Final Progress Report
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Title of project: Studies Of The Relationships Between Red Imported Fire Ants And Habitat Management For Deer

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Abstract:

We evaluated mechanisms by which RIFA might directly affect white-tailed deer populations. The second field season was just completed and data analyses are on-going. However, some preliminary results indicate that RIFA did not directly reduce survival of deer fawns. Fawn movements were increased when RIFA were present which could increase risk of predation in RIFA infested areas. We are continuing with other aspects of this study to determine whether wildlife habitat treatments affect RIFA abundance and distribution, or whether RIFA densities affect white-tailed deer use of habitats. This next biennium we will assess whether RIFA population distributions respond to brush management treatments in relation to degree of disturbance associated with past type, frequency, and spatial arrangement of treatments. Results from this research will give us greater insight into the spread of RIFA, particularly in relation to habitat management practices in Texas, and the impacts of RIFA on deer. This information can be used to assist landowners in making decisions about wildlife habitat improvements in areas with RIFA.

Introduction:

The red-imported fire ant (RIFA), a native of South America, is believed to have entered the United States via the port of Mobile, Alabama (Vinson and Sorenson 1986). Densities of RIFA have increased across the southeastern U.S. and range from 81-810 mounds/ha in our area (Allen et al. 1995). Though Stoddard (1931) documented individual wildlife mortalities caused by RIFA > 50 years ago, the impacts of RIFA on our wildlife resources are not known. Although, it is clear RIFA stings impact individual animals (Giuliano et al. 1996, Pederson et al. 1996), the potential for impacts on wildlife populations is unknown. Competition from or predation by RIFA may impact entire ecosystems (Roth et al. 1983, Allen 1993) or have little impact on wildlife resources Brennan (1991). Reduction of RIFA populations by insecticide treatment increased the density of both northern bobwhite and white-tailed deer populations in the Texas Gulf Prairie (Allen et al. 1995). Bobwhite quail brood survival was directly reduced by RIFA in the Texas Gulf Prairie (Mueller and Dabbert 1999). Direct effects of RIFA on white-tailed deer have been inferred from anecdotal evidence (Rollins 1989) but the mechanism (how, why, or how frequently this occurs) for RIFA impacts on deer is unknown.

Large-scale pesticide treatments to reduce RIFA may reduce these direct effects but they are expensive and may not be a solution for all landowners. Reducing the distribution or abundance of RIFA through changes in land management practices may be economical and effective. We want to ensure that we do not encourage the spread of RIFA through wildlife habitat manipulations. Both white-tailed deer and northern bobwhite populations are tied to early successional habitats that are maintained via disturbance. Mechanical manipulations, herbicide treatments, and fire are all commonly used to improve or maintain habitat for deer and quail (Guthery 1986). Such disturbance may also make habitats more suitable for ants (Tschinkel

1988) which could offset the expected benefits of treatments if they increase competition and predation by RIFA. We do not know how RIFA respond to different wildlife habitat treatment types or application patterns. Wildlife managers should pick the treatment that maintains habitat for wildlife but minimizes proliferation of RIFA. Currently no data are available from which to make such decisions.

Objectives:

The overall objectives of this study were to evaluate the effects of RIFA on white-tailed deer populations. To determine if RIFA have a direct effect on deer populations, we first examine whether RIFA cause deer mortality directly or increase the risk of mortality from other causes. If deer survival is affected by RIFA then the distribution and abundance of RIFA in habitats managed for wildlife must be examined to determine whether the distribution or abundance of white-tailed deer in those areas is affected by RIFA. Finally, if deer distribution or abundance is affected by RIFA, the response of RIFA to brush control practices used as habitat management for wildlife must be evaluated to test whether RIFA populations expand in relation to type, frequency, or juxtaposition of brush control treatments. We address the first of these objectives with this portion of our study.

Methods & Materials:

This study was conducted on the Welder Wildlife Refuge, San Patricio County, Texas (29°0'30"N, 97°32'0"W). The refuge lies in a transitional zone between the Gulf Paries and Marshes and the South Texas Plains (Drawe 1997). The dominant soil type on the refuge is Victoria clay, covering over 50% of the refuge, though soils ranging from clays to fine sands can be found (Drawe et al. 1978). Existing deer exclosures at the Welder Wildlife Refuge were modified to create 4 treatment (RIFA present), and 4 control (RIFA eradicated) exclosures (avg.

7,200 sq'). Exterior fence was 10' high, with the bottom 4’ consisting of 2”x4”, 16 gauge welded wire to prevent fawns from escaping or becoming caught in the fence. All fences were covered to a height of 6’ with Visqueen> mat to reduce disturbance to deer from outside the enclosures. A barrier of 20” metal flashing inserted 10-12" deep into the ground and coated with baby powder (**) was installed outside of but completely enclosing the control exclosures. RIFA mounds were surveyed, mapped, and rated using the colony vitality index (Lofgren and Williams 1982) inside the exclosures using a complete count method. Three weeks prior to putting deer in the exclosures, RIFA were eradicated inside the control exclosures using Amdro> and Diazinon>. Amdro> (1.5 lbs./acre) was applied using a broadcast spreader. Followed by the application of Diazinon> (1 oz/gallon water) directly onto all mounds mapped in the control exclosures. Amdro> was also applied “liberally” between the exterior of the exclosure and the metal flashing surrounding the control exclosures. Pesticide was not applied inside the exclosures when the deer were present to avoid unnecessary disturbance and possible ingestion.

Fences were marked at 10' intervals to create a grid system to facilitate recording locations of deer or RIFA mounds within the exclosures. Deer (gravid does) were captured from habitats adjacent to the exclosures on the Welder Wildlife refuge by helicopter net-gun (Krausman et al. 1985) or with drop nets (Ramsey 1968). Captured animals were marked and transported to the exclosures where 2 does were randomly assigned to each of the 8 exclosures.

Does were observed and monitored for condition daily and were fed Lyssy and Eckel> 20% protein deer pellets and alfalfa hay ad libitum. Water was provided in troughs in each exclosure. At birth or upon discovery, each fawn born was weighed, ear-tagged, and examined for any signs of fire ant stings, then replaced with its mother in the exclosure. All procedures followed

accepted animal welfare guidelines and were approved under Texas Tech Institutional Animal Care Committee protocol # 98738

Experimental design:

Fawns were observed from date of birth until 28 days of age. Fawn activity patterns were sampled using 10-minute focal animal sampling (Altmann 1974). Each fawn was observed as a focal animal ³ 4 times/day, and ³ 1 time/day in each of the following intervals: 0700-1000, 1000-1300, 1300-1600, and 1600-1900. The duration of time spent in and frequency of changes between each activity was recorded for each 10-minute sampling period. Location of fawns was charted for all sampling intervals. Fawn movement was recorded by marking the number of grid cells a fawn was located in during an observation period. Additional information recorded included the duration and frequency of licking, nursing, and vocalization by fawns.

RIFA encounter rates were surveyed for each exclosure 6-7 times/day using bait cups containing a 1" slice of hot dog (Mueller et al. 1999) placed along the fence of each exclosure. Placement alternated between the corridor fence and exterior fence and the exact position was randomized. Bait cups were collected after 60 minutes, covered, and frozen. All ants collected were analyzed to determine species, and all RIFA were counted. Ground and shade temperatures were recorded at fixed locations at the end of each RIFA encounter rate survey.

A split plot arrangement with years as the main plot factor, in a completely randomized factorial design with treatments and years as the sub-plot factor, and repeated measures. The experimental unit will be an individual deer pen, and individual deer fawns will be samples within an experimental unit. Weather variability can not be accounted for in the design, as adverse weather may affect both deer fawn behavior and fire ant activity levels. The objective of using years as the main plot factor is to create two distinct CRD factorials in each of the two field

seasons, which may or may not be combined statistically, depending on whether there is treatment x year interaction and main effect significance in the ANOVA. Repeated measures will be used as we will be collecting data every day for 28 days and we are interested in discerning an effect at intervals within that 28-day period, not for the 28-day period as a whole

Results & Discussion:

We captured does (n=25) with helicopter net gun on 10 May 1998. Ten of these animals did not enter the study on 20 May 1998 (3 escaped from the exclosure; 7 died due to capture myopathy). Between 26 May - 23 June, 26 (6 still born; 1 euthanized b/c unable to nurse) fawns were born in the exclosures. We recorded >350 hours of focal animal observations on movements and activity of 20 fawns between 26 May - 15 August 1998. There was no mortality associated with RIFA, in fact we detected no overt signs of fawns being stung by RIFA in 1998. The study was initiated with RIFA mound densities in the exclosures of approximately 1 mound/405 sq' (mean 95 mounds/acre). RIFA encounter rates were assessed with >3,800 bait cup measures from May-August. The mean number of ants in bait cups for exclosures with ants was 134.7ants/cup-hour while there were 6.8 ants/cup-hour (>80% of these known to have originated from outside the exclosure) on the control exclosures. Drought conditions in 1998 caused measured RIFA encounter rates to decline from > 220 ants/cup-hour in May to < 70 ants/cup-hour in early July. The number of active mounds in the exclosures declined 79% by the end of 1998.

We captured 11 does in 1999 with drop nets. There were no mortalities with these captures. Fawns (n= 18) were born in 1999. We recorded >310 hours focal animal hours observing movements and activity of 17 fawns between 20 May - 30 July 1999. In 1999, RIFA encounter rates were assessed with > 3900 bait cups. Exclosures with ants averaged 180.9 ants/cup-hour while the control exclosures averaged 6.8ants/cup-hour with the majority (actual %

not yet determined) from outside the control exclosure. There 86 RIFA mounds/acre in the exclosure with ants did not change significantly over the 1999 season. Observational data for the 1999 season are still being analyzed. However, there were no fawn mortalities associated with RIFA. We detected overt signs of fawns being stung by RIFA only 4 times. When stung by RIFA, fawns exhibited markedly increased movements which usually lasted < 5 minutes before the animal settled back to normal behaviors.

Conclusions:

Data analyses are still being completed. However, some preliminary conclusions can be made. RIFA did not cause white-tailed deer fawn mortality by stinging them. Over 1,300 hours of observation of 38 fawns did not detect any instances of fawns remaining bedded or hiding while being stung by RIFA. Spatial analyses have yet to be done, but fawns may avoid bedding on RIFA mounds and encounters seem to be limited. Fawns that were obviously stung by RIFA did exhibit behaviors that would increase their risk of being detected by potential predators like coyote and bobcats.

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