

Distribution of Raccoons and Coyotes during Quail Nesting Season



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Introduction

During nesting season quail and their eggs are particularly vulnerable to predation by mammals.

The abundance of meso-predators such as raccoon and coyote has increased over the last 30 years.



Most mammalian predators are nocturnal so we know little of their hunting behavior.

Knowledge of the distribution and movements of nocturnal predators could improve opportunities in habitat management to limit predation of quail.

Study Area

Rolling Plains Quail Research Ranch
1,910 ha in Fisher County, TX.



Habitat

Predominantly (80%) grassland with scattered shrubs on loamy soils

Rocky ridge 9%, Wooded riparian ephemeral creek system 11%.

Surrounding area is dry-land cotton farms N and E, more ranchland and pasture W and S.

Methods

In 2009 and 2010, during the nesting season for bobwhites (April – Aug) we put Lotek GPS 6000S and SL collars on coyotes and raccoons.

GPS fix rate - 5 min intervals from 1 hr before sunset to 1 hr after sunrise.

Batteries lasted for 34 nights for raccoons and 42 nights for coyotes.

Good data from 4 male and 1 female coyote, 7 male raccoons and 4 female raccoons.



Analysis

Using ArcView 3 and ArcGIS 9 we analyzed:

Area use MCP for habitat use and KHR for distribution.

Habitat use Used Chi-squared χ^2 to compare % use vs availability of NRCS ecological sites on ranch and 3km buffer and within individual MCPs.

Path characteristics length and tortuosity by Fractal 5 program.

Use of roads, water and quail feeders by comparing animal distribution relative to random points on a Distance Analysis Grid.

Use of cactus infested grassland Compared % use of area infested with high, medium or low density prickly pear.

Coyotes



Coyotes: Distribution

Individual coyotes used areas of 533 ± 189 ha (95% KHR) associated on ranch grasslands and pastures.

Coyotes preferentially hunted in grassland on shallow ($\chi^2_1 = 5.99, P < 0.02$) and sandy loam ecological sites ($\chi^2_1 = 25.30, P < 0.0001$).

Avoided open crop fields (loamy prairie $\chi^2_1 = 7.34, P < 0.01$).

Did not avoid grassland heavily infested with cactus.



Coyotes: Individual Paths

Hunting path 9.06 ± 0.72 km/night.

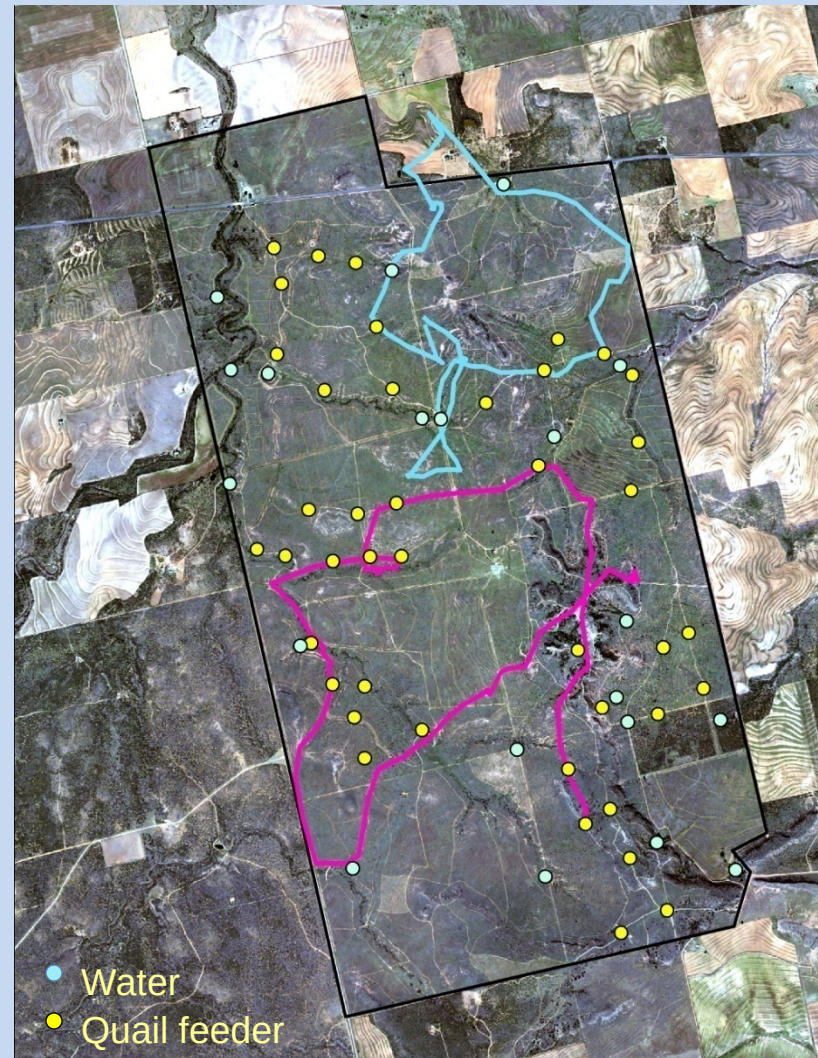
In fairly straight paths $FD = 1.08 \pm 0.01$ (1 = straight, 2 = random).

Tend to travel on roads ($\chi^2_1 = 6.92, P < 0.01$)

Investigate quail feeders ($\chi^2_1 = 23.33, P < 0.001$). Spent 5-10 min at feeders when encountered.

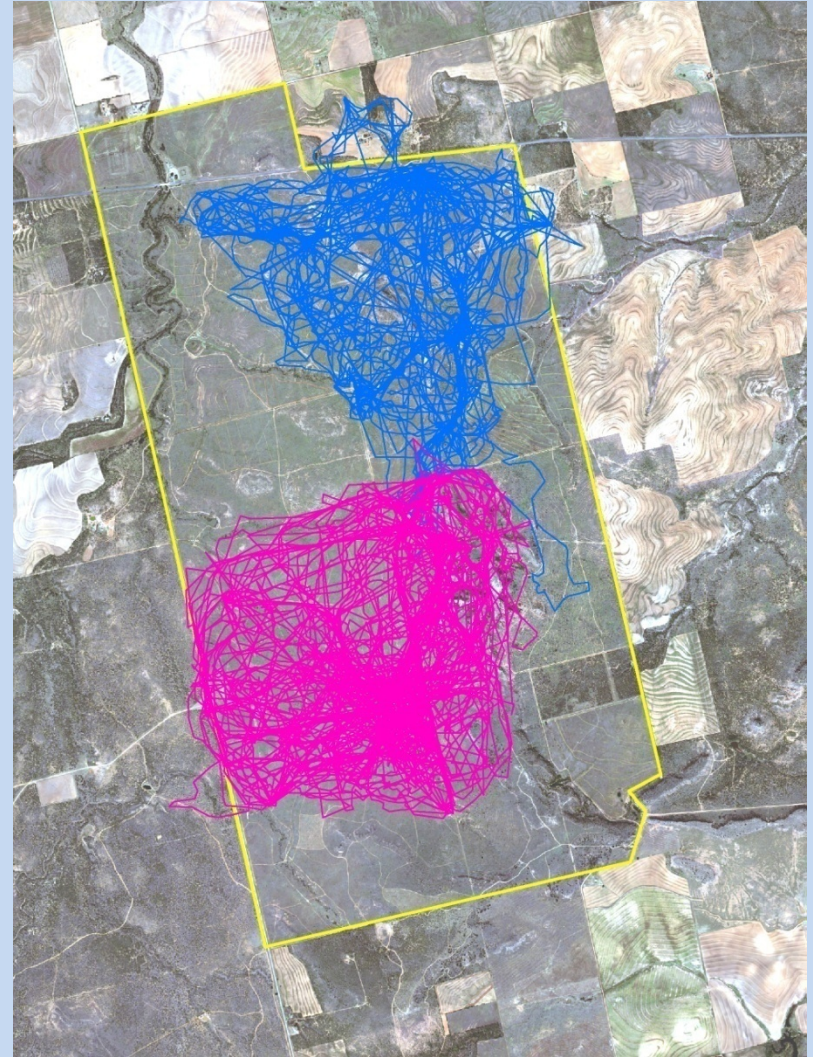
Distribution not related to water points.

Active during daylight hours.



Coyotes: Paths in 1 Month

Nocturnal paths of coyotes form an extensive network throughout the grassland.



Raccoons



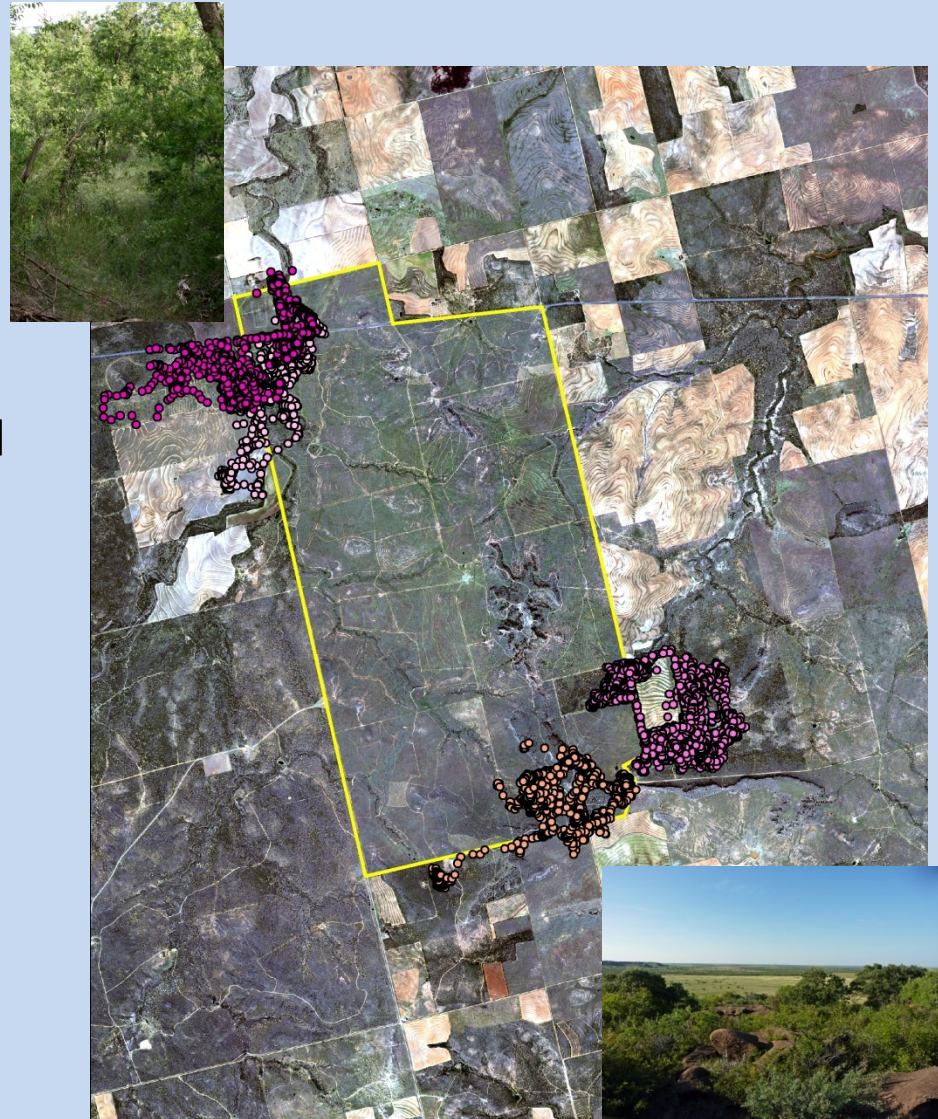
Female Raccoons: Distribution

Occupied small areas 129 ± 11 ha
(95% KHR).

Restricted to wooded riparian areas
(41.26%, $R^2=85.93$, $p<0.001$) and
rocky hillsides (23.50%,
 $R^2=57.89$, $p<0.001$) .

Avoided grassland and crop fields
($R^2=17.48$, $p<0.001$)

Did not encounter cactus areas
(mainly on clay loam grassland)



Male Raccoons: Distribution

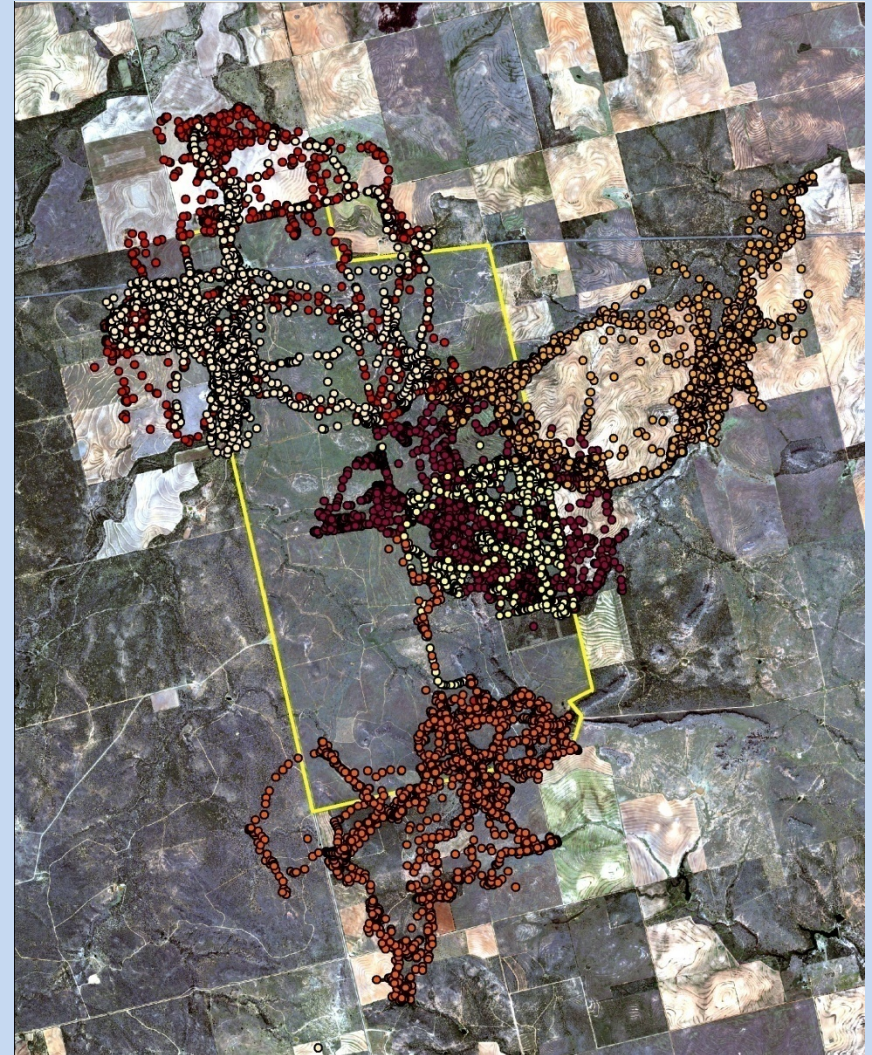
Used large areas of 729 ± 268 ha.

Favored same habitats as females,
(riparian woodland 25.22%,
 $R^2=19.25$, $p<0.001$, rocky hillside
15.09% $R^2=16.32$, $p<0.001$).

But also used grassland with denser
shrub cover (sandy loam 29.31 %
 $R^2=17.72$, $p<0.001$).

Avoided bare crop fields (Loamy
prairie $R^2=13.93$, $p<0.001$).

Avoided dense cactus ($R^2=7.72$,
 $p<0.01$).



Male Raccoons: Distribution

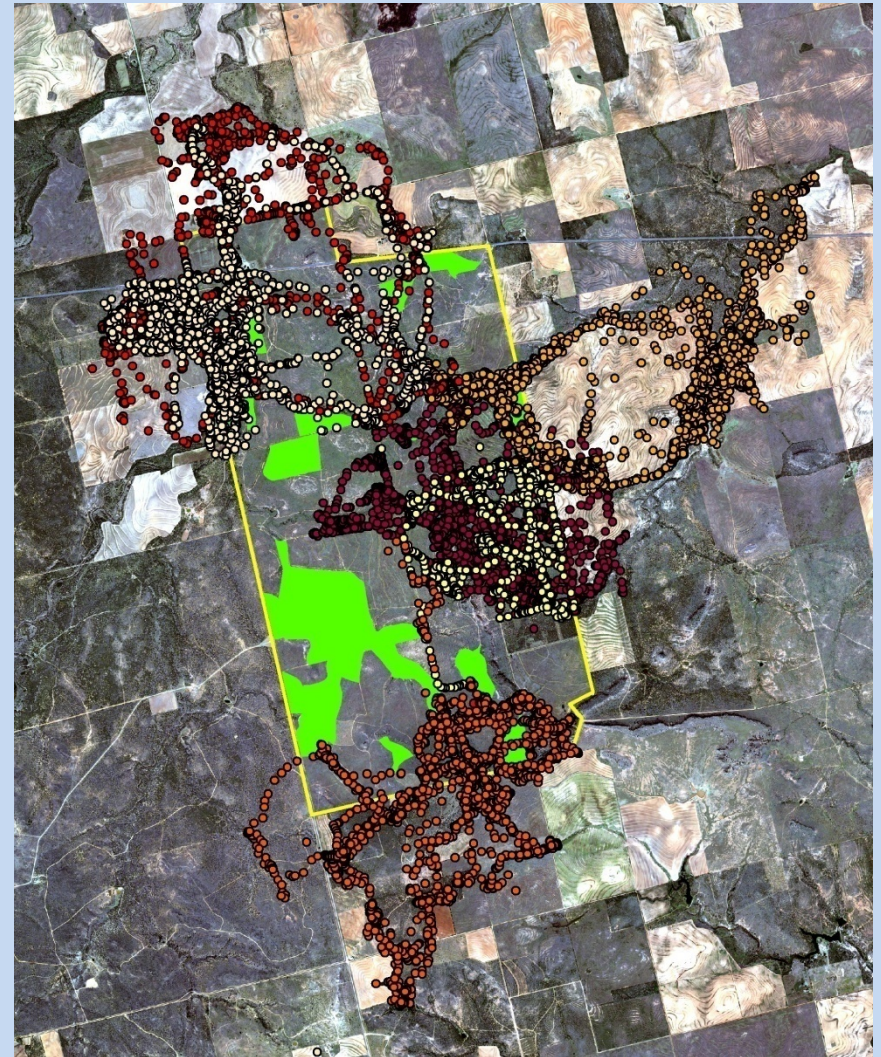
Used large areas of 729 ± 268 ha. 51% of activity is off ranch.

Favored areas of greater cover such as riparian woodland 25.22%, $R^2=19.25$, $p<0.001$, rocky hillside 15.09% $R^2=16.32$, $p<0.001$.

Males used grassland with denser shrub cover (sandy loam 29.31 % $R^2=17.72$, $p<0.001$).

Avoided bare crop fields (Loamy prairie $R^2=13.93$, $p<0.001$).

Avoided dense cactus  ($R^2=7.72$, $p<0.01$).

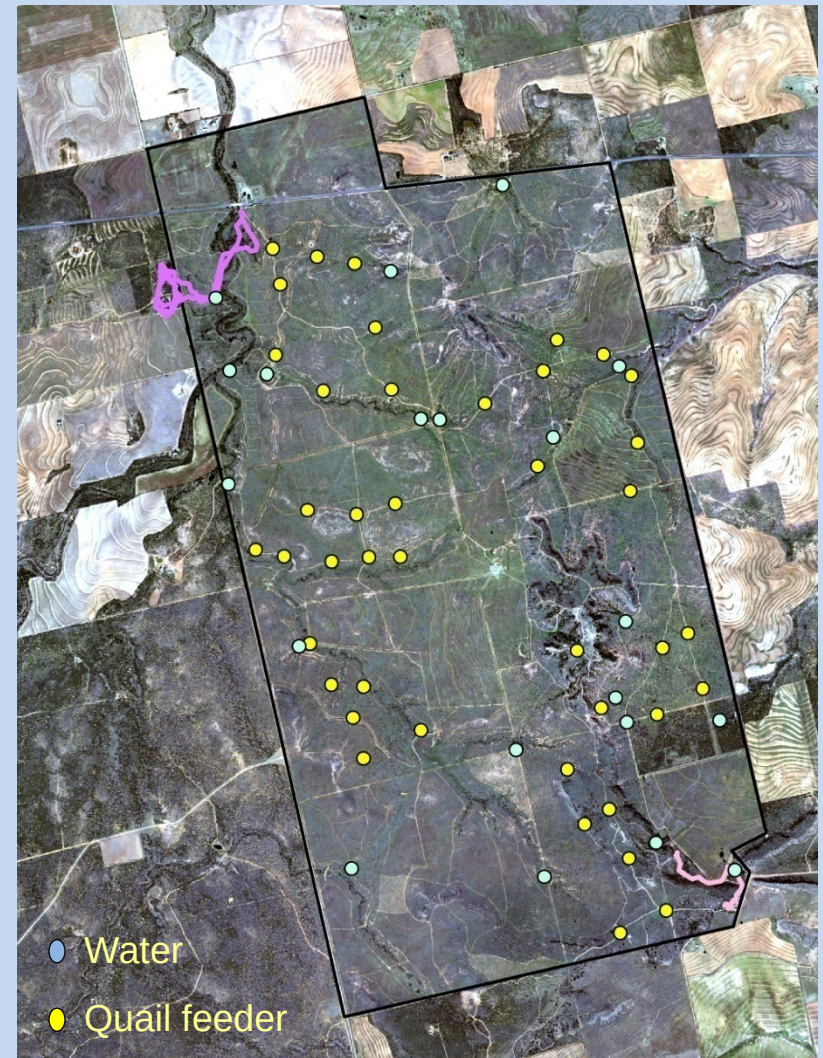


Female Raccoons: Individual Paths

Females traveled 3.48 ± 0.41 km/night.

More convoluted paths than males FD
 $= 1.17 \pm 0.01$ ($t_9=5.00$, $P < 0.001$).

Often return to a den.

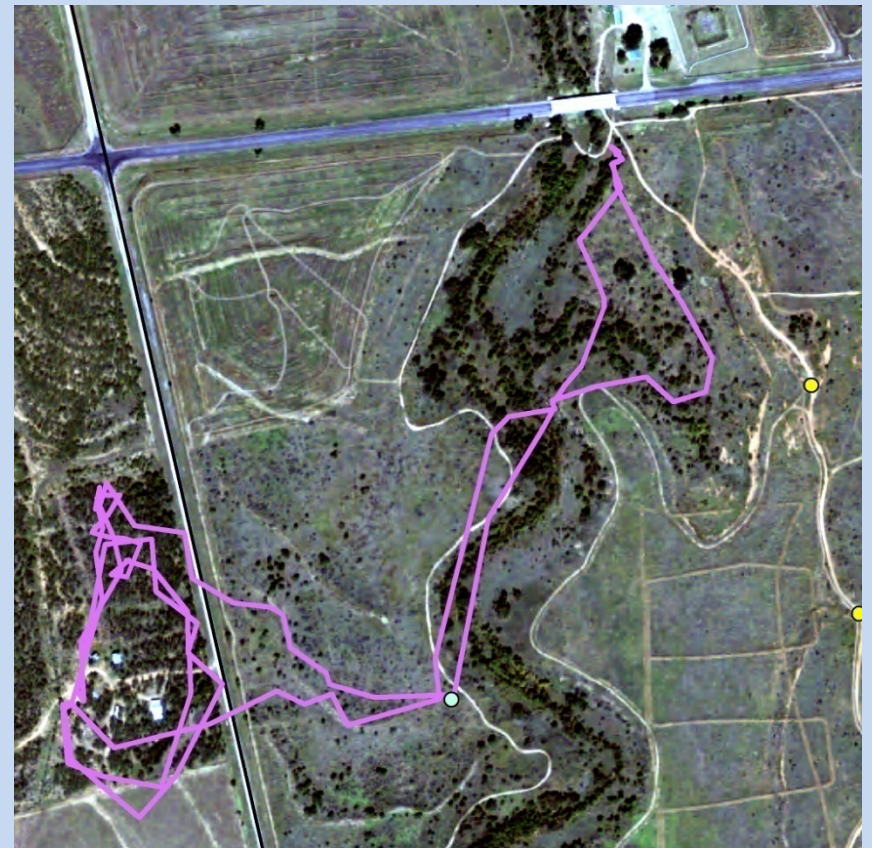


Female Raccoons: Individual Paths

Distribution of females not influenced by ranch infrastructure of roads and water tanks.

Only 1 out of 4 females used quail feeders (0.67% locations, $\chi^2_1 = 16.33$, $P < 0.001$)

But...only access quail feeders close to cover .



- Water
- Quail feeder

Male Raccoons: Individual Paths

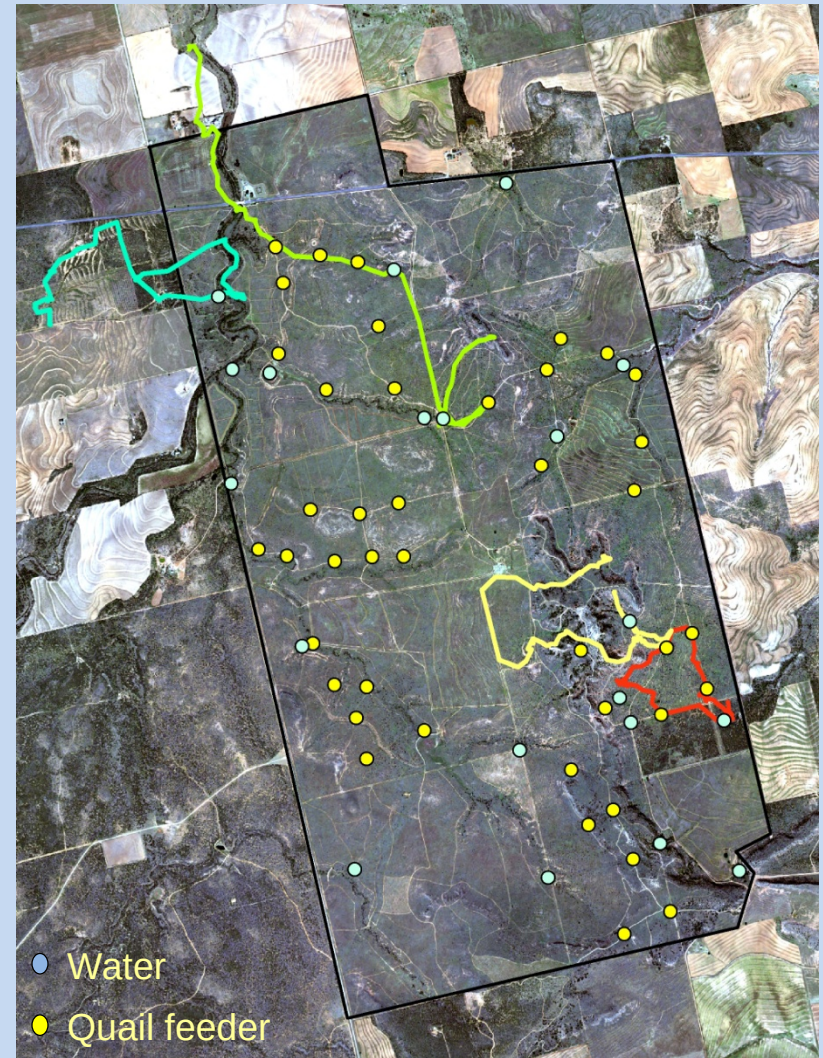
Traveled 5.51 ± 0.56 km/night.

Occasional long forays (8 km).

More tortuous paths than coyotes

FD = 1.11 ± 0.01 . ($t_{14}=3.57$, $P < 0.01$).

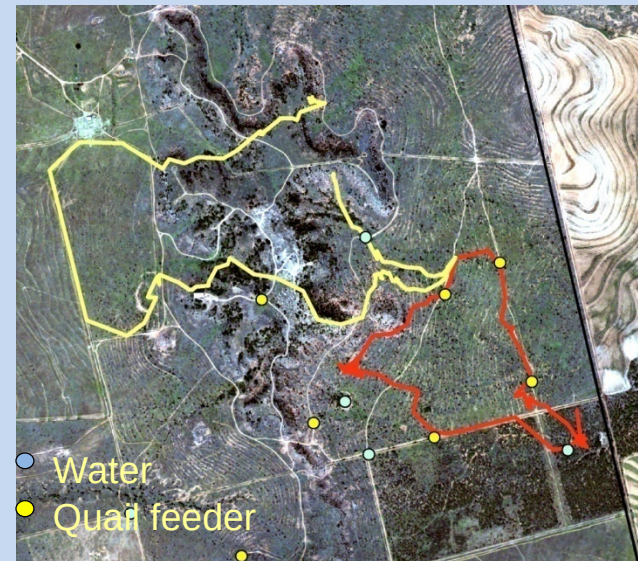
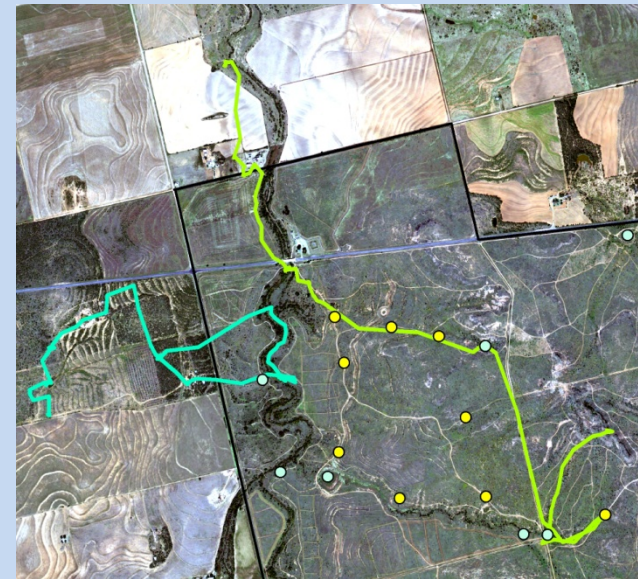
Traveled along roads, (on ranch 35.9% locations on the road $R^2=72.26$, $p < 0.001$).



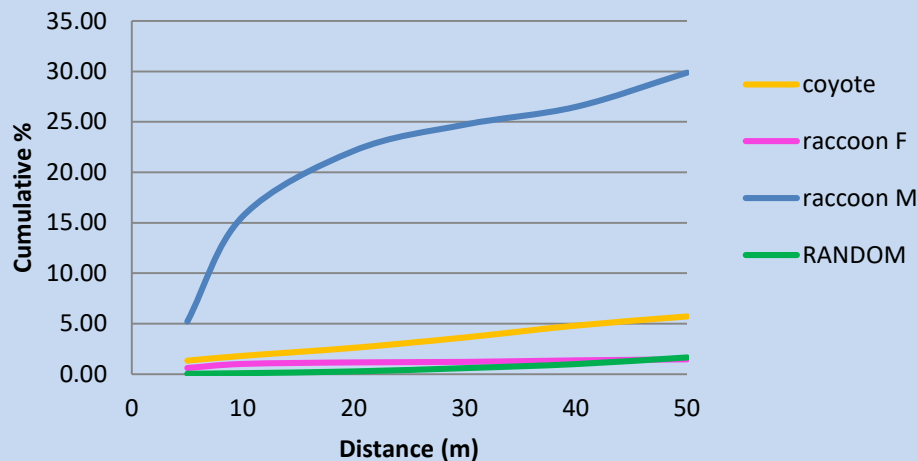
Male Raccoons: Individual Paths

3 out of 7 males were highly attracted to quail feeders (3.08% locations, $R^2_1 = 365.01$, $P < 0.001$).

Stayed at feeders for 5-10 mins, lingered within 50 m for 45-50 min.



Cumulative distance from feeders



29.9% fixes within 50 m of a feeder ($R^2 = 480.40$, $P < 0.001$).

Discussion: Predator Distribution as it relates to Quail Management



Predator activity in quail nesting habitat



Northern Bobwhite preferentially nest in grassland with a few scattered shrubs for cover.

Coyotes are most active in grassland. Their dense network of fairly straight foraging paths provide effective coverage of preferred quail nesting habitat and their hunting pattern is effective in locating scattered resources.

Raccoon use of open grasslands is limited but males use grassland where shrubs are available for cover. Their more tortuous foraging paths provide a tight search pattern most likely to detect hidden resources such as quail nests.

Which is worse?

Can coyotes protect quail from raccoon predation?

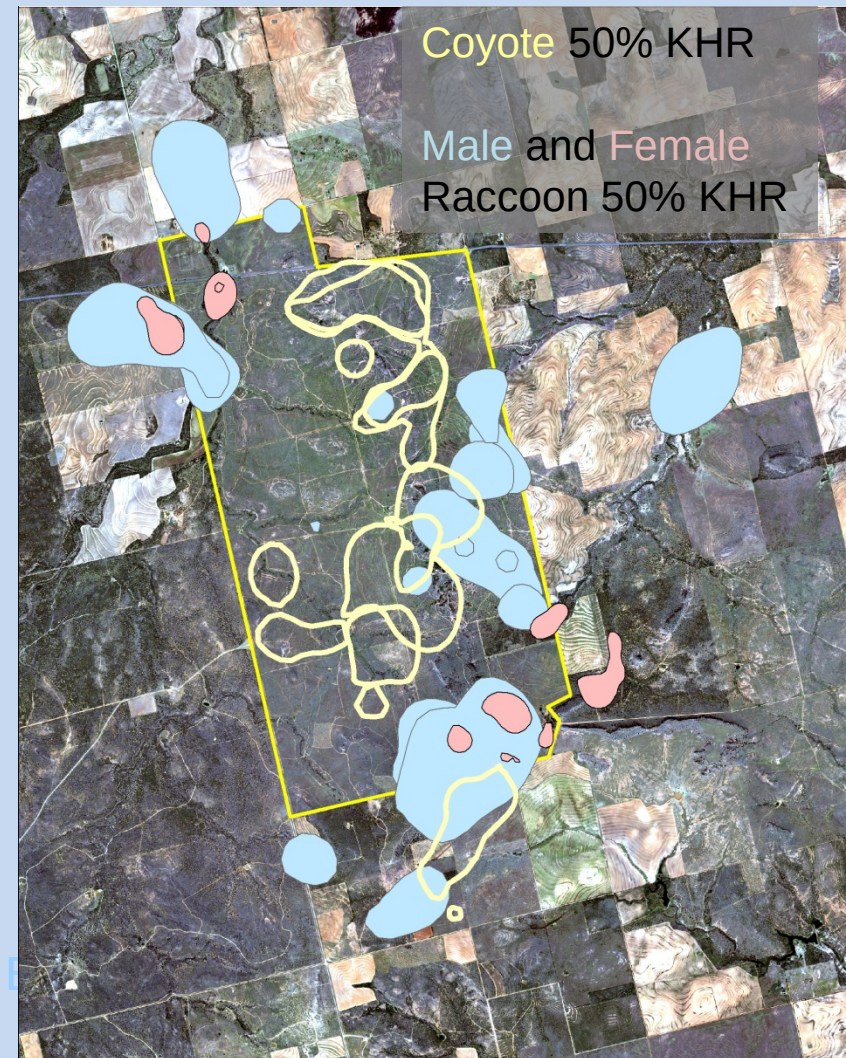
Competitive Exclusion? - Larger predators may restrict the distribution of smaller predators.

The coyote and raccoon predation is not additive. When both are present they tend to hunt in different areas.

50% core areas of coyotes and raccoons only overlap on the ridges.

If coyotes restrict the activity of smaller predators in grassland quail may benefit.

Depends on which predator is most harmful to quail - raccoons with detailed search pattern - or coyotes that cover large areas?



Does cactus protect quail from mammalian predators?

Prickly pear cactus in the grass is a problem to bird dogs, hunters and grazing animals but may protect nesting quail from raccoons.

Raccoons, but not coyotes, are deterred from hunting in grassland densely infested with cactus.

Leaving some cactus infested areas may provide protection for nesting quail.

How much do quail use these areas?



Does supplemental feeding attract predators into quail habitat?

Provision of supplemental feed for quail seems to attract male raccoons into quail nesting areas.

Weigh up the advantages of improved nutrition of quail versus increased risk of predation.

Only certain individuals use feeders heavily. Trap problem individuals at feeders.

Site feeders away from areas with cover for raccoons.





We thank our sponsors

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