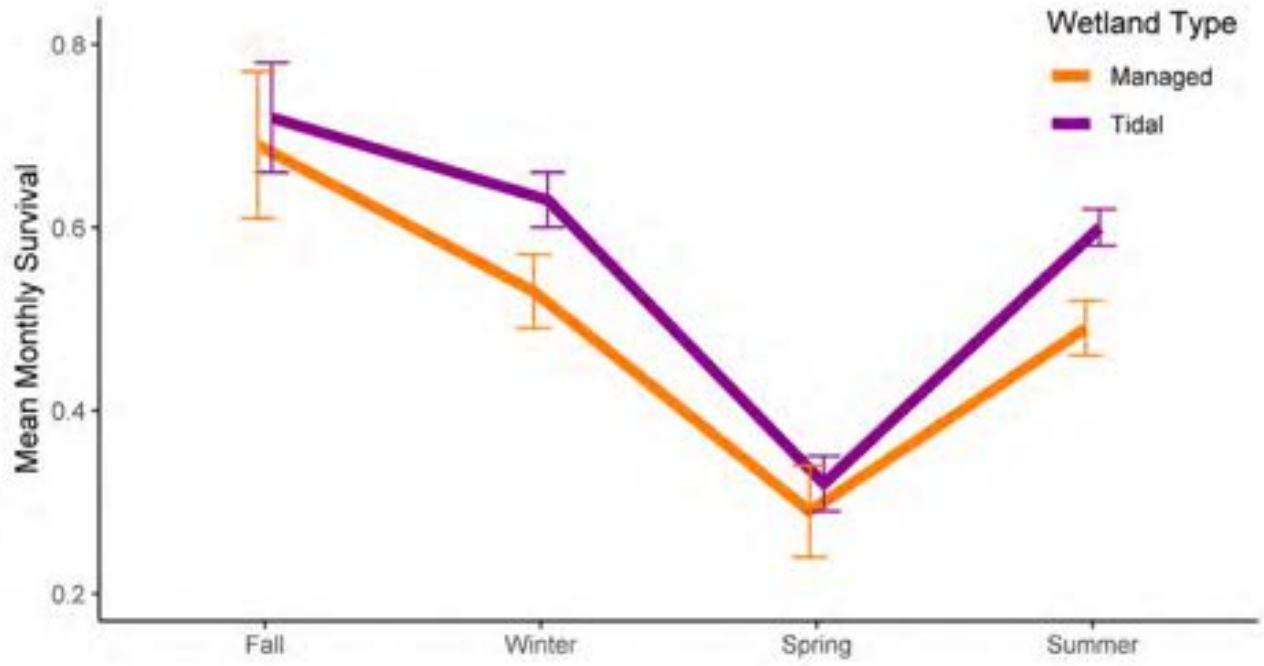
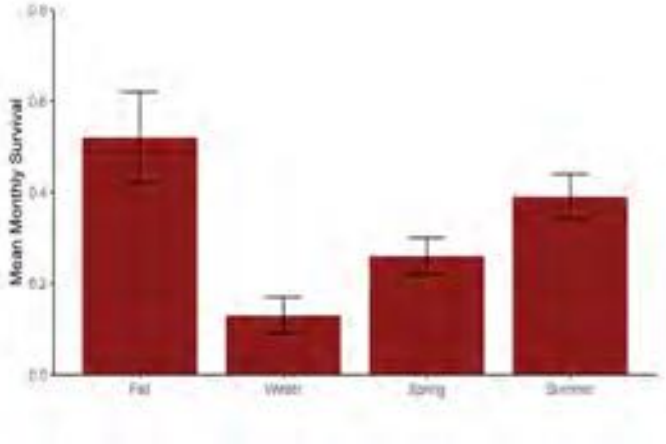
Population and Demographics

Survival

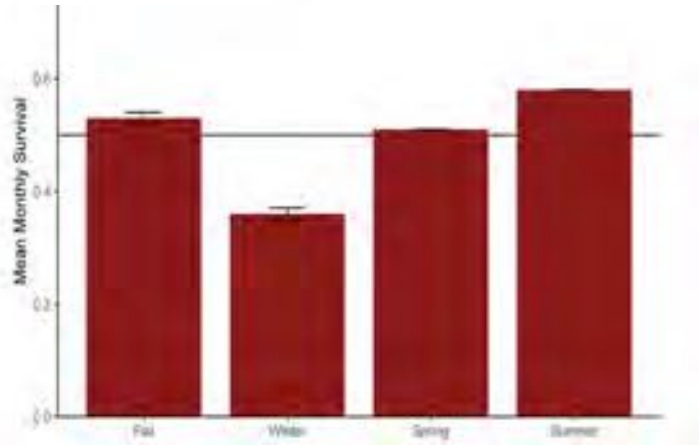
Salt Marsh Harvest Mouse



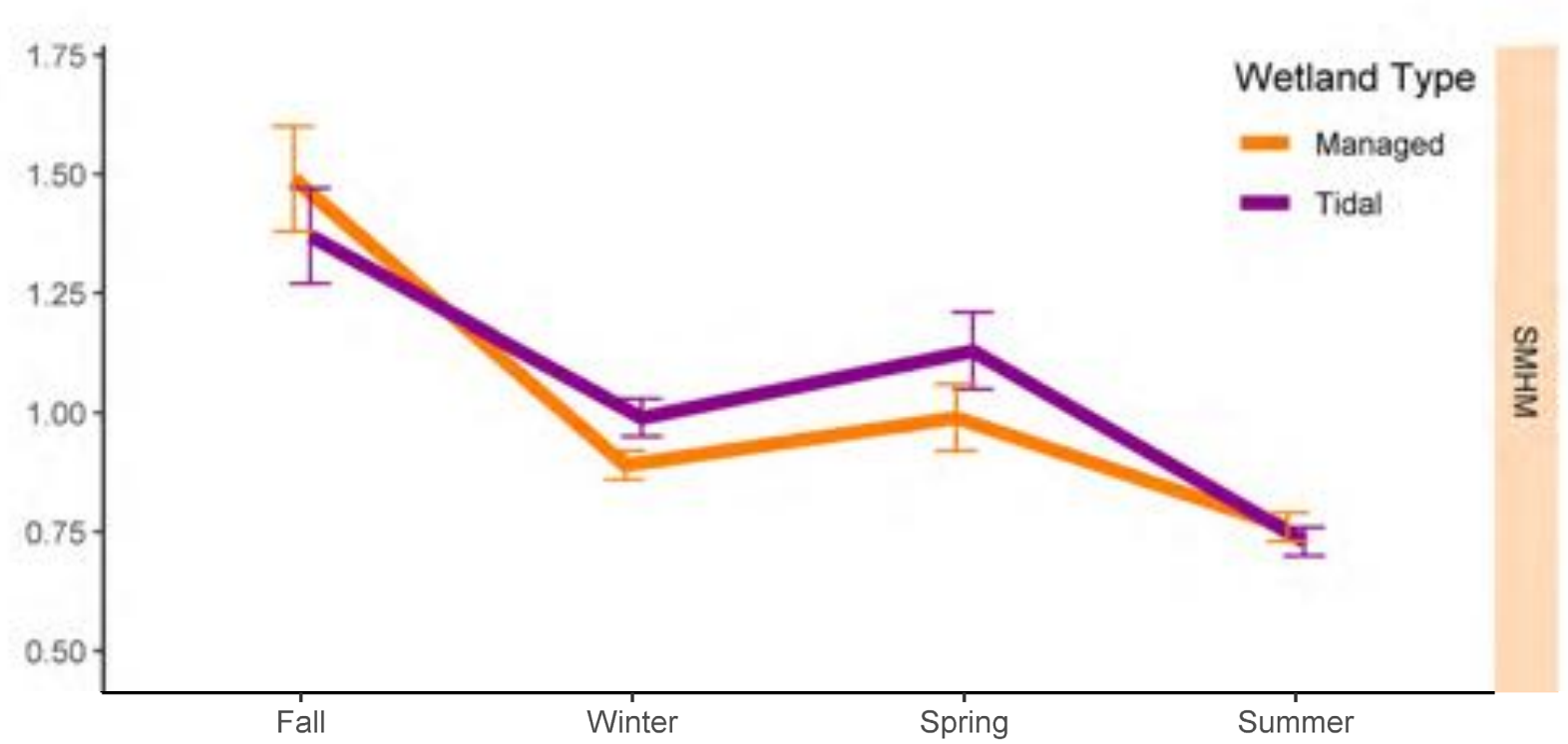
Western Harvest Mouse

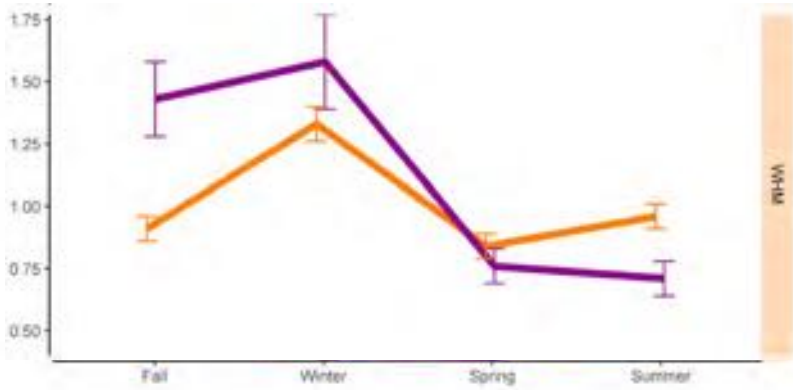


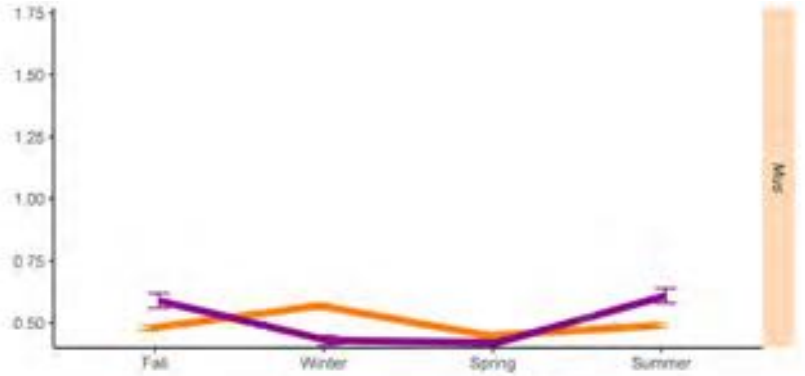
House Mouse



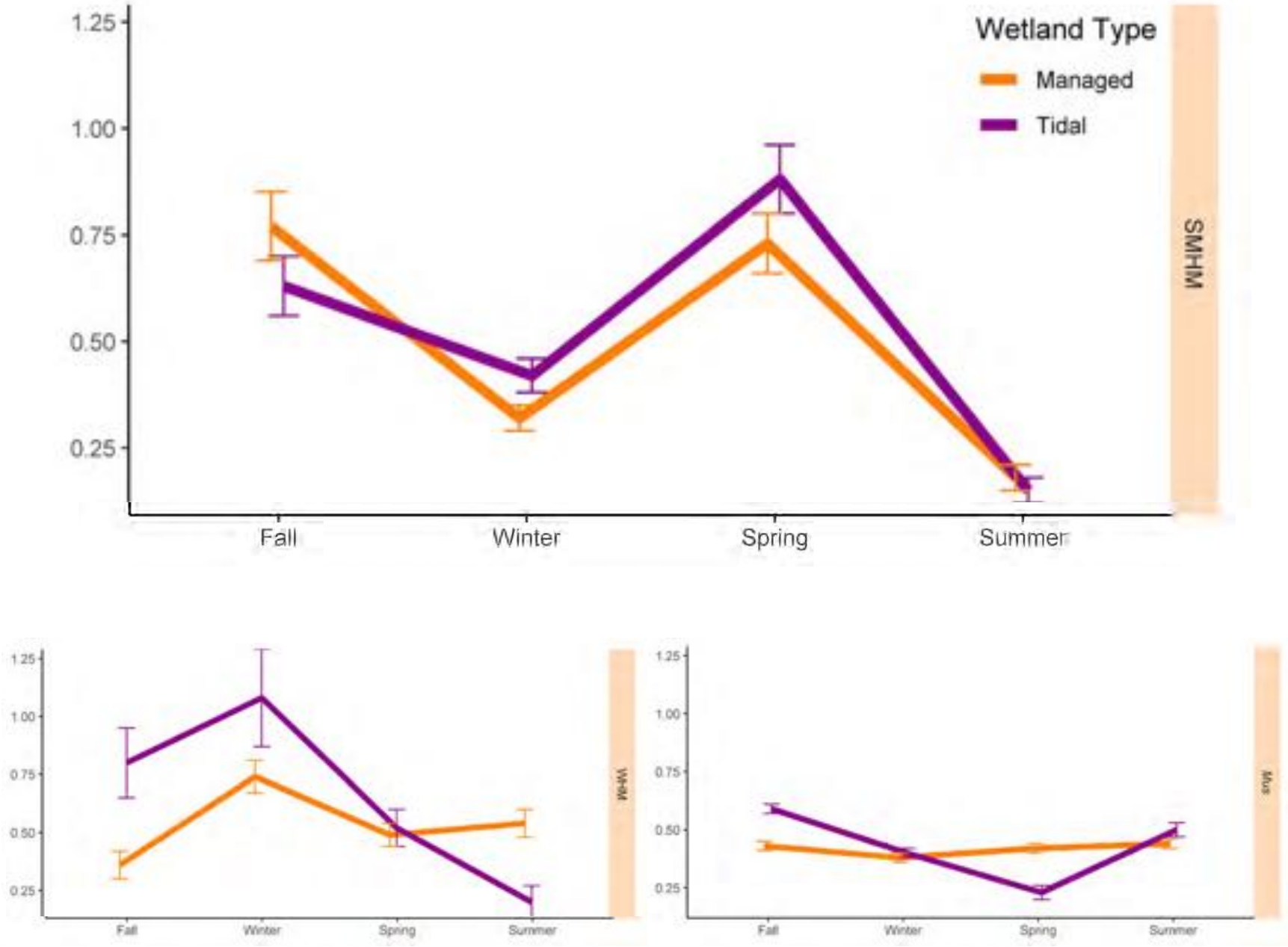
Fecundity


1.75
1.50
1.25
1.00
0.75
0.50
Fall
Winter
Spring
Summer
Wetland Type
Managed
Tidal
SMHM

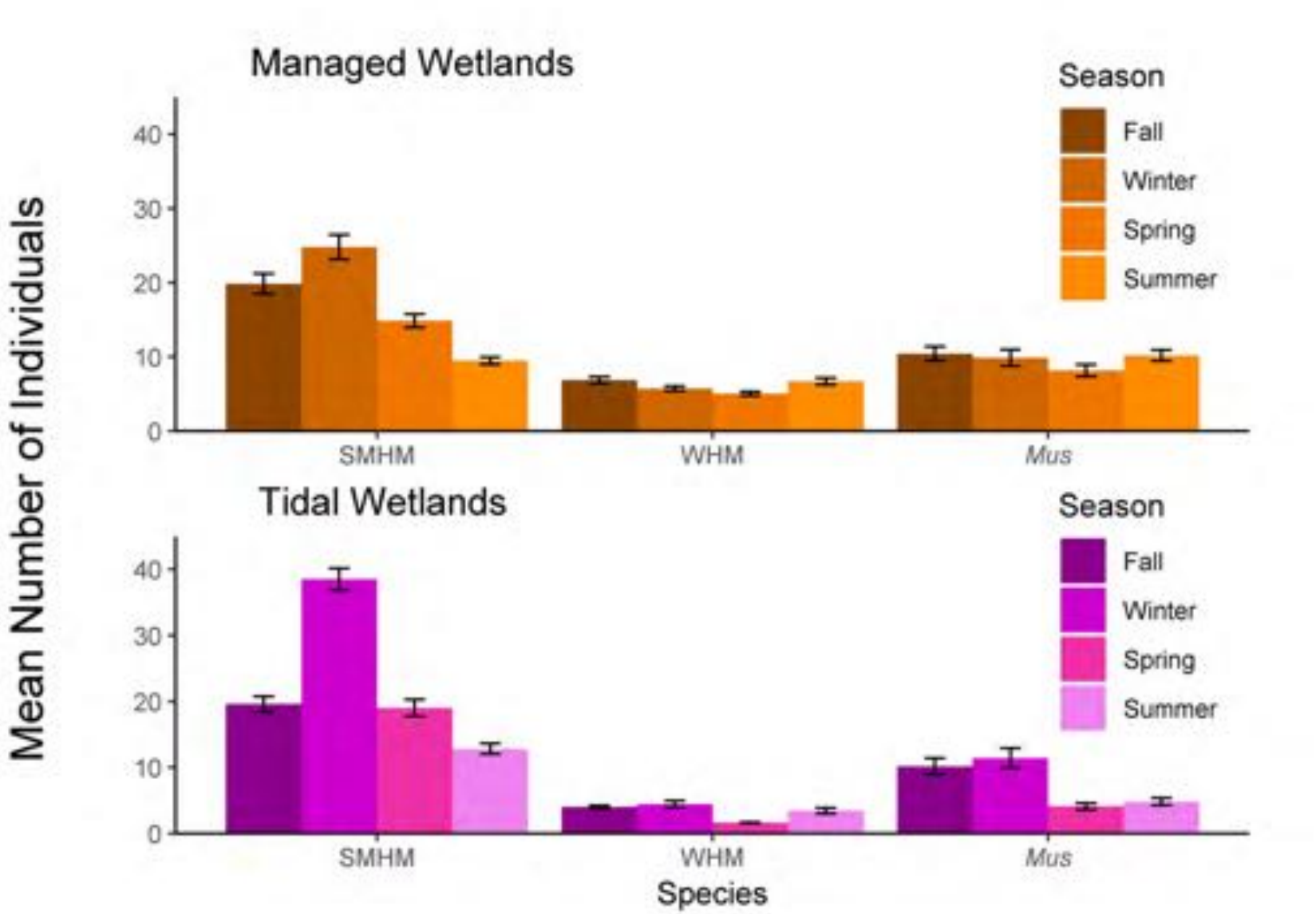

1.75
1.50
1.25
1.00
0.75
0.50
Fall
Winter
Spring
Summer
WHM


1.75
1.50
1.25
1.00
0.75
0.50
Fall
Winter
Spring
Summer

Population Growth Rates



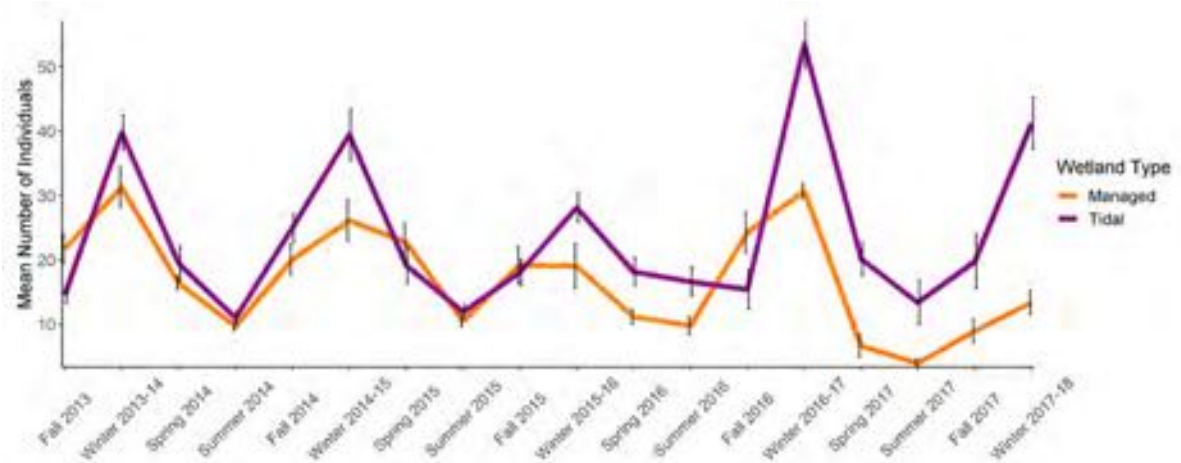
Populations

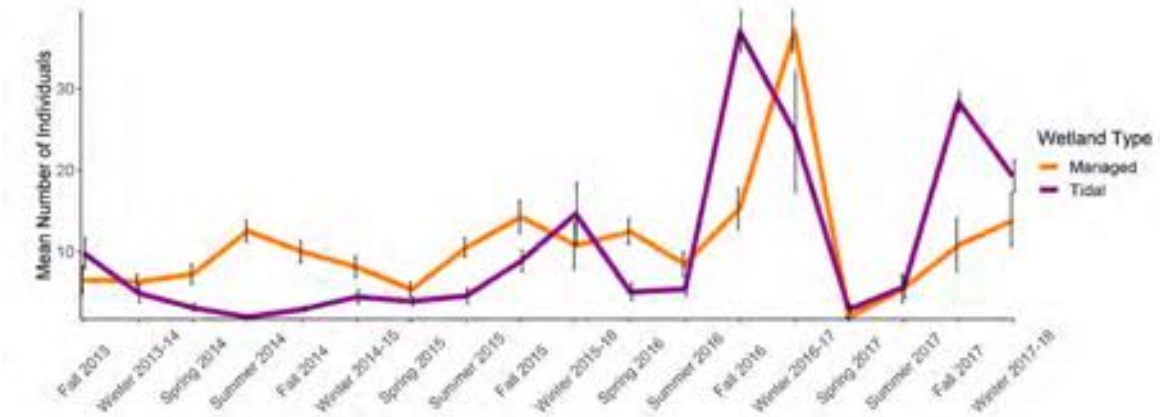


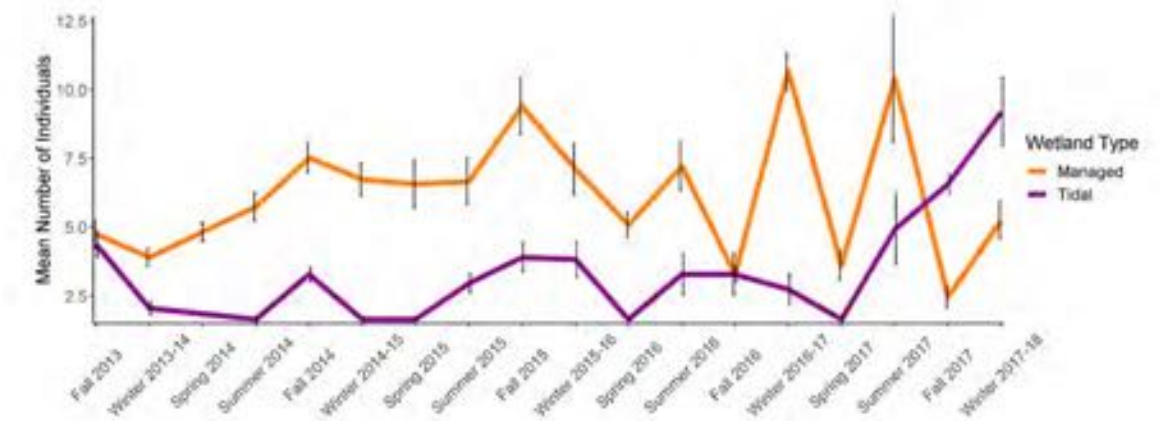
Populations

a. Salt Marsh Harvest Mouse	DF	Deviance	F value	Pr(>F)
Intercept	NA	840.82	NA	NA
Season	3	1031.98	11.67	< 0.001*
Wetland Type	1	840.85	0.01	0.94
Season * Wetland Type	3	865.95	1.53	0.21
b. Western Harvest Mouse	DF	Deviance	F value	Pr(>F)
Intercept	NA	213.97	NA	NA
Season	3	217.05	0.59	0.61
Wetland Type	1	225.43	6.64	0.01*
Rain	1	214.40	0.25	0.62
Season * Wetland Type	3	220.77	1.31	0.27
Season * Rain	3	216.61	0.51	0.68
c. House Mouse	DF	Deviance	F value	Pr(>F)
Intercept	NA	766.51	NA	NA
Season	3	771.12	0.27	0.85
Wetland Type	1	766.93	0.07	0.79
Season * Wetland Type	3	843.16	4.50	< 0.01*

Populations

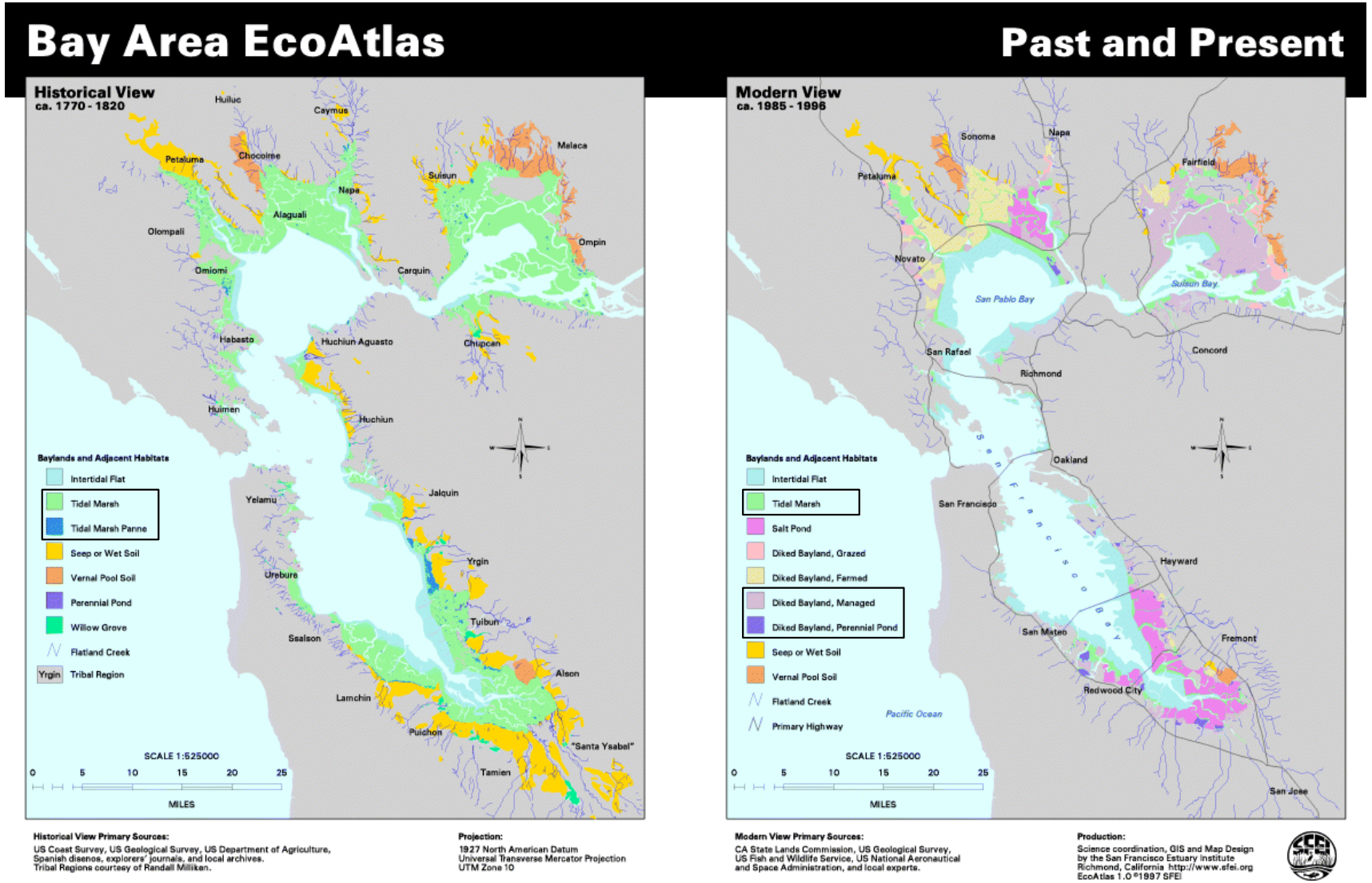






Distribution

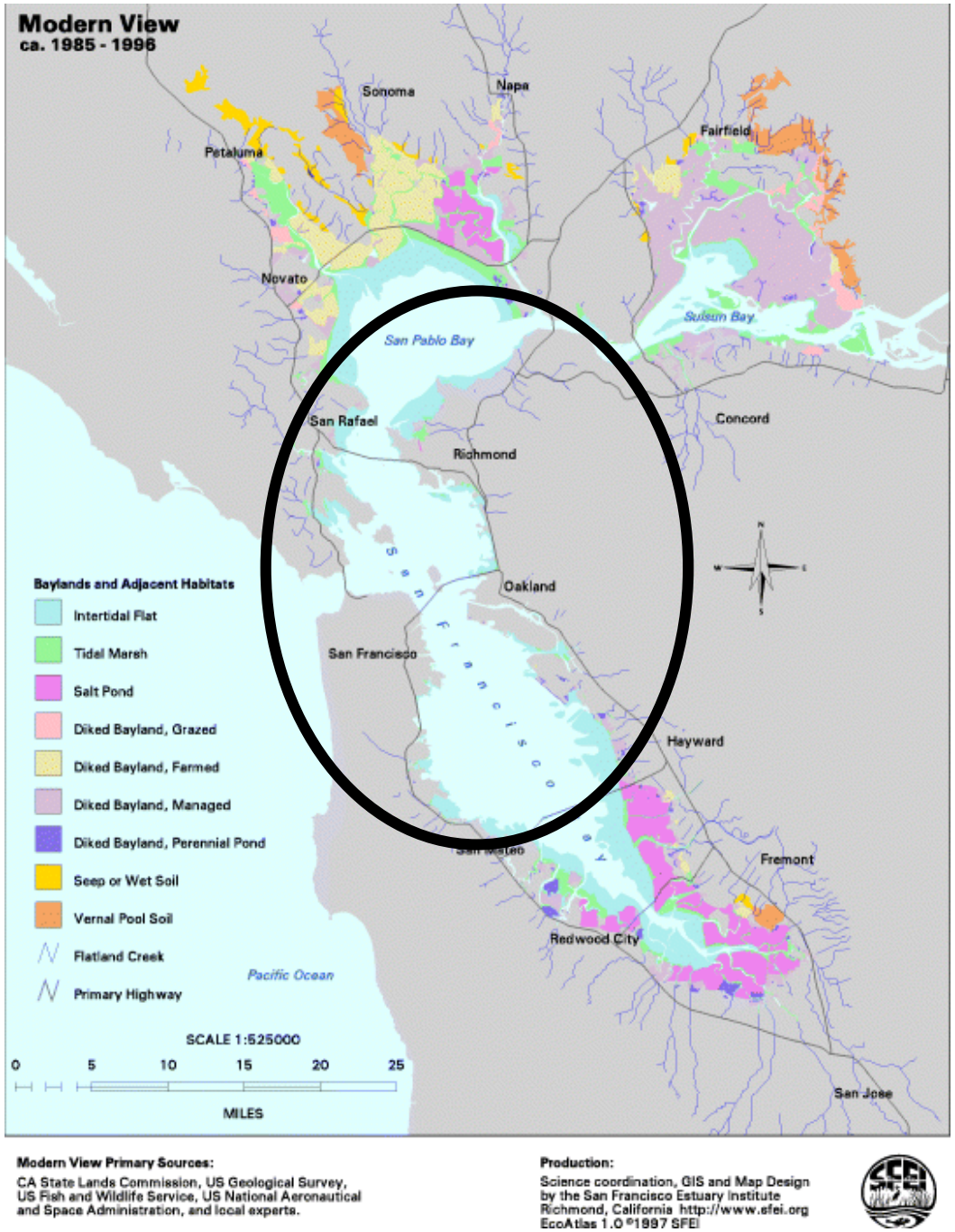
Current vs. Historical Distribution



Strongholds

- Historical wetland loss in the Bay Area was not homogeneous
  (Goals Project 1999)
- South Bay – Salt Production
- North Bay – Agriculture
- Suisun Bay – Waterfowl Hunting

Data Deficient Areas



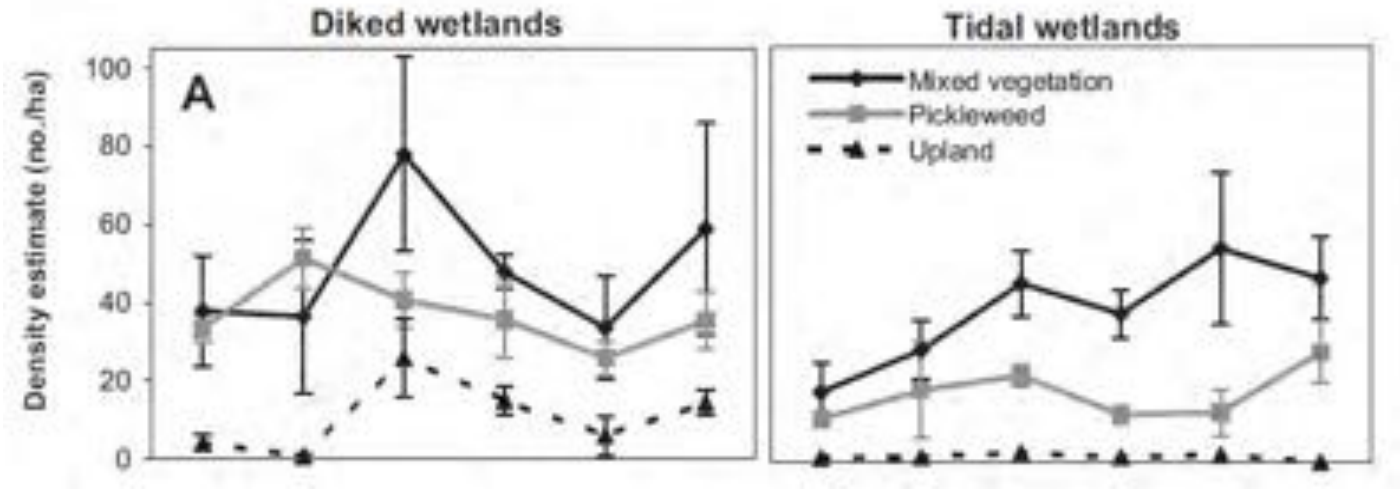
ACTIVITY

Where is the cut off between the species?

Habitats

Broad Habitat Associations

- Pickleweed dominated tidal marshes considered optimal (USFWS 2013)
- Height, salinity, percent pickleweed cover (Zetterquist 1977; Gilroy and Shellhammer 1980; Shellhammer et al. 1982, 1988; Takekawa et al. 2001; Kingma 2003; Padgett–Flohr and Isakson 2003; Basson 2009)
- Will utilize alkali bulrush marshes (*Bolboschoenus maritimus*; Shellhammer et al. 2010) and tri-corner bulrush marshes (*Schoenoplectus americanus*; Sustaita et al. 2011)
- Are frequently more common in mixed halophytic vegetation than pickleweed monocultures (Zetterquist 1977; Gilroy and Shellhammer 1980; Shellhammer et al. 1982; Sustaita et al. 2011)



Broad Habitat Types

- Deep (200m) Mid-High Marsh zones with Pickleweed (SFB and SPB)
- High tide refugia/Ecotone
  - Flooding due to high/king tides, storm surges, extreme river outflows
  - Minimize predation and mortality due to exposure and drowning
  - Many marsh transition zones are too steep, narrow and weedy.
- Tall Vegetation such as gumplant and bulrush
- Well developed tidal marsh (SFB and SPB) or muted/managed marsh (Suisun)
- Marsh connectivity (gene flow)
- Large & compact marshes

Core Habitat Needs

- Nesting
- Rearing
- Foraging
- Dispersal?

Nesting Habitat

- Safe from rain and tidal waters
- Safe from predators
- Generally restricted to marsh habitat

Nesting

- SMHM use a variety of different nest types
  - Co-op elevated bird nests
  - Utilize existing burrows/underground spaces
  - Most common: egg shaped balls of grass tucked into vegetation

ACTIVITY

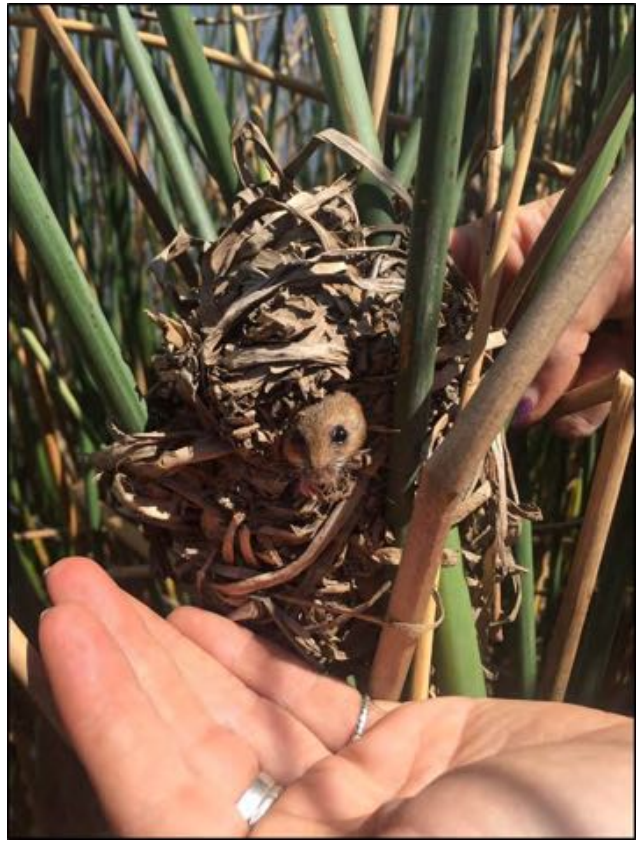
Find the nest!

Ground Nests

Ground Nests

Ground Nests

Elevated Nests



Rearing Habitat

- Abundant evidence that young forage with parents for some period of time
  - Juveniles are commonly trapped with adults
  - One adult male was observed nesting with young (Trombley and Smith 2017)
  - Observations of young and adults foraging together

Extended dependency of young?

Foraging Habitat

Faber Marsh

Dumbarton Marsh

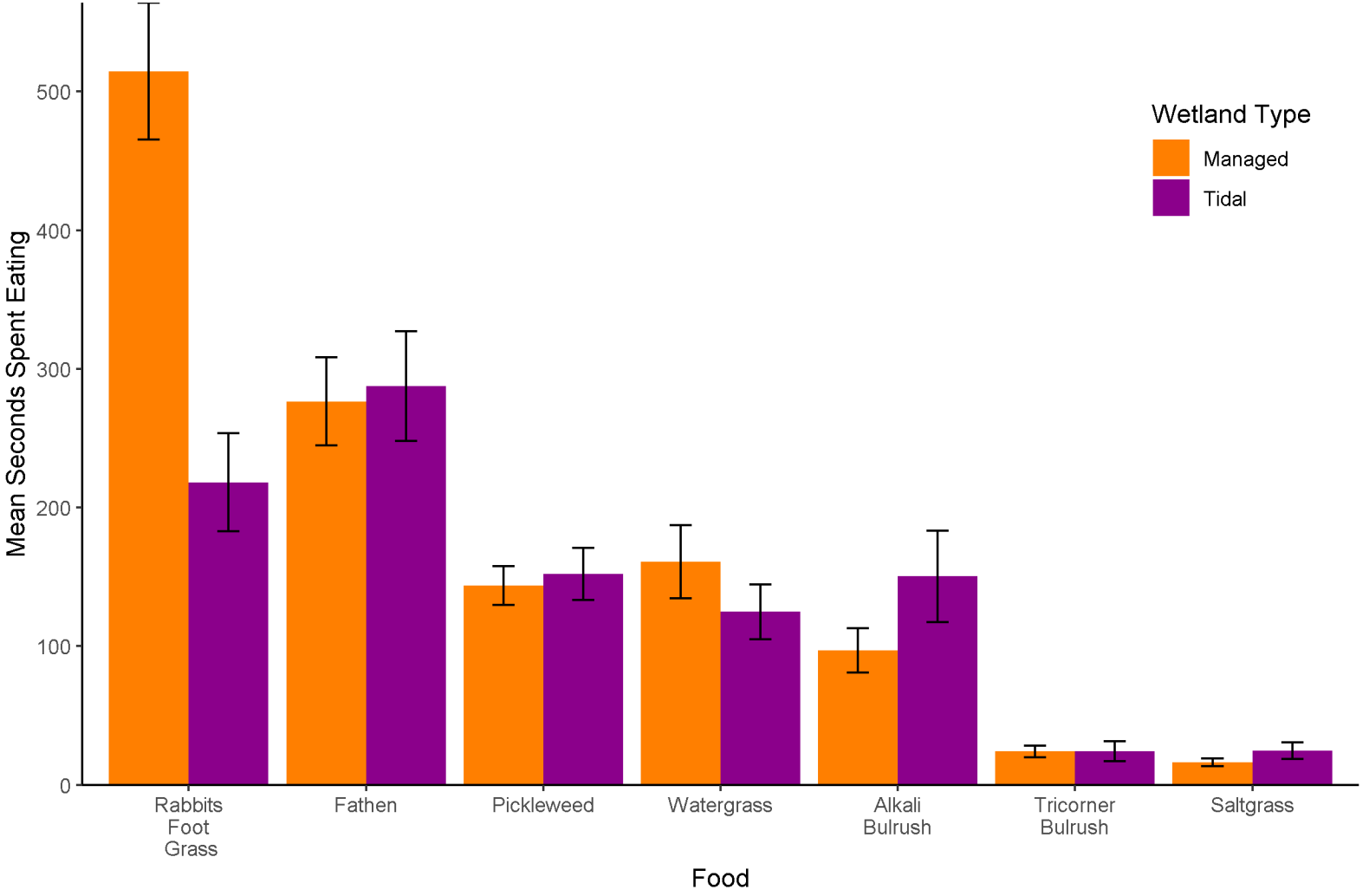
Triangle Marsh

Photos: USFWS

Foraging Habitat

Foraging

Foraging


Wetland Type
Managed
Tidal
Mean Seconds Spent Eating
0
100
200
300
400
500
Rabbits Foot Grass
Fathen
Pickleweed
Watergrass
Alkali Bulrush
Tricorner Bulrush
Saltgrass
Food

Foraging Habitat

Foraging Habitat

Foraging Habitat

Foraging Habitat

Foraging Habitat

Foraging Habitat

Foraging Habitat

Foraging Habitat

Dispersal Habitat?

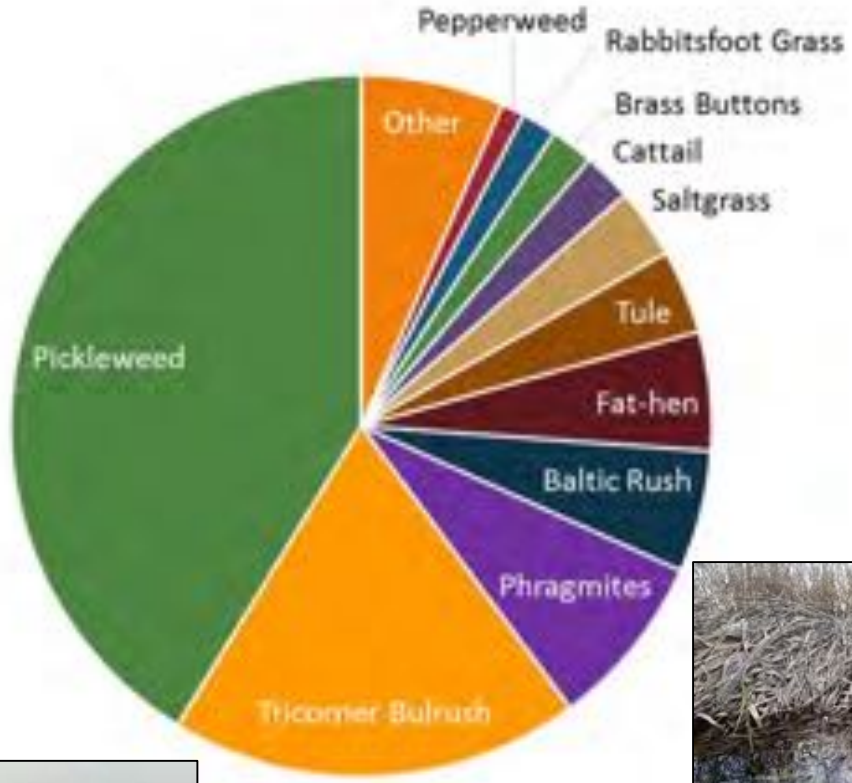
- Cover
- Forage
- Connectivity

DISCUSSION

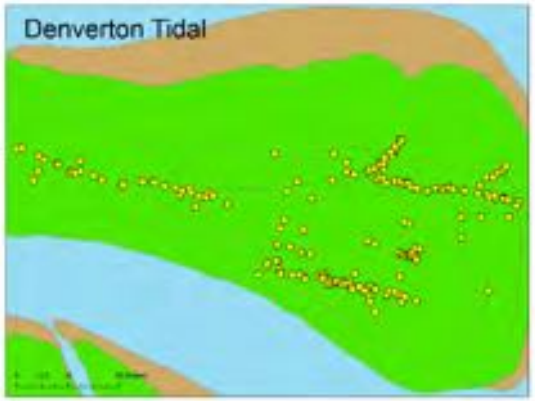
Which habitat characteristics are you curious about?

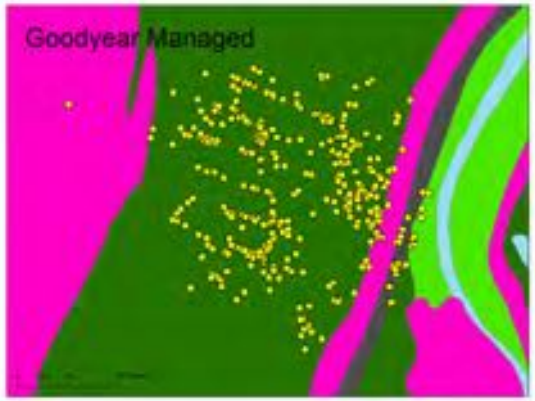
Where is the strangest place you have seen a mouse?

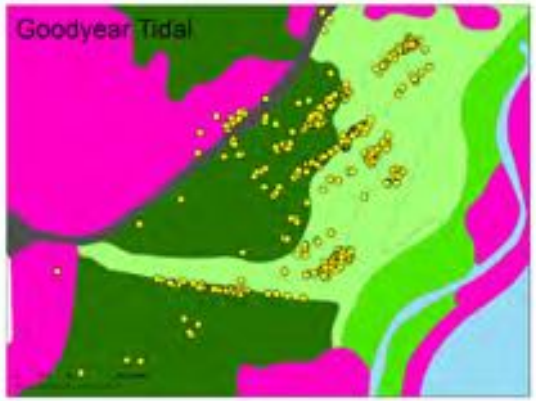
What do they like?

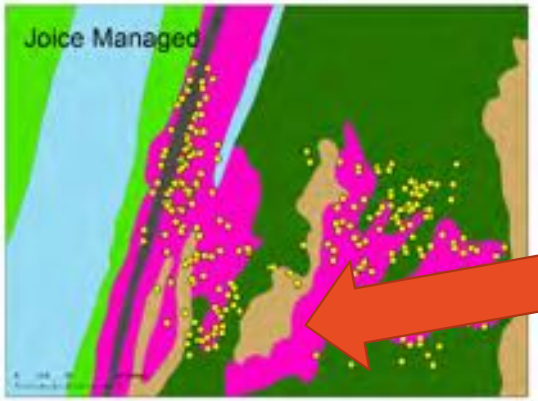


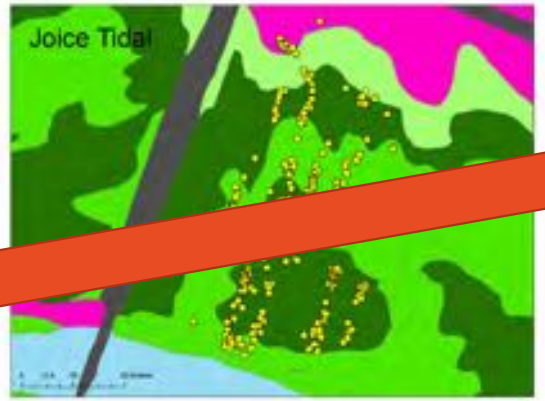
Microhabitat Use











Why do they like some areas?

- Provides appropriate structure to escape tidal waters and predators
- Provides a variety of food sources that provide year-round availability
- Is sufficiently stressful to exclude competitors

ACTIVITY

Which habitat patch is better?

ACTIVITY

Which habitat patch is better?

Movements

Home range size

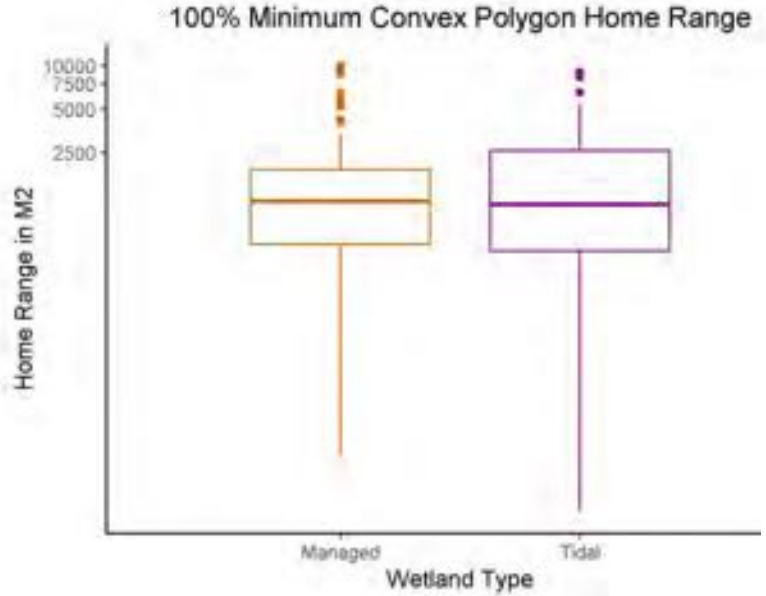
Home Range

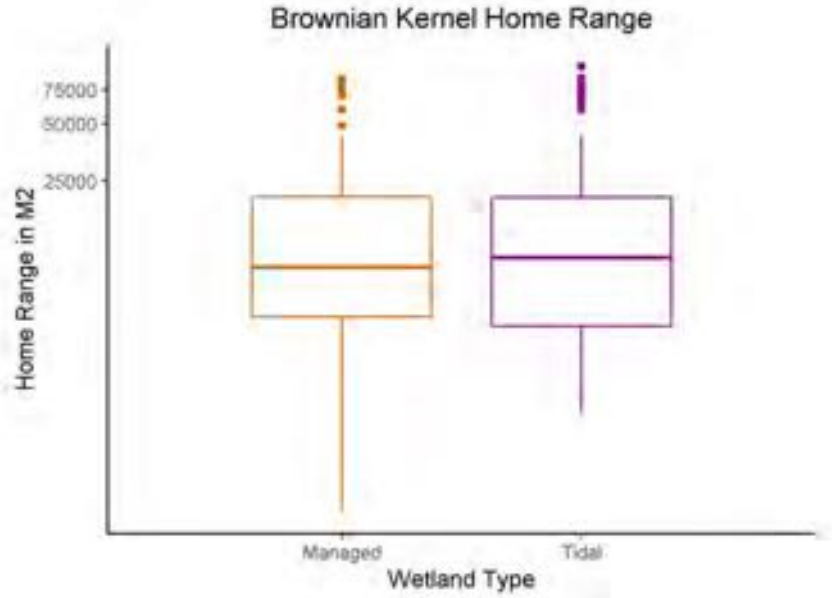
- 0.52 acres Mare Island (Bias and Morrison 1999)
- 0.37 acres South Bay (Geissel *et al.* 1988)
- 0.30 acres Suisun (Smith *et al*.)

Maximum Distances Traveled

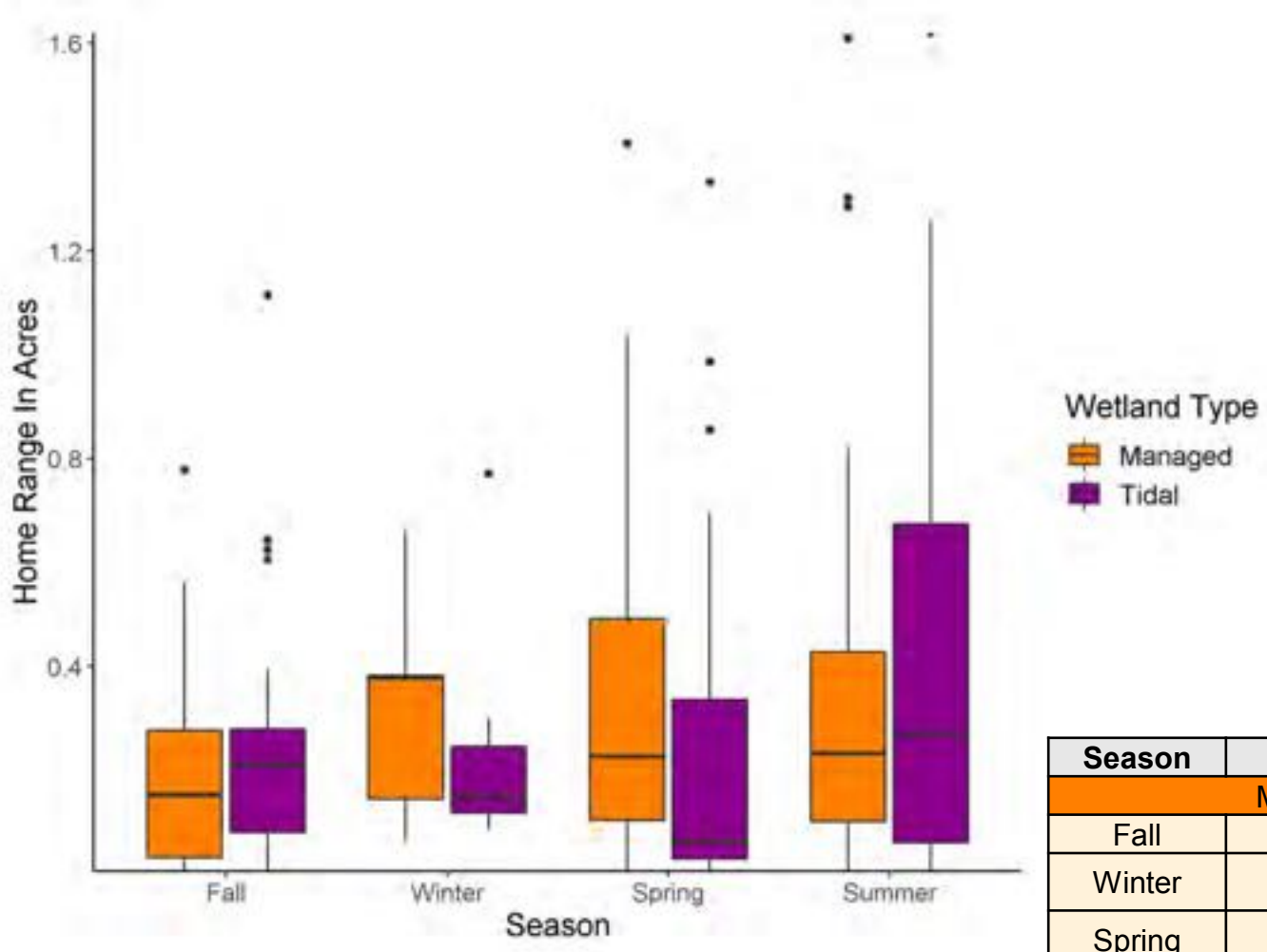
- 100+ m into grassland (Barthman-Thompson, *in litt*. 2009).
- 131.5m (Geissel *et al.* 1988)
- 86 m (Basson 2009)

Home range size



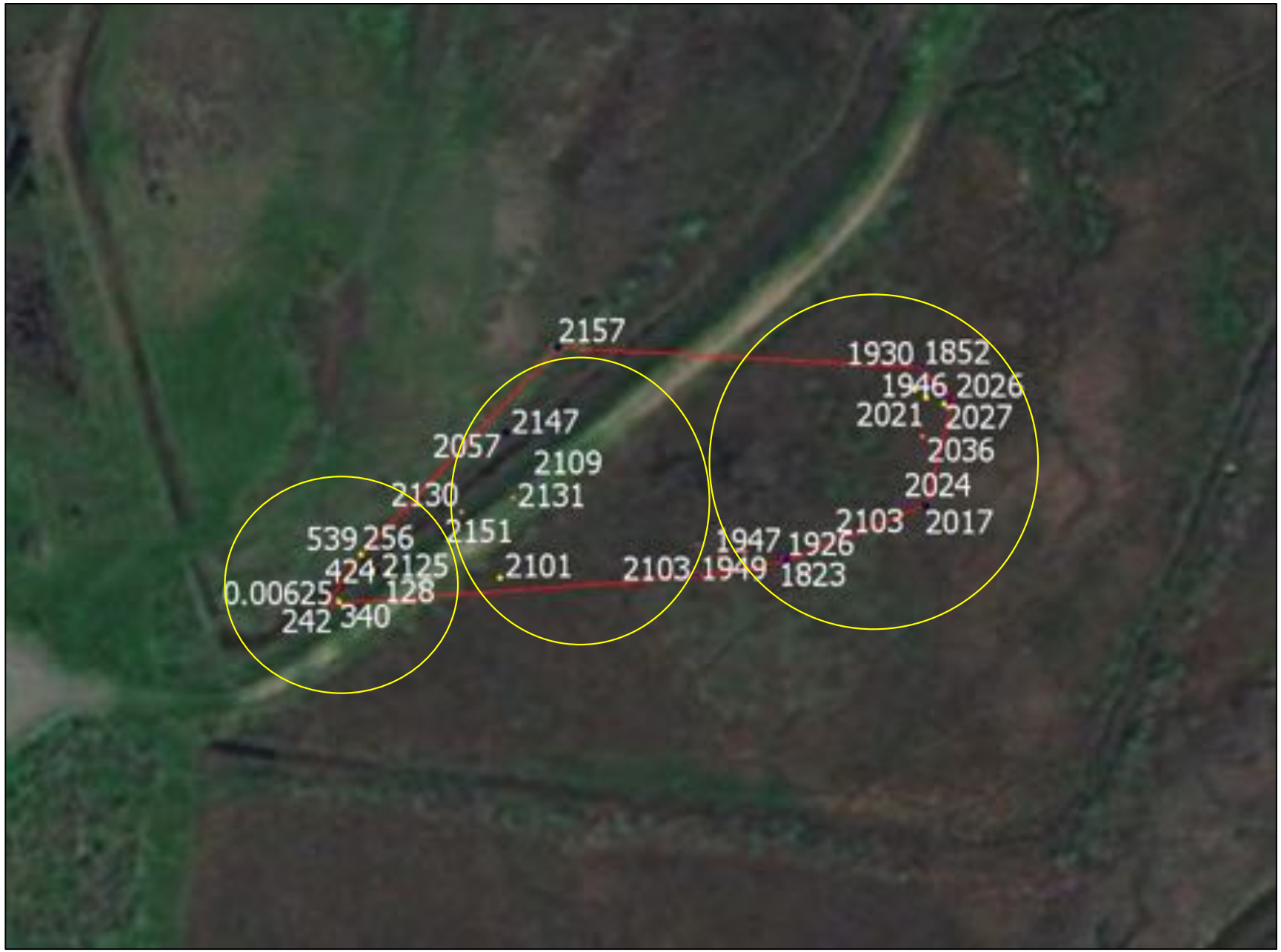


Home range size



Season	N	Acres	sd
Managed			
Fall	44	0.18	0.17
Winter	31	0.27	0.25
Spring	37	0.33	0.34
Summer	86	0.34	0.33
Tidal			
Fall	19	0.30	0.27
Winter	13	0.14	0.20
Spring	19	0.25	0.38
Summer	42	0.40	0.40

Nightly Movement



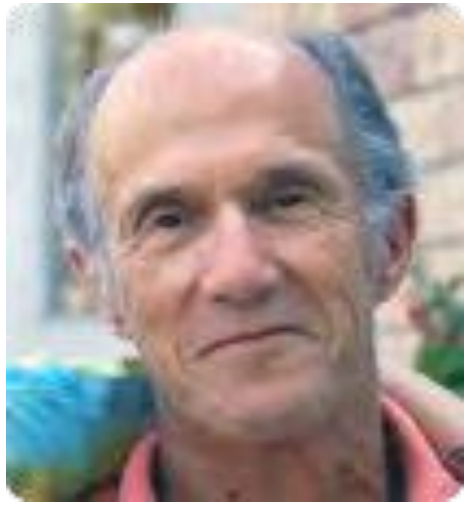
Barriers

What are the appropriate work windows?

- If on Federal land, technically: Jan 15-Aug 31
- Otherwise, not defined.
- Daily work windows:
  - Be aware of torpidity
  - Many mice get **very** sleepy at sunrise
- Seasonal work windows:
  - Populations highest moving into winter, lowest coming out of winter
  - Survival is low across winter
  - Weather patterns matter!

What a wondrous experience
to sit at the edge of a salt marsh
and hold a beautiful little mouse,
small and docile, soft and shy.
Why worry about such a mouse
when markets are low and gas is high?
It matters because when species disappear
they disappear forever and we have less.
I've worked to save this little mouse
so that in the future there will be
marshes down at the edge of the Bay
and in them salt marsh harvest mice,
little mice that have a right to be there
no matter how small or hidden from sight.
You'd understand if you could see one
in a salt marsh in dawn's early light.

- Howard Shellhamer



Lunch Break!

Suisun Hill Walk

Structure and Connectivity, Sea Level Rise, Tidal Restoration Concerns, Tidal & Diked Wetlands: