USE OF *EXTINGUISH PLUS*™ TO REDUCE RED IMPORTED FIRE ANTS AND INCREASE NORTHERN BOBWHITE ABUNDANCE

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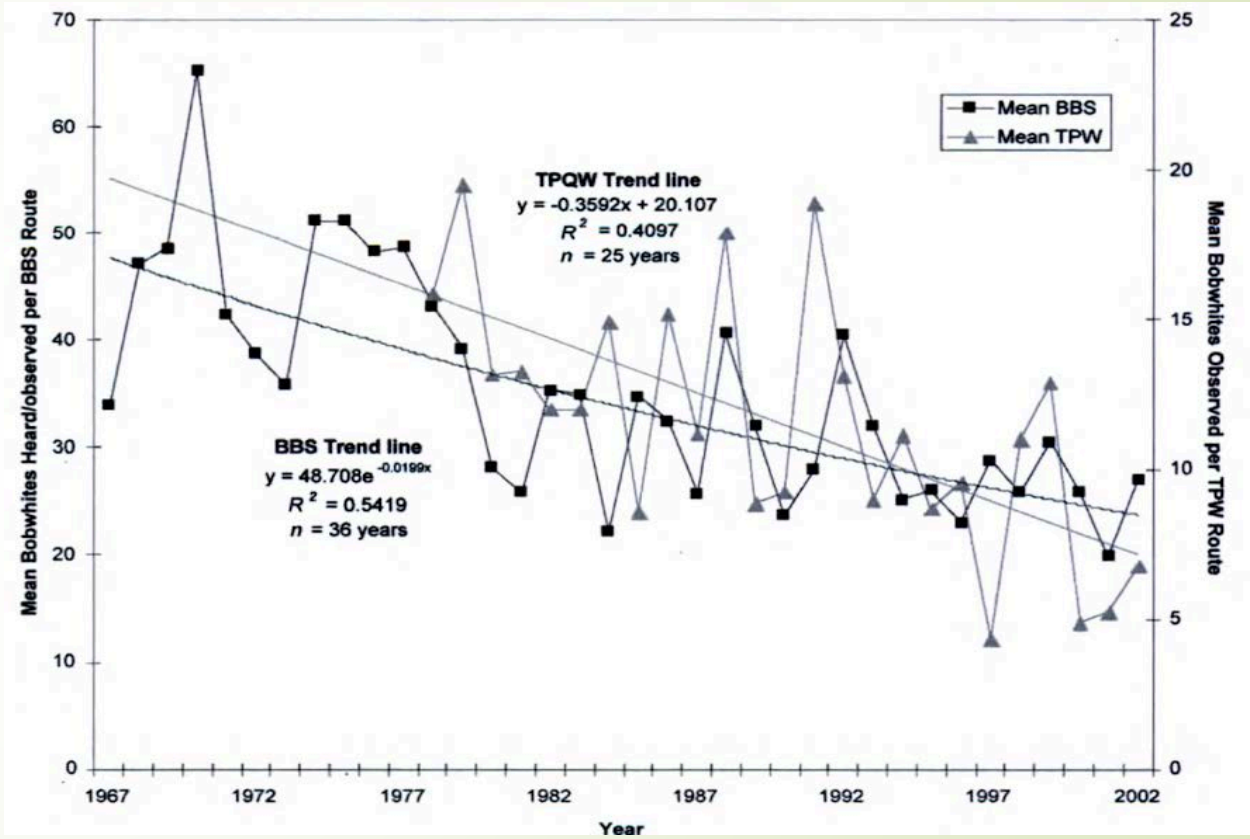
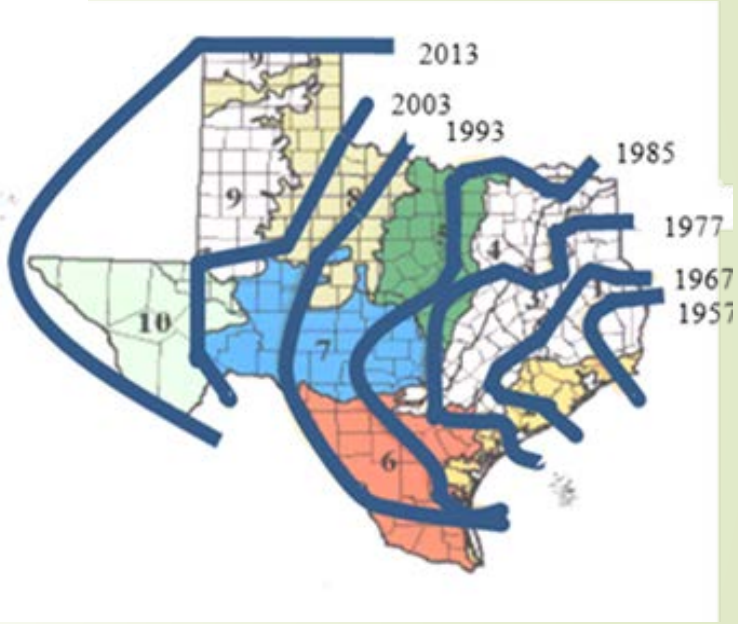
Background: Northern bobwhite (*Colinus virginianus*)

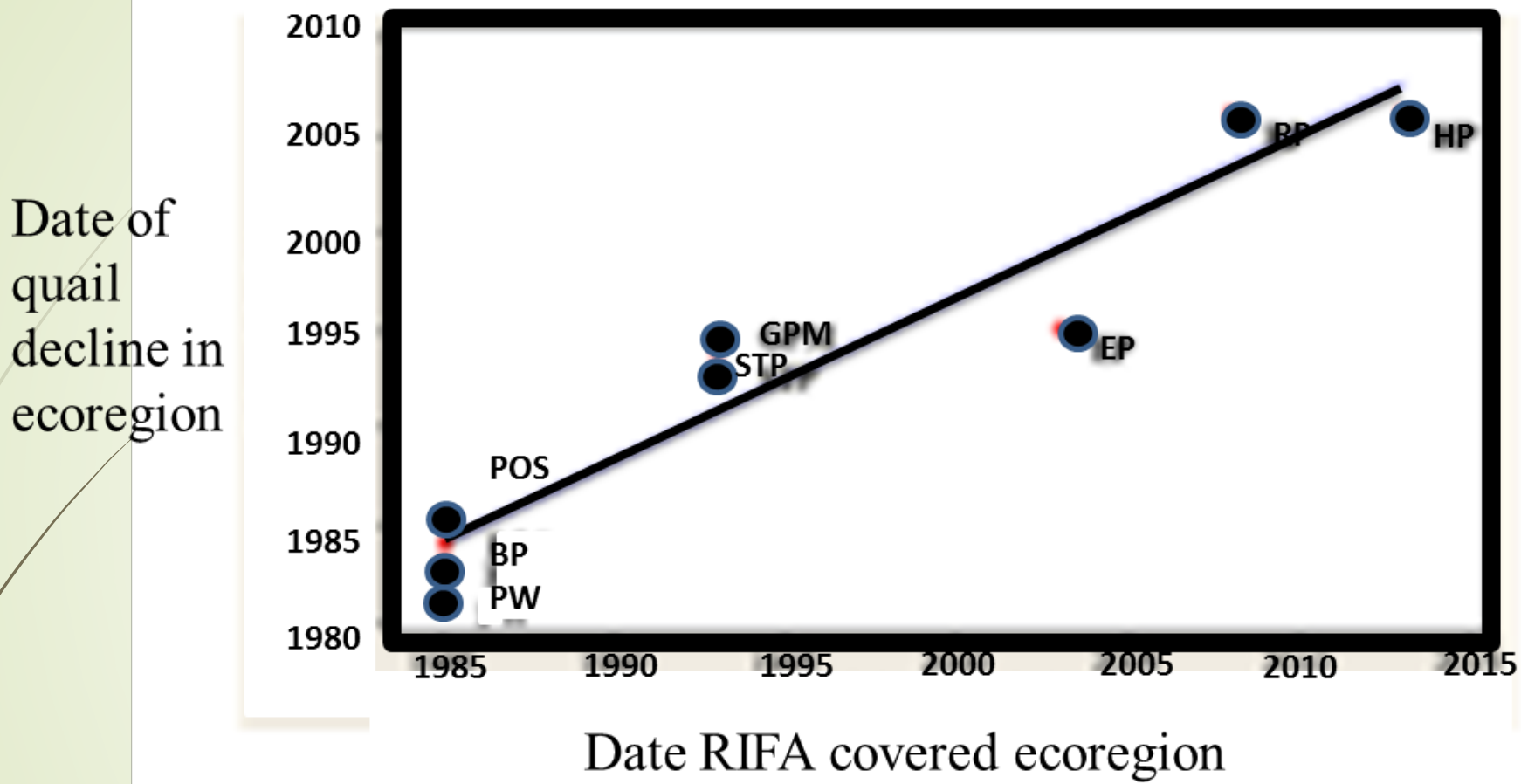
- Widespread declines across their historic range since the 1960s (Williams et al. 2004)
- Fragmented populations are vulnerable to local extinction with the occurrence of a catastrophic event (Brennan et al. 2005, Perez 2007)



Background: Red imported fire ants (*Solenopsis invicta*, RIFA)



- Began its establishment in the Gulf Prairies and Marshes in 1957 (Vinson and Sorensen 1986)
- Correlation between bobwhite population decline and presence of RIFA (Allen et al. 1995)
- Suggested effects of RIFA on bobwhites
  - Direct predation of pipping chicks
  - Reduced chick survival from RIFA stings
  - Competition over invertebrates as a food source

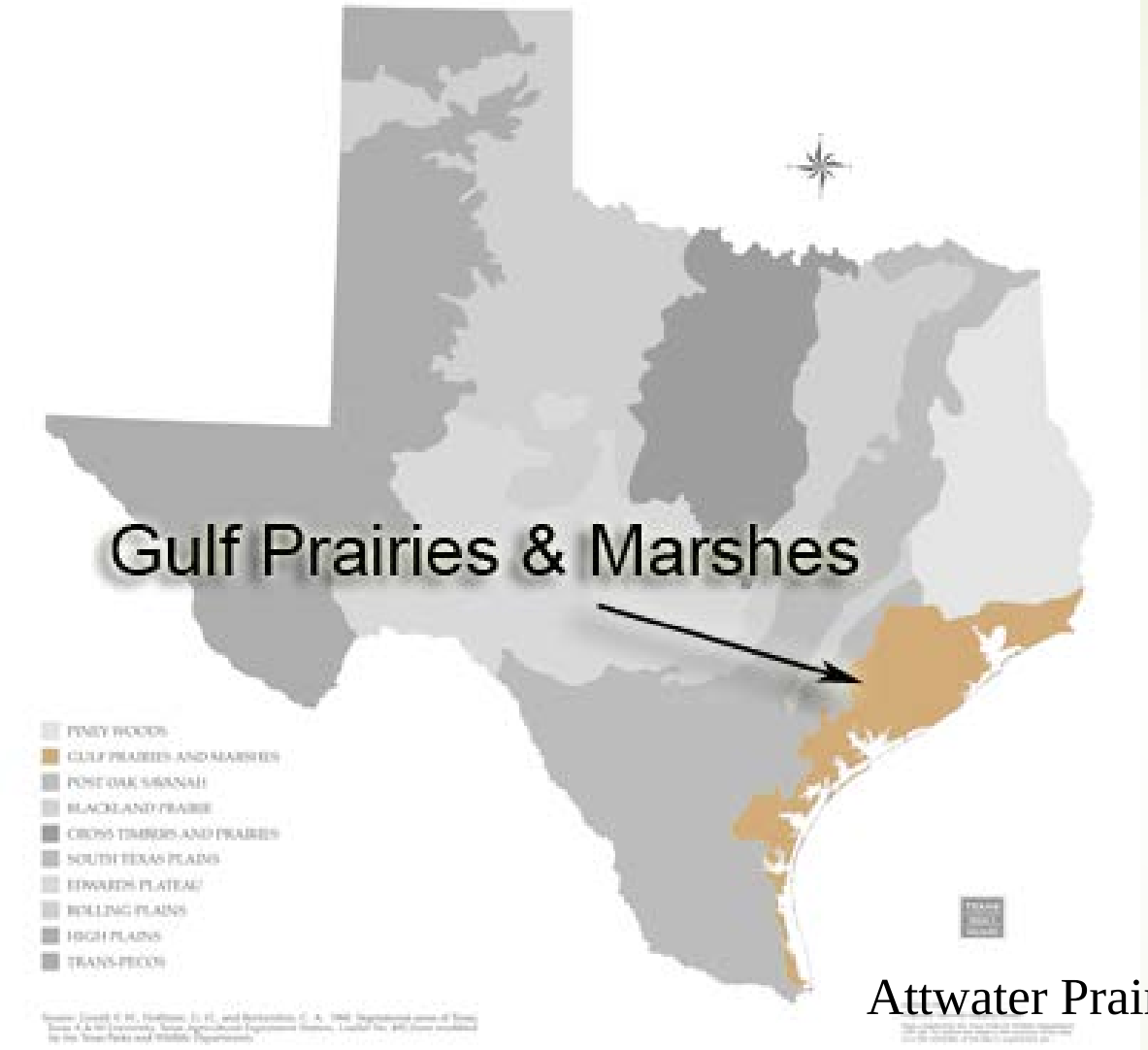


Date of bobwhite decline by date RIFA covered majority of ecoregion ($R^2 = 90.2, P = 0.0001$).

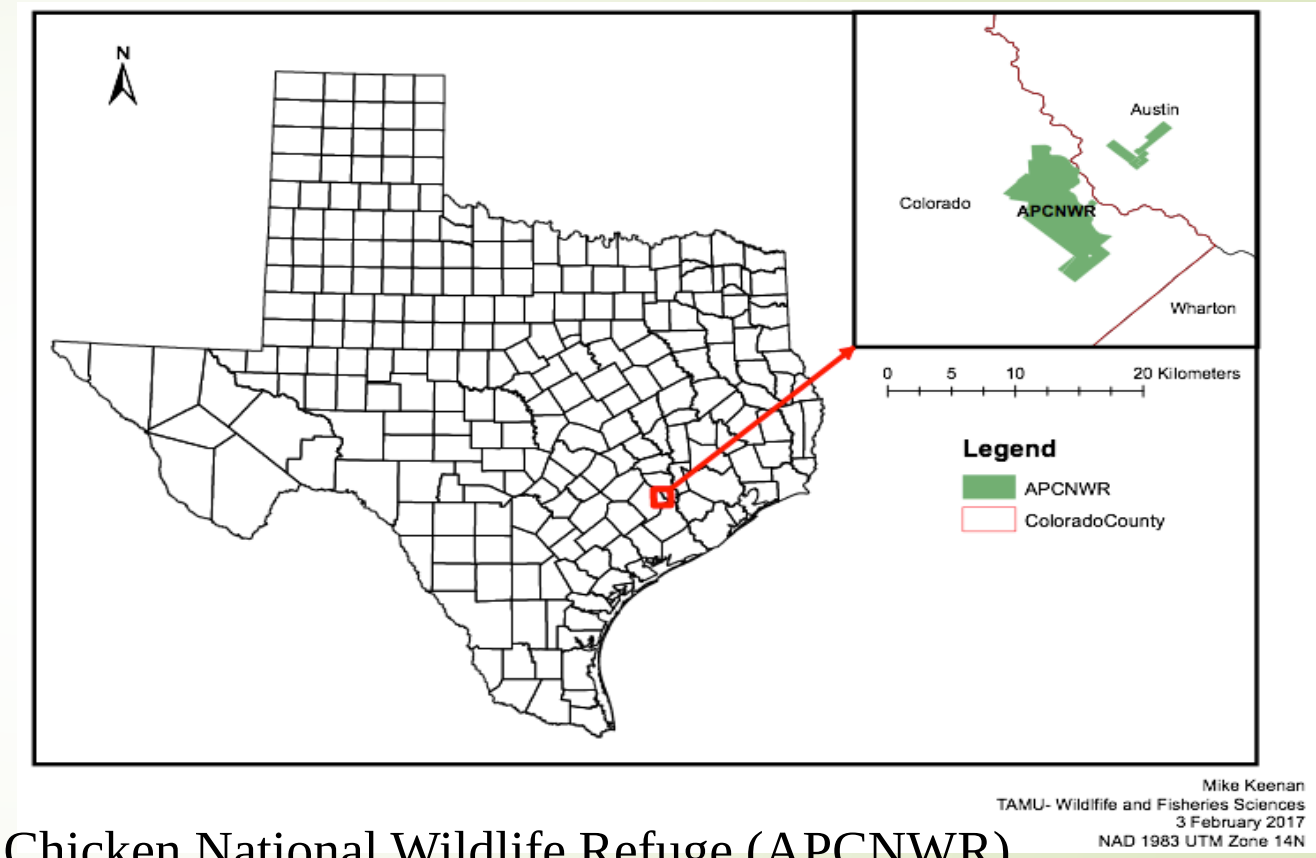
Objectives

- Our research hypotheses were:
- (1) Treatment of areas with *Extinguish Plus*^{TM} would reduce the abundance of RIFA
- (2) bobwhite nest success would be higher in areas treated with *Extinguish Plus*
- (3) bobwhite brood survival would be greater in areas treated with *Extinguish Plus*
- If significantly more bobwhite chicks survived to fledgling age and more fledglings survived to adulthood in the treated areas of the refuge than in the non-treated areas, it could be inferred that chemical reduction of RIFA was successful at increasing bobwhite nest success and brood survival.

Study Area

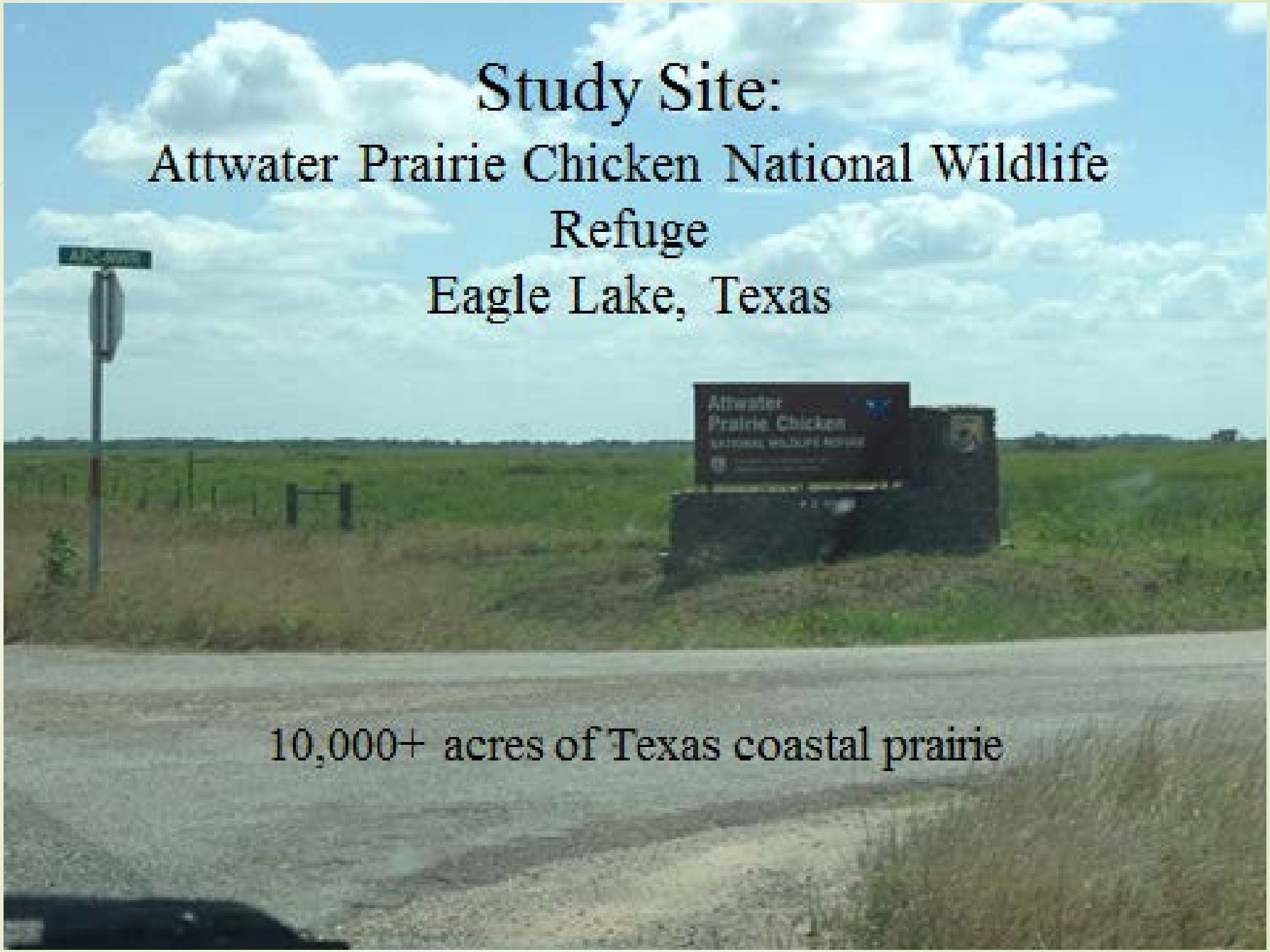


https://tpwd.texas.gov/education/hunter-education/online-course/wildlife-conservation/texas-ecoregions

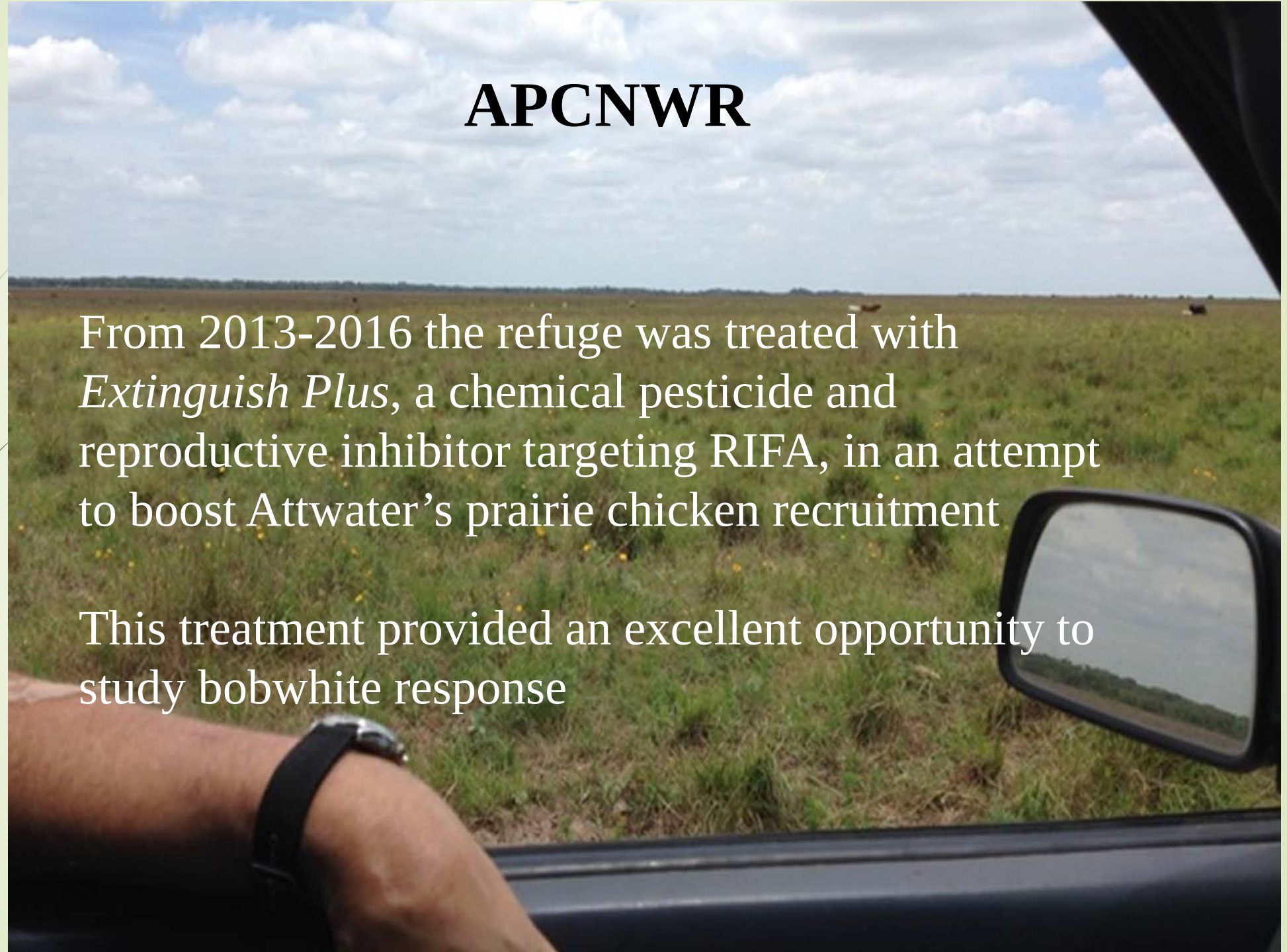


Attwater Prairie Chicken National Wildlife Refuge (APCNWR)

97 km west of Houston, Texas


Study Site:
Attwater Prairie Chicken National Wildlife Refuge
Eagle Lake, Texas
Attwater
Prairie Chicken
10,000+ acres of Texas coastal prairie

APCNWR



From 2013-2016 the refuge was treated with *Extinguish Plus*, a chemical pesticide and reproductive inhibitor targeting RIFA, in an attempt to boost Attwater's prairie chicken recruitment

This treatment provided an excellent opportunity to study bobwhite response

Fire Ant Control

2013 **2014–2015** **2016**

Methods: RIFA Sampling

- Randomly selected sites within pastures
- 13 treated and 13 non-treated control
  - 26 sampling sites/month
- Dual samples at each site with 2 Petri dishes placed 3 m apart
- 20 minutes of exposure

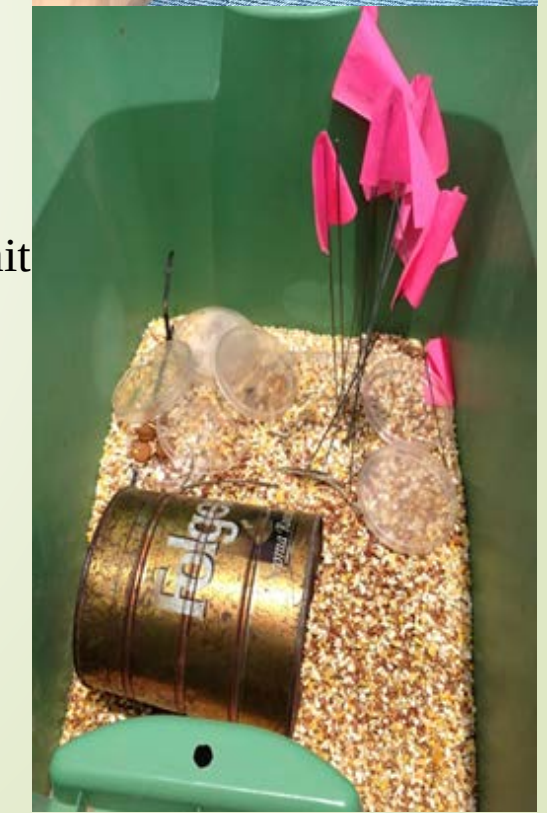
Trapping and Marking

Bobwhites were trapped (AUP: IACUC 2014-0012) using funnel traps (Kuvlesky 1989).

Trap locations were pre-baited weekly with commercial grain mixes which included cracked corn, milo, sunflower, millet, and wheat seeds.

In 2014, bait stations were placed along13.0 km of roads in both treated and non-treated areas. However, from 2015 through 2016, bait stations were placed along 15.1 km of roads in the treated area and along 10.2 km or roads in the non-treated area.

Bobwhites were aged, sexed (Lyons et al. 2012), weighed, banded, and fitted with an 8.0 g (approximately 4% body weight) neckless style radio transmitter (150MHz; Wildlife Materials, Carbondale, Illinois).



Methods: Bobwhite Relative Abundance

Mark-recapture methods (Pierce et al. 2012) were used to calculate estimates of adult bobwhite relative abundance near our traps in 2014, 2016, and 2016. We used a modified Schnabel method using only known (recaptured or observed after each estimate) adult birds alive at the time of each estimate as the total number marked (Silvy et al. 1977) to obtain conservative relative abundance estimates of bobwhite using our trap sites during June of each year.

Methods: Bobwhite Nest Success

- Females were tracked ≥4 times per week
- Nests located after female was found in the same place 3–4 consecutive tracking sessions
  - Tried not to flush female from nest
  - Nest details were noted and GPS location taken
- Nesting females were monitored 2–3 times per day, and if a female was located off the nest for 3–4 consecutive tracking sessions, then the nest was checked to determine if the nest had hatched or failed.

Methods: Brood Survival

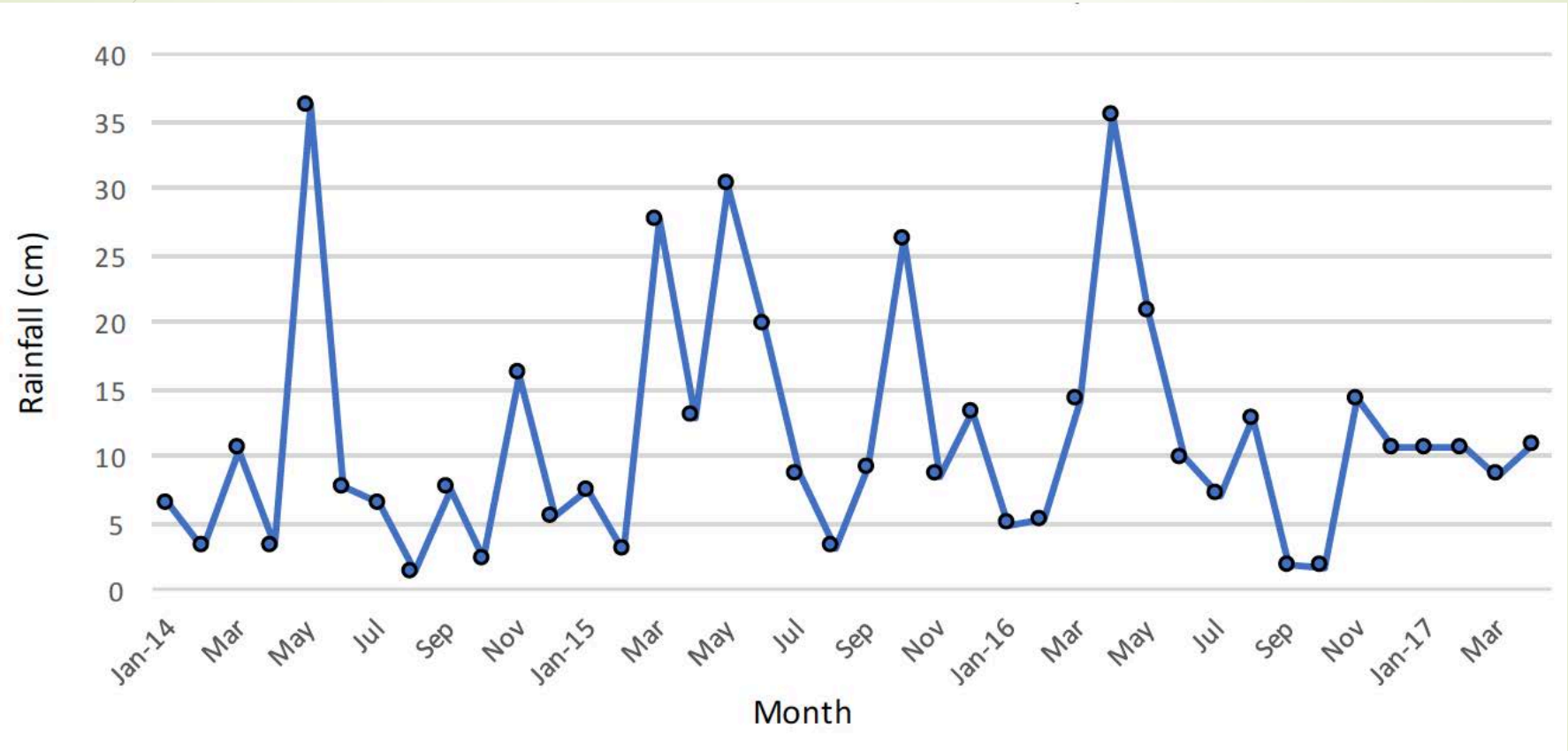
To estimate brood survival without influencing brood survival by flushing radio-tagged hens with broods we recorded all females sighted or trapped with and without broods in treated and non-treated areas and recorded the number of chicks per brood. These data were collected once the first brood was sighted (usually June) and continuing until 31 August of each year. Broods were sighted while driving refuge roads while collecting data for other aspects of this study.

To determine the number of females without broods, we used our female relative abundance estimates in treated and non-treated areas as total females available for these areas. To obtain an estimate of females without broods, we subtracted the number of females with broods from the total number of females available from our relative abundance estimates.

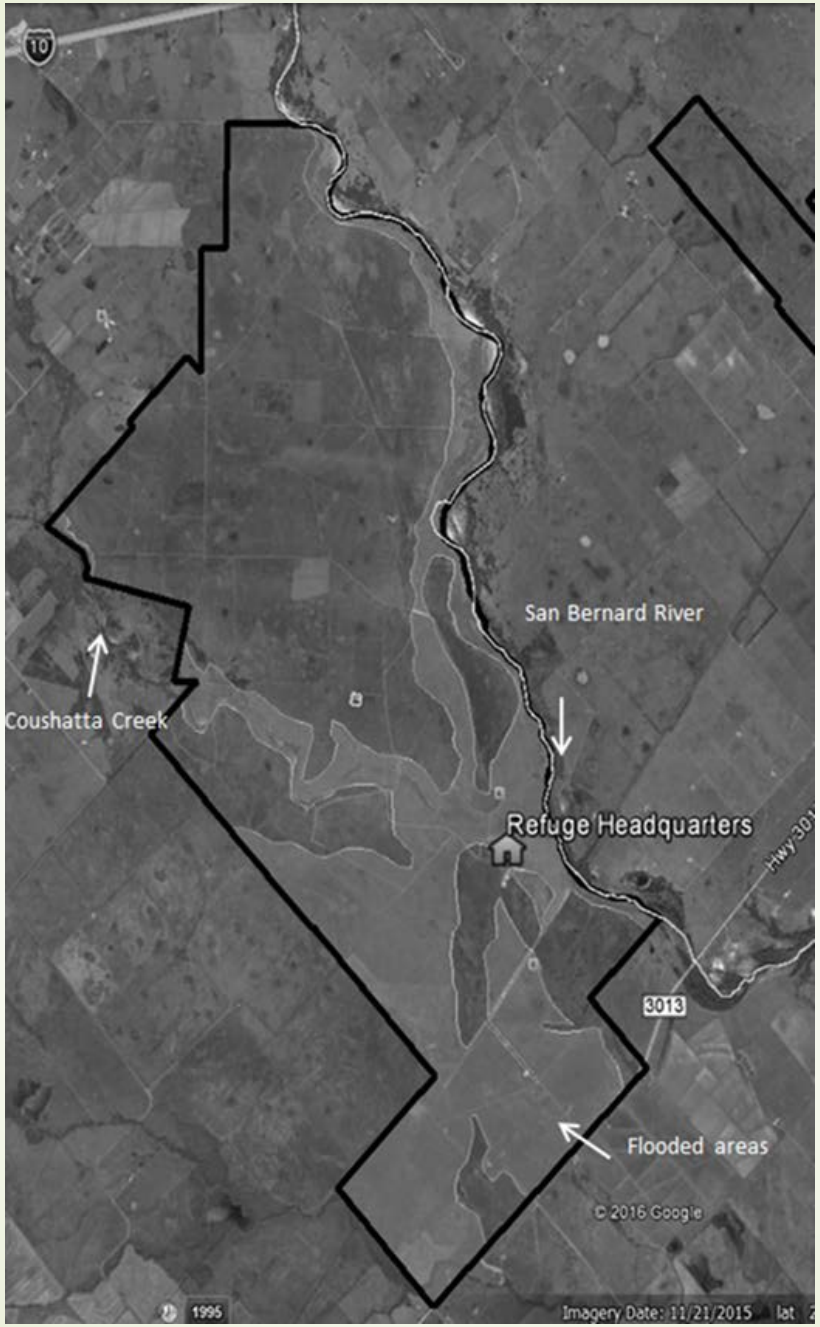
Results: RIFA Sampling

- 99.6% reduction in RIFA from 2014–2016
- However, after 16 April 2016 flood, more RIFA in treated area
- Factors that influence treatment effectiveness:
  - Flooding (RIFA Rafting)
  - Freeze (18^{o} F) during winter 2016
  - Adjacent un-treated areas

Precipitation



16 April 2016 Flooding on Refuge



Map generated by John Magera, Attwater Prairie Chicken National Wildlife Refuge, based on his personal observations of the flooding.

Results: Bobwhite Relative Abundance

- June 2014: 83 (95% CI = 71–95) individuals (54 treated and 29 non-treated)
- June 2015: 82 (95% CI = 64–100) individuals (49 treated and 33 non-treated)
- June 2016: 87 (95% CI = 47–108) individuals (60 treated and 27 non-treated)
- June 2017: 53 (95% CI = 36–70) individuals (43 treated and 10 non-treated) in the areas influenced by our traps

Results: Bobwhite Relative Abundance (Catch per Trap Site)

- Another estimate of bobwhite relative abundance is catch per trap site. The mean number of adult bobwhites captured per trap site was higher in non-treated (2014 = 7.5, 2015 = 4.5, and 2016 = 10.5) than treated (2014 = 5.6, 2015 = 2.9, and 2016 = 8.3) areas during all years suggesting bobwhite relative abundance was greater in non-treated areas.

Results: Nest Success

- 20% for all 3 years (2014-2016) in treated areas
- 18% for all 3 years in non-treated areas; however, 27% lost due to flooding in 2016

Results: Brood Success (Sightings)

- Pooled data 2014-2016 found a significant (χ^2 = 11,009, *df* = 1, *P* < 0.001) difference in the number of hens sighted with broods vs. without broods between non-treated (*n* = 56 hens, *n* = 20 hens with broods) and treated areas (*n* = 77 hens, *n* = 15 hens with broods).
- During 2014 and 2015, the treated area yielded a mean of 6.1 chicks per brood sighted compared to 8.9 chicks per brood in non-treated areas. Non-treated areas had a significantly (*t* = 2.51, *df* = 12, *P* = 0.027) larger mean brood size, which is a trend opposite that which we had hypothesized.
- However in 2016, the mean brood size for treated (7.7) and non-treated (8.4) areas was non-significant (*t* = 0.32, *df* = 12, *P* = 0.754).

Results: Brood Success (Hatch-year chicks)

- Further support of this was the fact that more (n = 28) hatch-year chicks were trapped in 11 traps in the non-treated site traps than the hatch-year chicks (n = 23) trapped in the 16 treated site traps in 2014.
- Trapping was discontinued on 31 July 2015 prior to any hatch-year chicks being captured because the initial 2 years of funding had ended and a final report was due on 31 August 2015.
- However, trapping results (June–August) in 2016 also indicated there were more hatch-year chicks produced in the non-treated area (34 chicks trapped in 15 traps) than in the treated area (19 chicks trapped in 16 traps).

Conclusions:

- Based on our study, the following conclusions were drawn:
- 1. Treatment with *Extinguish Plus* reduced RIFA relative abundance in 2014 and 2015, but not in 2016.
- 2. Because of small sample size, we could not conclude if treatment with *Extinguish Plus* improved bobwhite nest success in 2014, 2015, or 2016.
- 3. Treatment with *Extinguish Plus* did not improve the percent of female bobwhites with broods or the mean brood size per female.
- Based on the results of our research, the use of *Extinguish Plus* to reduce RIFA did not lead to higher bobwhite relative abundance. It is possible that our results are related to factors other than those which we researched such as predator abundance and vegetative succession differences between the treated and non-treated areas of the APCNWR during our study.

Funding and Support

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Questions?