[\text{use}|\text{resources}]$: Resource utilization function (what we want)
- $[\text{resources}]$: Available resources

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To model pig selection for forage resource we need to

1. Identify covariate proxies for “resource”
2. Identify “available” habitat

Covariates for pig resource selection

Non-foraging resources (at least not directly)

- Water availability
- Tree cover
- Temperature
- Precipitation
- Snow depth
- Elevation
- Human development index

Foraging resources

- Crop availability
(Anthropogenic forage)
- Livestock presence
(Anthropogenic forage)
- Plant productivity (Natural forage)
- Mastig tree density (Natural forage)

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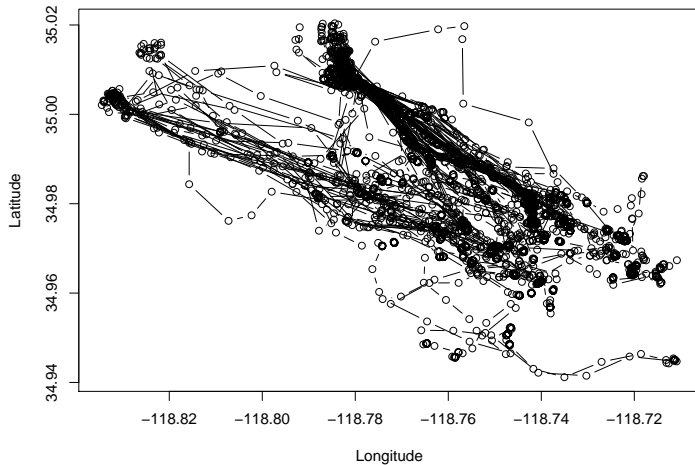
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How do foraging resources drive pig resource selection, after accounting for non-foraging resources?

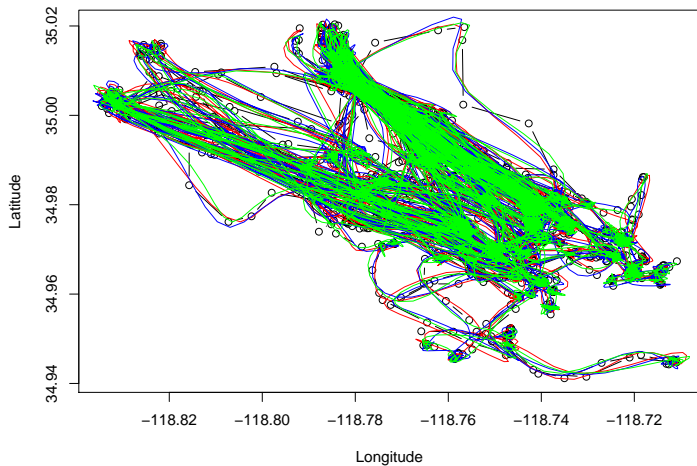
Identify “available” habitat with movement model

Step 1: Fit a continuous-time movement model to GPS data



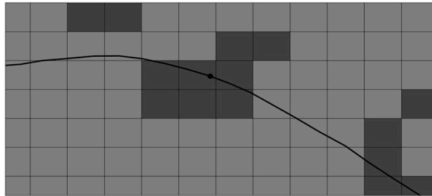
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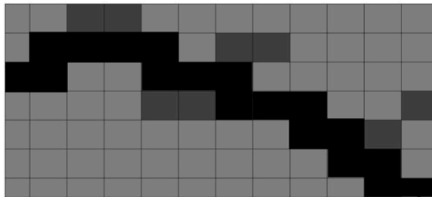


Identify “available” habitat with movement model

Step 2: Convert continuous path into discrete environmental space



(a) continuous path



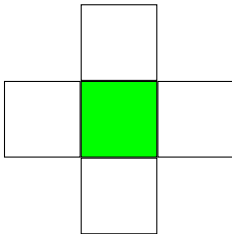
(b) discrete path

Yields a continuous-time, discrete-state movement model.

Predict resource utilization

Covariates + movement model \rightarrow prediction of resource utilization

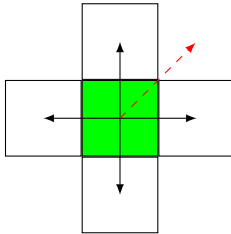
1. *Location-based covariates*: How long a pig remains in a cell as a function of resource
2. *Directional covariates*: The direction in which a pig moves from that cell as a function of the resource gradient



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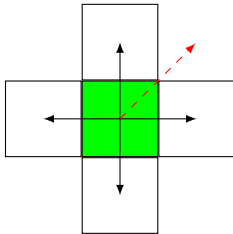
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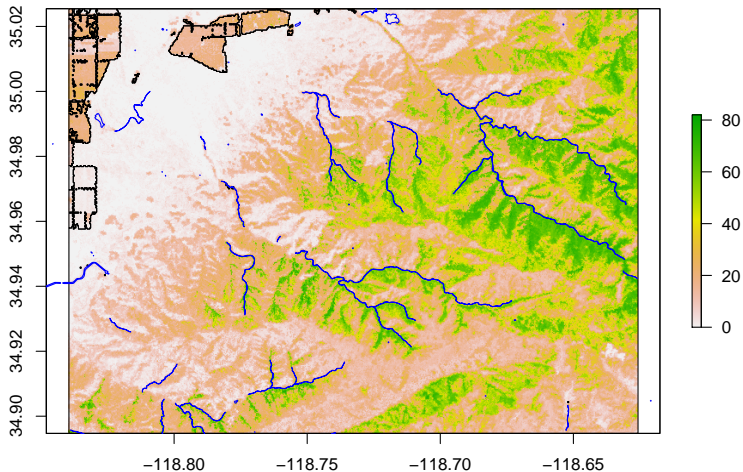
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$$\log \lambda_{ij} = \log \tau_{ij} + \beta \mathbf{X} \text{ where } \mathbf{X} \text{ contains location and directional covariates}$$

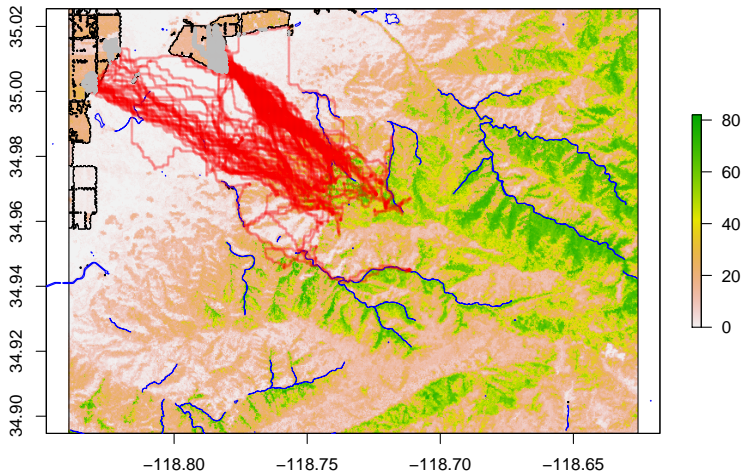
An example from Tejon

Spatial scale: 30m by 30m



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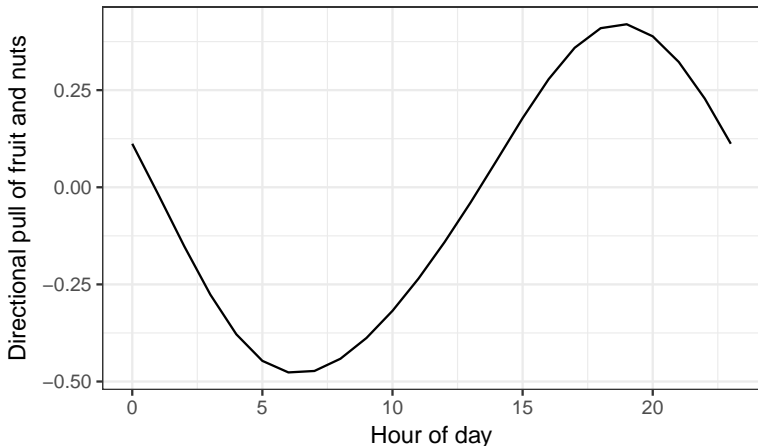
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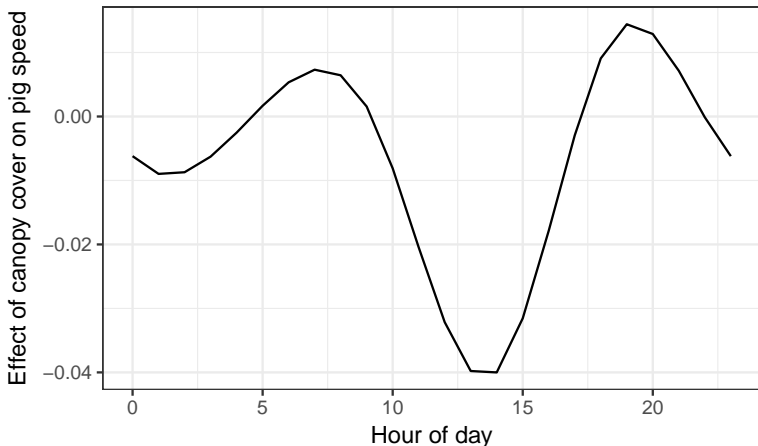
Fruit and nuts drive the direction of this pig's movement



An example from Tejon

Spatial scale: 30m by 30m

Pig spends more time in increased canopy during mid-day



Where we are trying to go...and some challenges

How does the availability of natural forage resources and anthropogenic forage resources affect pig movement on a landscape?

- Are there any consistent effects of forage resource use across pigs/populations?
 - Currently performing movement analyses across populations.
Summary: its a mess.
 - Not all pigs use crops. Just focus on crop-users?

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- Spatial scale affects resource selection
 - At what scale does a pig select a particular resource?