

Mazama Pocket Gopher WDFW Abundance Protocol Surveys

Christa Rolls (she/her) - Prairie Vertebrate Species Lead

Erica Henry (she/her) - Prairie Ecologist



Washington
Department of
**FISH &
WILDLIFE**

Background

Need to know abundance to track **trends** and **recovery goals** and inform **management actions** and objectives.

U.S. Fish & Wildlife Service

Recovery Plan for Four Subspecies of Mazama Pocket Gopher



Photo: Gail Olson, W

STATE OF WASHINGTON

August 2020

Mazama Pocket Gopher Recovery Plan and Periodic Status Review



Objective of abundance protocol

- Estimate abundance at **known-occupied** potential reserve sites
- **Track population over time** within reserves to determine if/when recovery criteria are met



Mazama pocket gopher handled during surveying and trapping. Photo by WDFW.

Abundance Protocol Features

- **Minimal impact** to gophers and their habitat
- Reflect **biological processes** including behavior and biology
- Uses **simple** data collection methods
- Suitable for **wide range** of site conditions
- High mound **detectability**
- Allow for other factors affecting detectability
- Analytically **sound**



Mazama pocket gopher mound cluster. Photo by WDFW

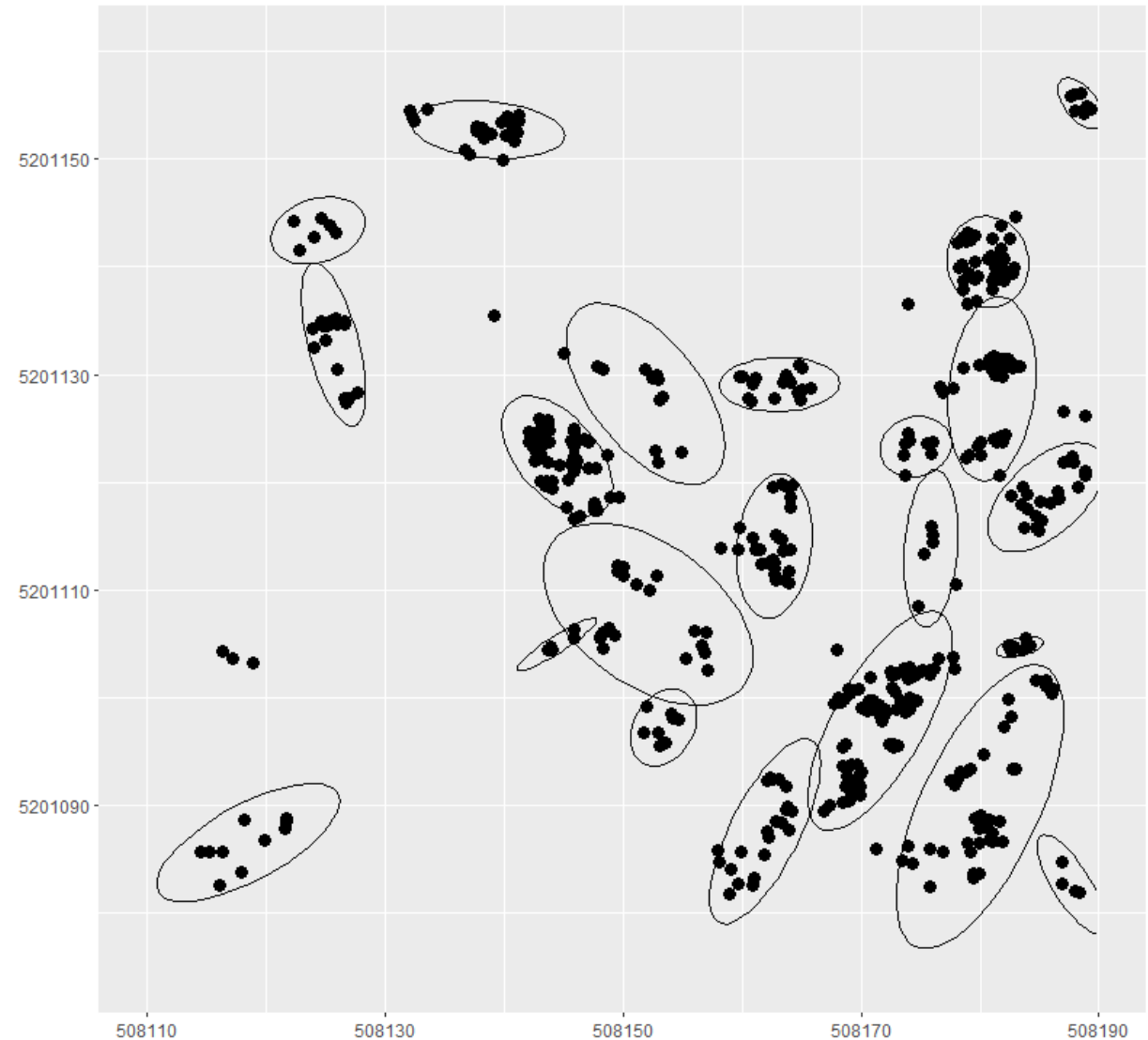
Trapping

- ~~Minimal impact~~ to gophers and their habitat
- Reflect **biological processes** including behavior and biology
- ~~Uses simple~~ data collection methods
- ~~Suitable for wide range~~ of site conditions
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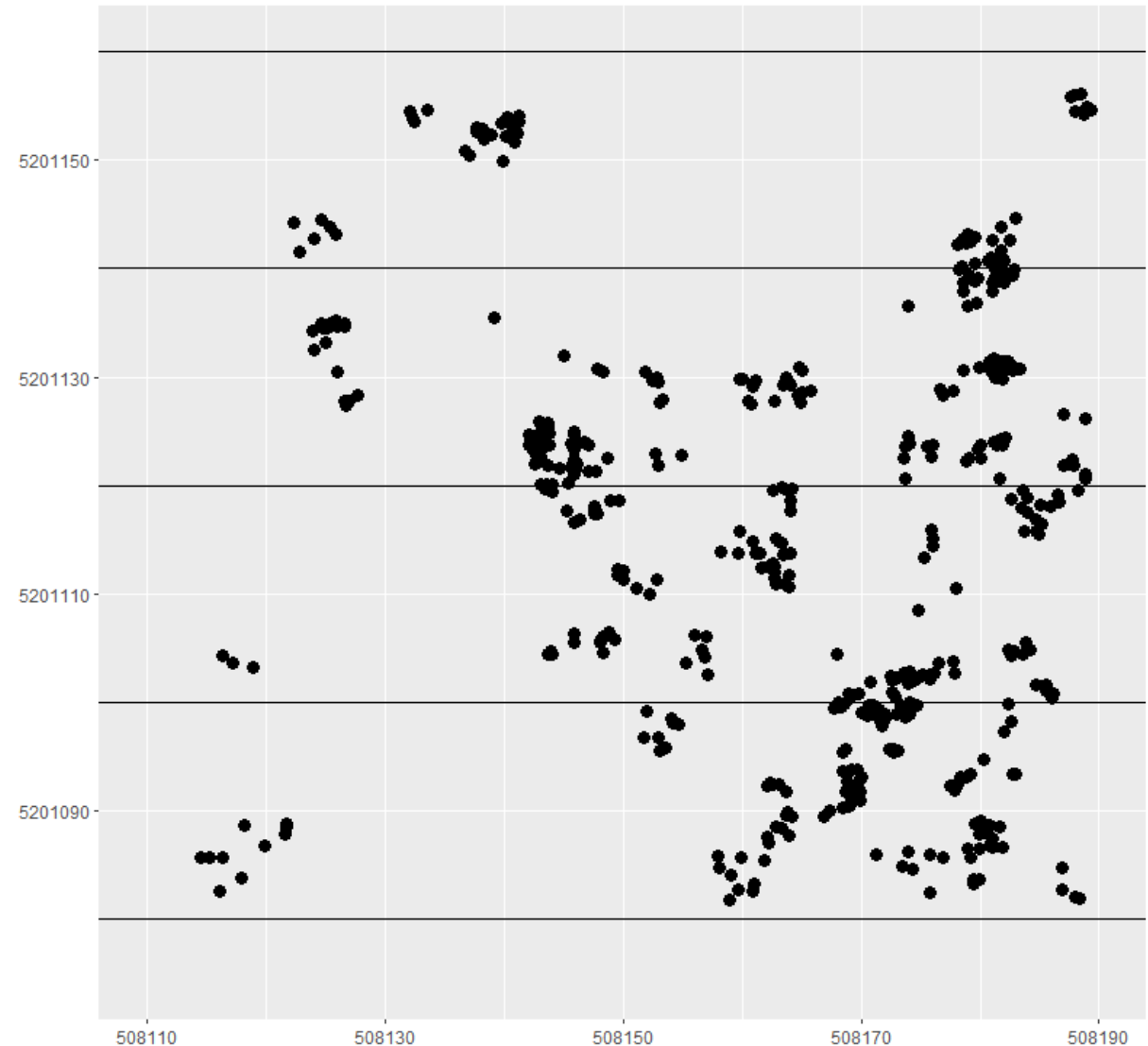
Mound mapping

- **Minimal impact** to gophers and their habitat
- Reflect **biological processes** including behavior and biology
- ~~Uses **simple** data collection methods~~
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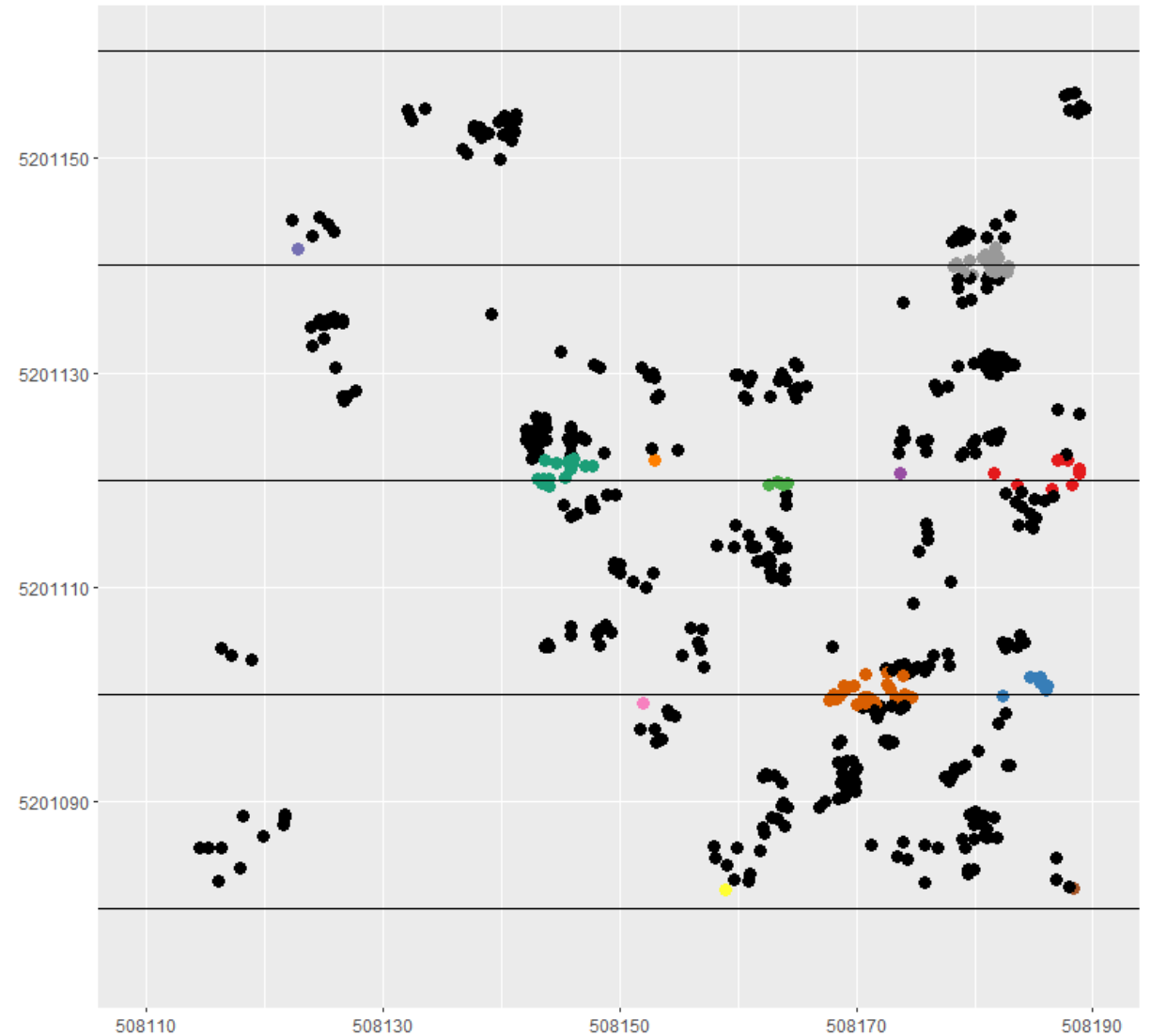
Transect surveys

- **Minimal impact** to gophers and their habitat
- Reflect **biological processes** including behavior and biology
- Uses **simple** data collection methods
- Suitable for **wide range** of site conditions
- High mound **detectability**
- Allow for other factors affecting detectability
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Transect surveys

- ASSUMPTION: mounds closer together belong to the same gopher and mounds that are farther apart belong to different gophers
- Two mound distances
 - Within gopher
 - Between gophers





How many GOPHERS, not how many mounds



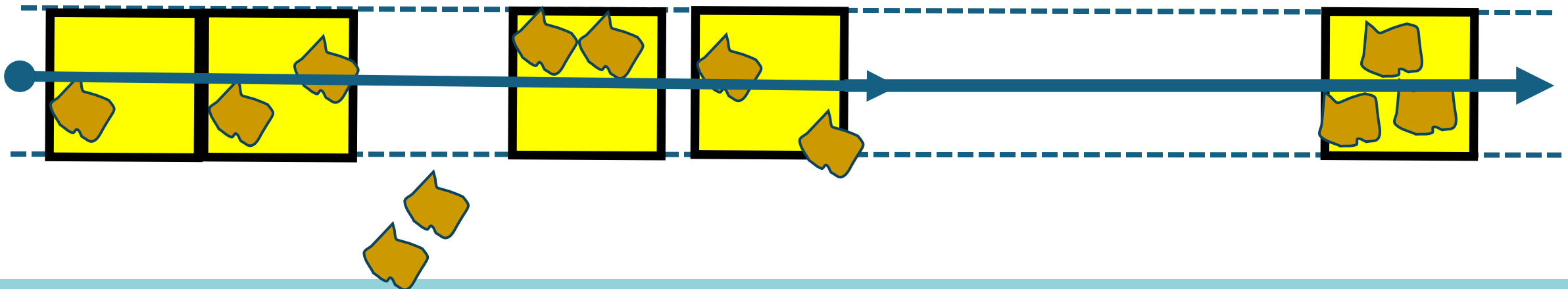
Simple data collection



Fresh pocket gopher mounds and depiction of transect walked. Photo by WDFW.

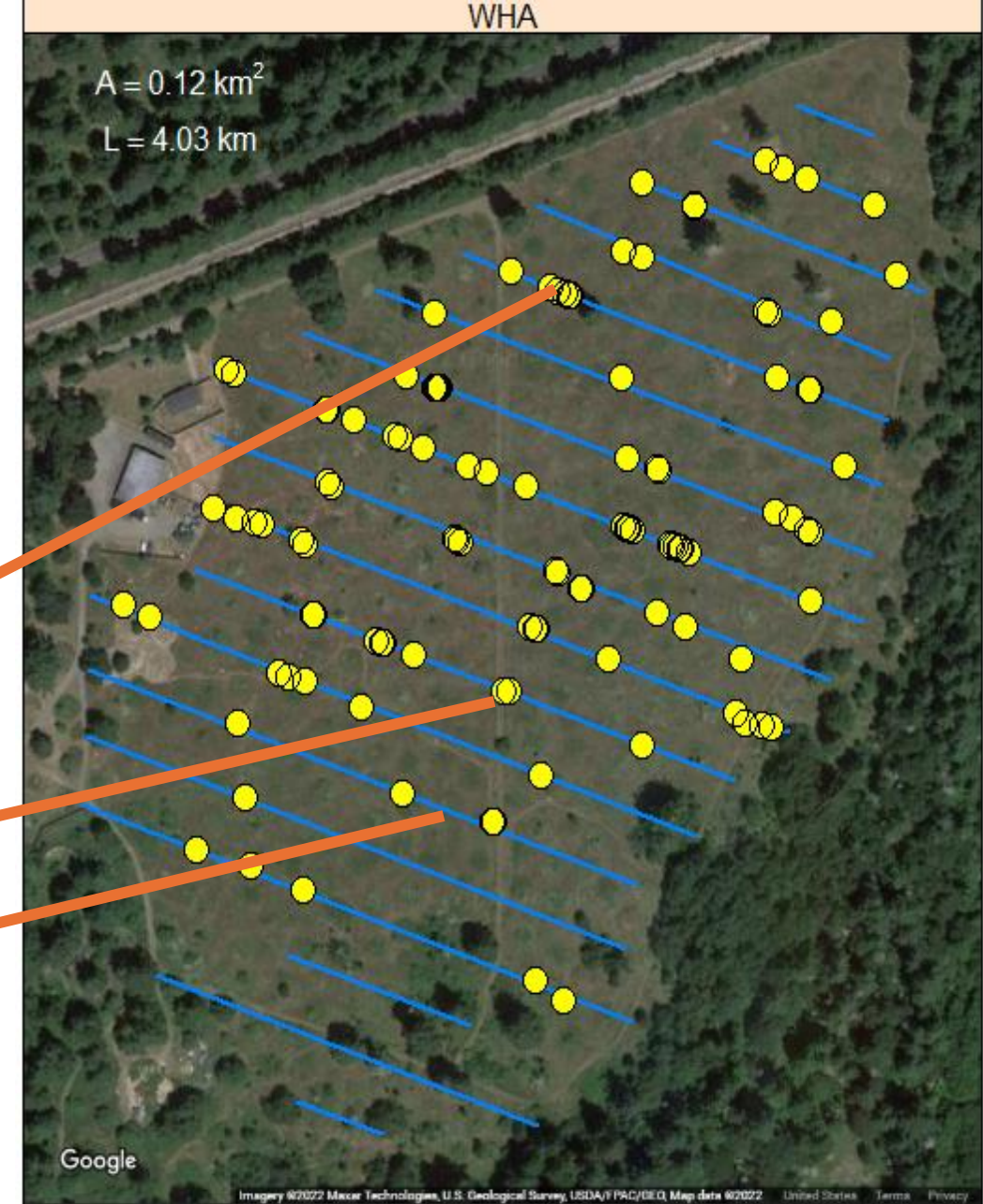
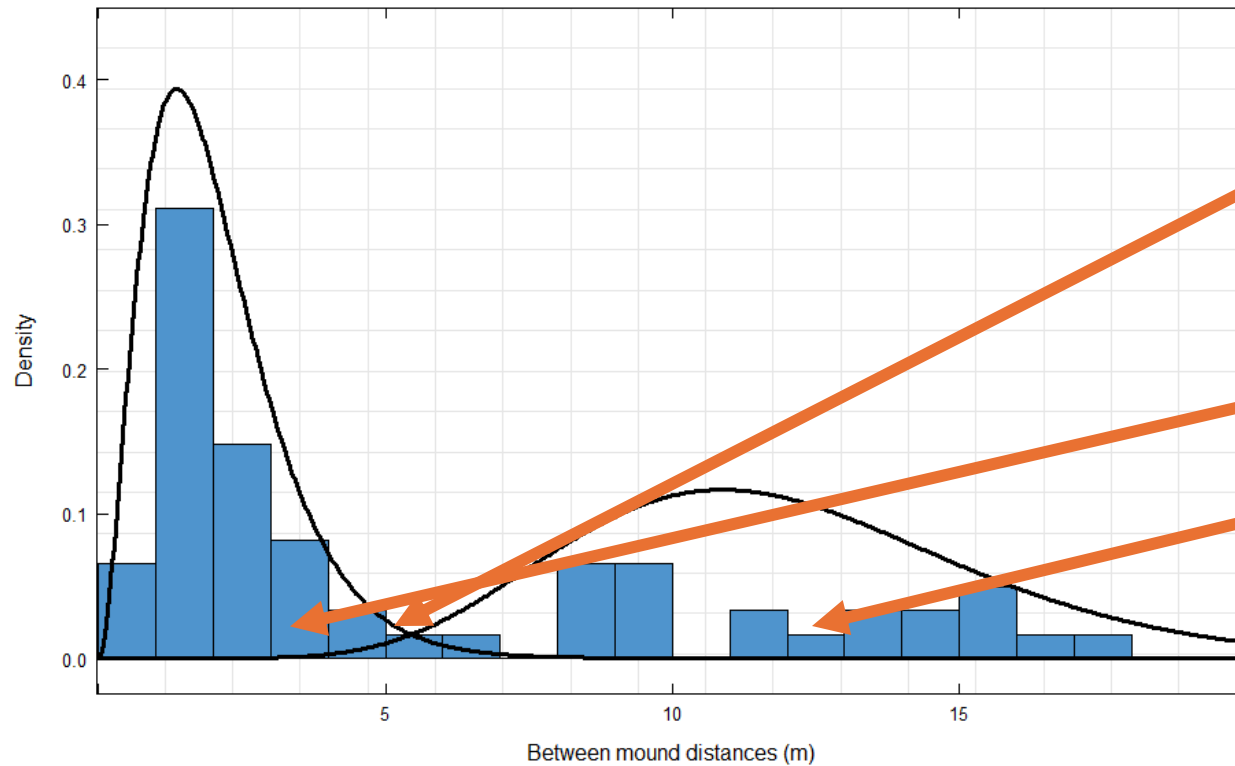
Data collection details

- Survey along pre-established transect lines with sub-meter GPS precision
- Locate fresh mounds within 1m of transect (ensures 100% detection on the line)
- Results in dataset of accurate distances between mounds



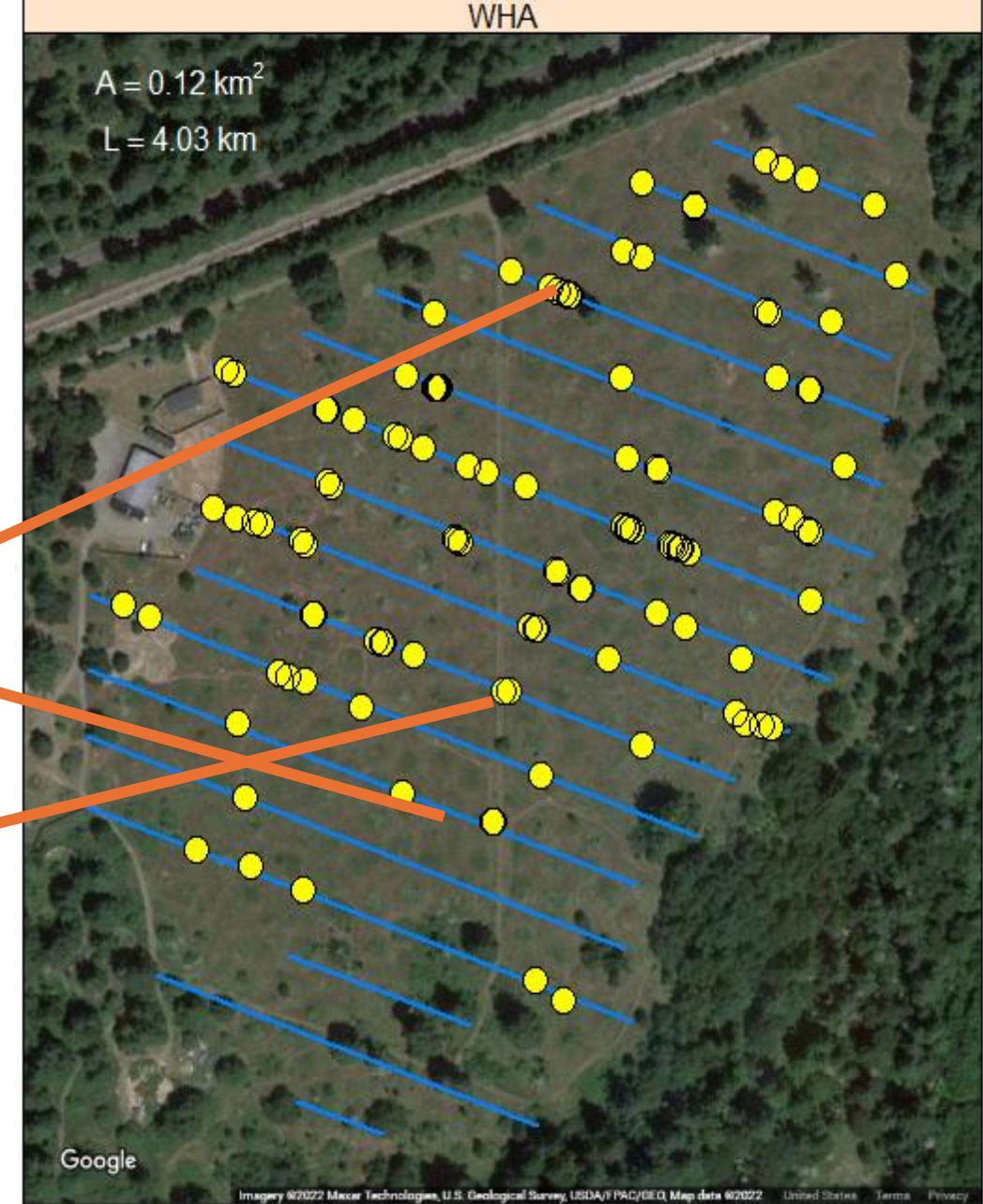
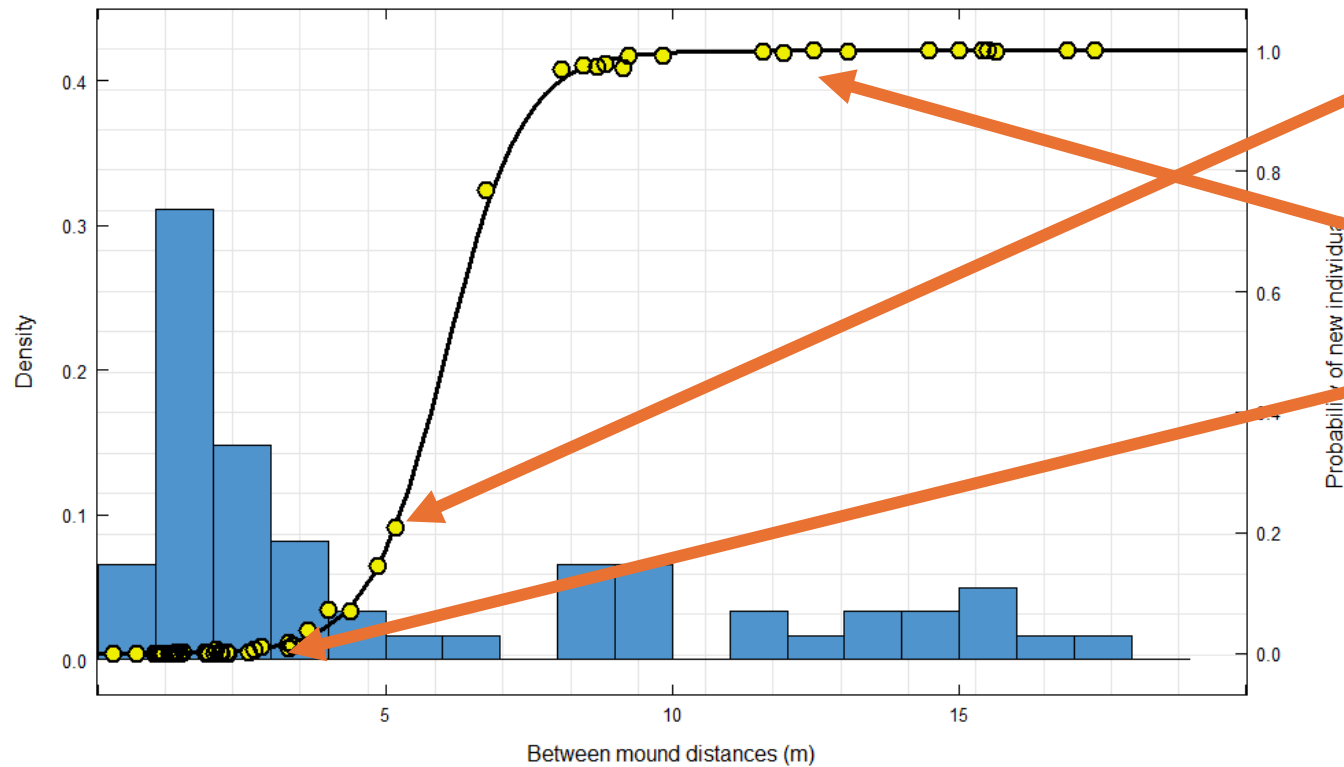
Analytical Methods

Model the distribution of two distances as a mixture of two states:
1) same gopher or 2) new gopher



Analytical Methods

Probability of new gopher estimated by distance from neighboring mounds and length of mound "strings"



Gophers on transects → Total gophers at site

$\hat{n}$ = sum of model predicted
“new gophers”

$\hat{N}$ = given distance between
gophers ($\hat{g}$), number of
gophers that fill up the survey
area, times proportion of
transect length with gophers

$$\hat{N} = \frac{A}{\pi\left(\frac{1}{2}\hat{g}\right)^2} \times \frac{\hat{n}}{TL}$$

Field Validation

Field and analytical methods developed, tested, and implemented starting in 2014.

Strong relationship between gophers estimated using this algorithm to that determined by intensive trapping.



Trap setup for trapping pocket gophers in their tunnels. Photo by WDFW

Key survey design considerations

- Transects must be:
 1. Long enough to include mounds from multiple gophers
 2. Dense enough to allow estimation of site abundance
- Method assumes 100% detection on the line
- Requires high accuracy GPS locations so can measure small distances between mounds



Yelm South PG at Scatter Creek North WLA. Photo by WDFW.



Recommend corresponding with WDFW during setup of survey sites and transects.



Protocol Conditions

- Conducted ~September-November:
 - To avoid breeding/rearing season
 - When gophers are most active
 - When field conditions are consistent and enable accurate mound ID and aging



Violet Prairie Wildlife Area occupied by Yelm South PG. Photo by WDFW.

Calibration

- Understanding of survey methods
- Mound identification
 - Gopher vs. mole
- **Mound aging**
 - Pre-season
 - Daily



Survey protocol and mound calibration training. Photo by WDFW

Weather Watching

- Weather-dependent! Field conditions should be consistent and enable accurate mound ID and aging
 - "Fresh" mounds (1-3 days old)
 - Wait at least 24-48 hours post-rain event
 - Flexibility in scheduling

WDFW will correspond with surveyors on survey season start



Scatter Creek Wildlife Area before a rain event. Photo by WDFW.

Example – Scatter Creek North

- ~ 315 acre site occupied by Yelm-South PG
- Habitat fairly consistent throughout site, note lower detections on west side

Number of mounds detected (m): 816

Number of MPG on-transect ($\hat{n}$): 458 (442-473)

Site-wide abundance estimate ($\hat{N}$): 1,620 (1,392-1,887)



Scatter Creek North WLA with Yelm PG occupancy.

- Active MPG mound
- Transect Start
- Transect End

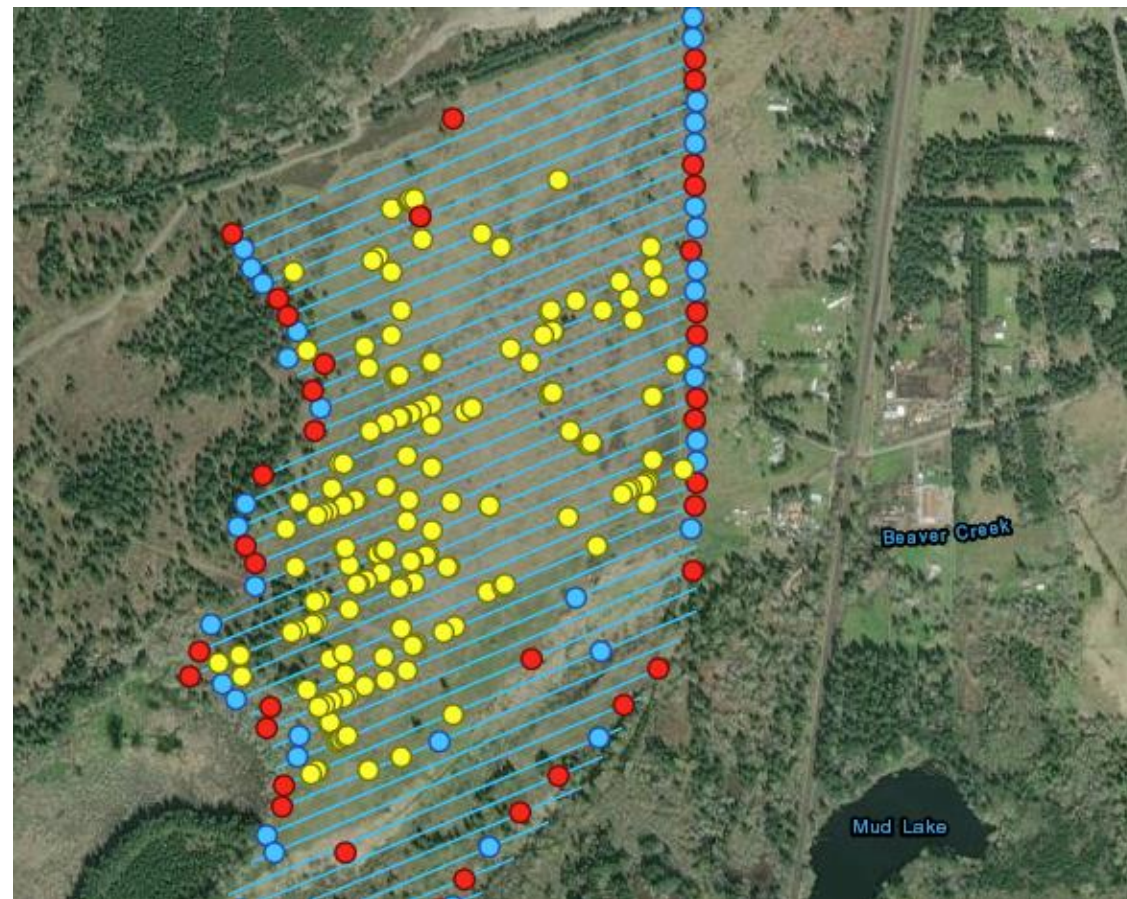
Example – West Rocky Prairie

- ~237 acre site occupied by Yelm-South PG
- Transects initially laid out throughout all suitable soils and within site boundary line via GIS. On-the-ground suitability was different.
- Note lower density in northeast.

Number of mounds detected (m): 175

Number of MPG on-transect ($\hat{n}$): 129 (124-134)

Site-wide abundance estimate ($\hat{N}$): 389 (263-639)



West Rocky WLA with Yelm PG occupancy.

- Active MPG mound
- Transect Start
- Transect End



Questions?

Erica Henry, Prairie Ecologist: Erica.Henry@dfw.wa.gov

Christa Rolls, Prairie Vertebrate Lead & JBLM Liaison: Christa.Rolls@dfw.wa.gov

Request this information in an alternative format or language at www.dfw.wa.gov/accessibility/requests-accommodation, 833-885-1012, TTY (711), or CivilRightsTeam@dfw.wa.gov.



A team of four personnel completed approximately 200 acres of surveys (30 m spaced transects) in a day (~0930-1700) at Olympia Airport in 2023 (under ideal weather conditions).

Total gophers on the surveyed site

$$\widehat{N} = \frac{A}{\pi\left(\frac{1}{2}\widehat{g}\right)^2} \times \frac{\widehat{n}}{TL}$$

Total Survey Area
Size of gopher "blobs"

$\widehat{n}$ = Estimated number of individual gophers on transects

$\widehat{g}$ = Estimated average distance to the next individual (aka gap-hat)

A = total area

TL= total transect length

Total gophers

$$\widehat{N} = \frac{A}{\pi\left(\frac{1}{2}\widehat{g}\right)^2} \times \frac{\widehat{n}}{TL} \quad \frac{\text{Total Survey Area}}{\text{Size of gopher "blobs"}} \times \frac{\text{gophers on transects}}{\text{total transect length}}$$

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Total gophers

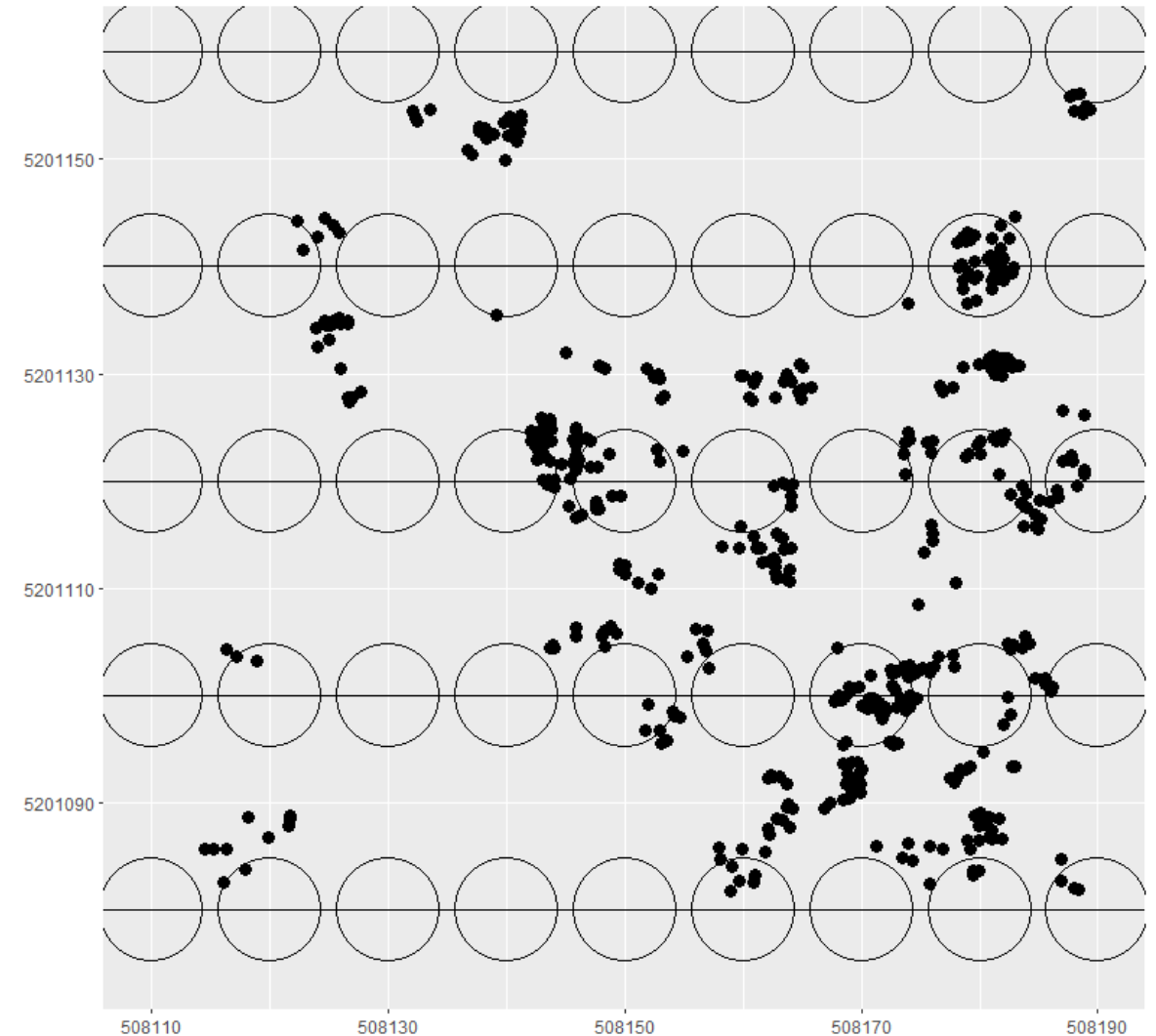
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Total gophers

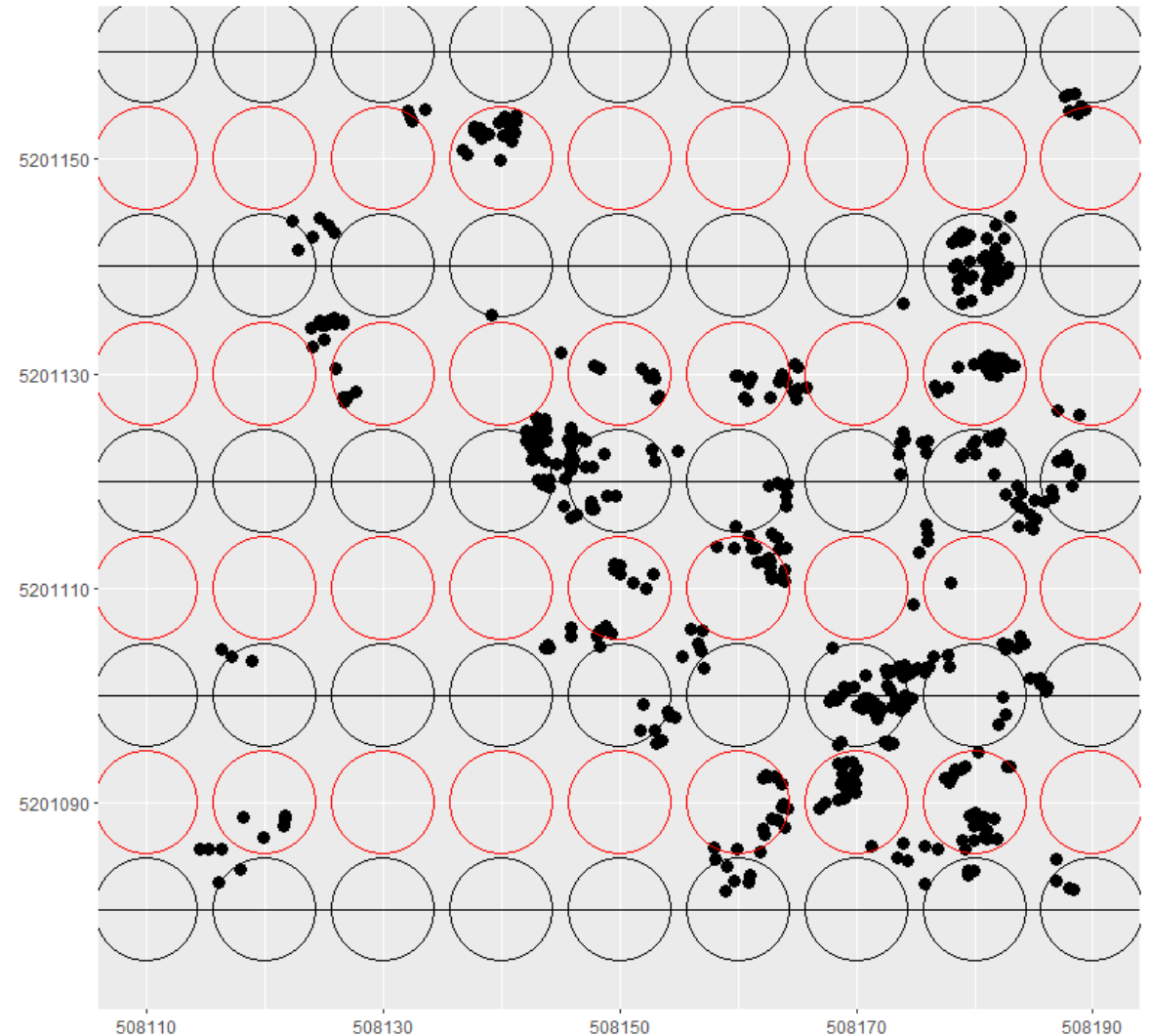
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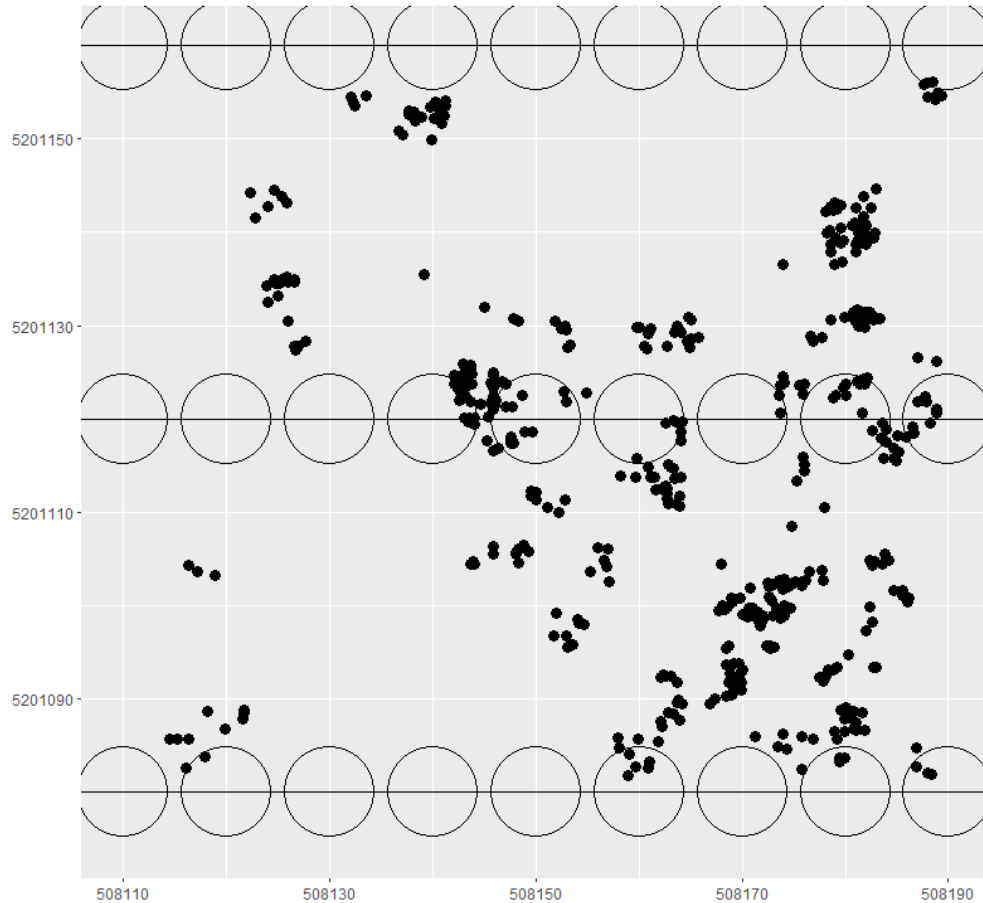
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Transect spacing matters for total gophers!



Because we are filling in the gaps based on the gophers detected on transects, the farther apart transects are, the more we are interpolating into space we don't know much about.

Transect spacing matters for total gophers!

