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Alternative Baits for Minimization of Non-target Species Usage in an Eastern Gray Squirrel (*Sciurus carolinensis*) Contraceptive Project



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Introduction

The eastern gray squirrel (*Sciurus carolinensis*) (EGS) is a common nuisance species, but a new means of limiting EGS populations is being tested on Clemson University's campus by orally administering the drug DiazaCon™ using coated sunflower kernels. DiazaCon™ has already shown success in reducing reproduction in both black-tailed prairie dogs (Nash et al., 2007) and monk parakeets (Avery, et al., 2008). Since DiazaCon™ is effective on a range of species there is a concern that if non-targets access and consume the treated bait, there may be reproductive consequences for those animals.

Non-target usage can be easily monitored through the use of either video or still-image cameras set at the bait sites. Previous studies with monk parakeets did monitor additional non-target usage, but the results were not published in their final paper (Avery, et al., 2008).

During the current study on Clemson University's campus, there has been a variety of non-target species usage, from songbirds to small mammals, which has resulted in questions regarding possible actions that can be taken to lower non-target usage. As expected, many of the suggestions for limiting non-target usage include traditional means such as exclusion techniques, repellents, scare tactics, and bait changes. However, none of these methods were directly tested during the project.



Figure 1. Raccoon at hopper (rural site)

Figure 2. Carolina wren at hopper (urban site with high foot traffic)

Figure 3. Tufted titmouse at hopper (urban site with low foot traffic)

Objectives

- Determine which bait (sunflower kernels, crushed unsalted peanuts, or whole kernel corn) is most effective at reducing non-target usage when used for administering DiazaCon™, an oral bait contraceptive, to EGS.
- Determine which bait (sunflower kernels, crushed unsalted peanuts, or whole kernel corn) would most efficiently retain the oral bait contraceptive DiazaCon™.

Literature Cited

Avery, M. L., C. A. Yoder, and E. A. Tillman. 2008. DiazaCon™ inhibits reproduction in invasive Monk Parakeet populations. *Journal of Wildlife Management* 72:1449-1452.

Fisher, P. 1999. Review of using Rhodamine B as a marker for wildlife studies. *Wildlife Society Bulletin* 27:318-329.

Nash, Paul, Furcolow, Carol A., Bynum, Kimberly S., Yoder, Christi A., Miller, Lowell A., & Johnston, John J. (2007). *20,25-Diazacholesterol as an oral contraceptive for black-tailed prairie dog population management* (USDA National Wildlife Research Center - Staff Publications Paper 712). Ft. Collins, CO.

Acknowledgements

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- Squirrel Contraceptive Creative Inquiry members and other field assistants

Materials & Methods

Camera Survey

Three baits were chosen that would be both palatable and attractive to EGS, but would also be economically efficient for managers to use in squirrel contraceptive projects. The chosen baits were sunflower kernels, crushed unsalted peanuts, and whole kernel corn. The sunflower kernels were general seeds bought in bulk and the whole kernel corn was Country Feeds® brand which is produced by Nutrena®. Both the sunflower kernels and the corn were purchased from Griff's Farm and Home Center. The unsalted peanuts were Southern Grove® brand and were purchased from ALDI™.

Three individual study sites were selected based on their having both a considerable EGS population and varying levels of human presence. The three sites were classified as rural, urban with little foot traffic, and urban with heavy foot traffic.

To mimic a typical DiazaCon™ administration time frame, in each of the three sites, six feeding stations were set up and retained for a two-week period.

Feeding stations were placed in trees frequented by squirrels. Each feeding station included a squirrel feeder designed to eliminate non-target usage, as well as a Reconyx™ trail camera which was placed facing the entrance of the feeder.

Bait levels were checked and replenished every three days. Amounts of bait added, weather, tree species, and other notes were also taken at the feeder station sites during the two-week study period. At the end of the two-week study period total bait usage was calculated for each bait type and both the bait stations and trail cameras were taken down.

After the cameras were taken down, the pictures were analyzed for each feeder station and the number of pictures at the feeder was recorded for every species (non-targets and EGS). Pictures with no species present at the feeder were excluded from the total picture count. After this exclusion, the percent of pictures at each feeder was calculated for each species.

Retention of DiazaCon™ On Bait

To test the possible DiazaCon™ retention of each bait type, 5 pounds of each bait type was mixed as both control and the DiazaCon™ mixture. The National Wildlife Research Center (NWRC) in Ft. Collins, CO will conduct bait analysis.

- Control baits were mixed with Alcolec® S (sticker) and corn oil.
- Contraceptive baits were mixed with DiazaCon™, Rhodamine B (biomarker used to determine which EGS have consumed treated DiazaCon™ bait, Fisher 1999), Alcolec® S (sticker), corn oil, and water.



Figure 4. Rural Site



Figure 5. Urban Site (Low Foot Traffic)



Figure 6. Urban Site (High Foot Traffic)

Results

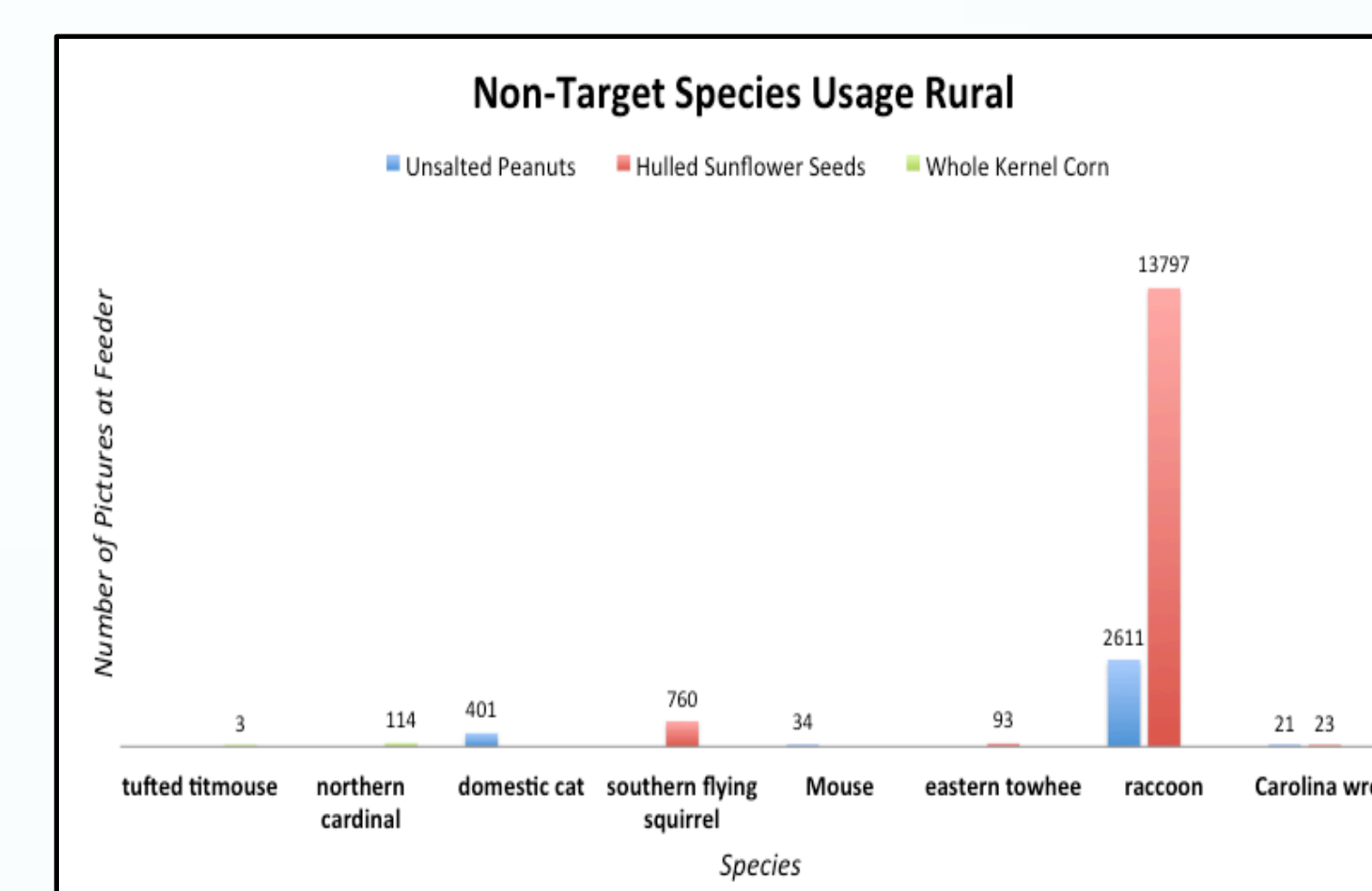


Figure 7. Number of Non-target Species pictures at Rural Site

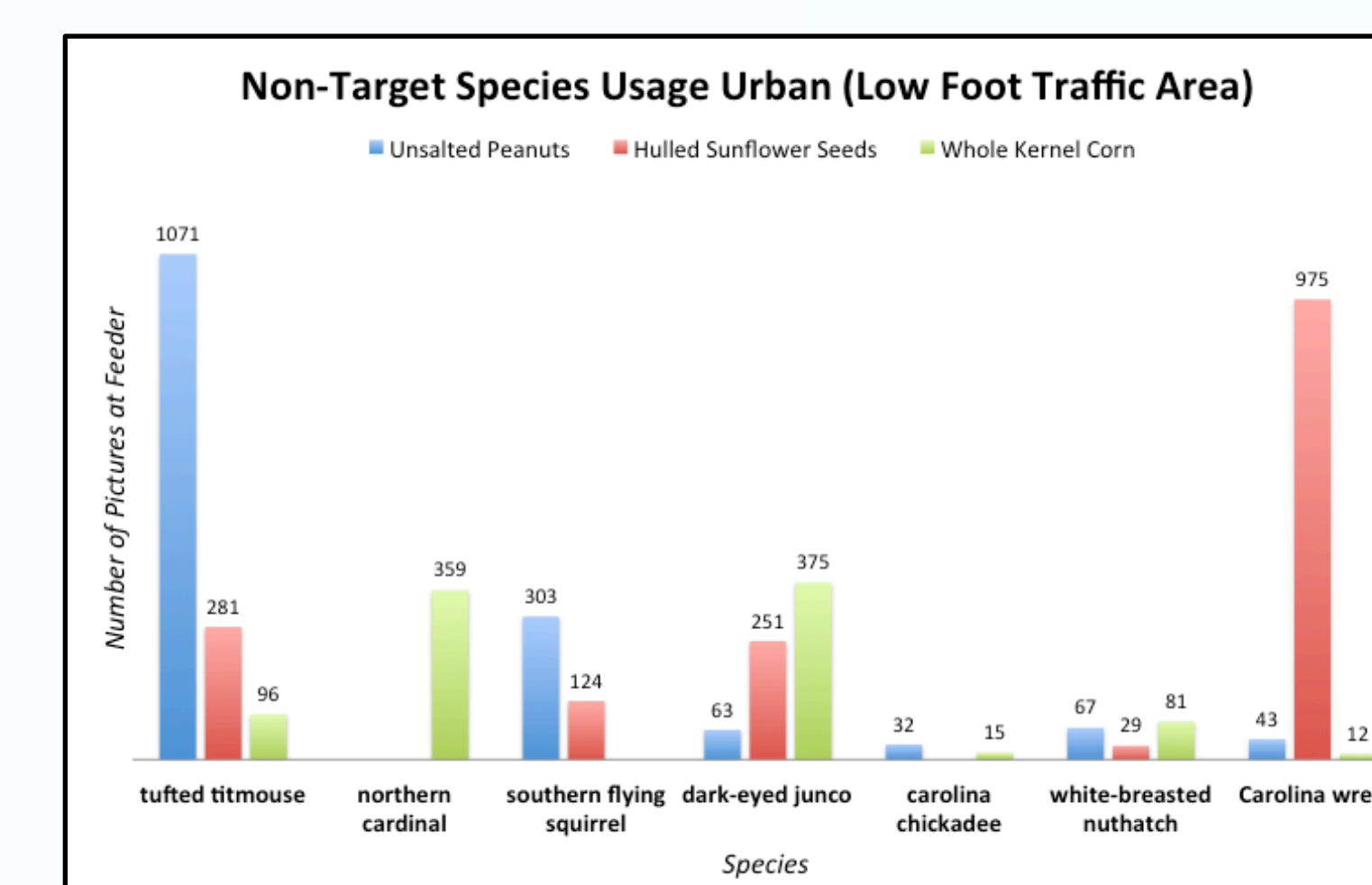


Figure 8. Number of Non-target Species Pictures at Urban Site (Low Foot Traffic)

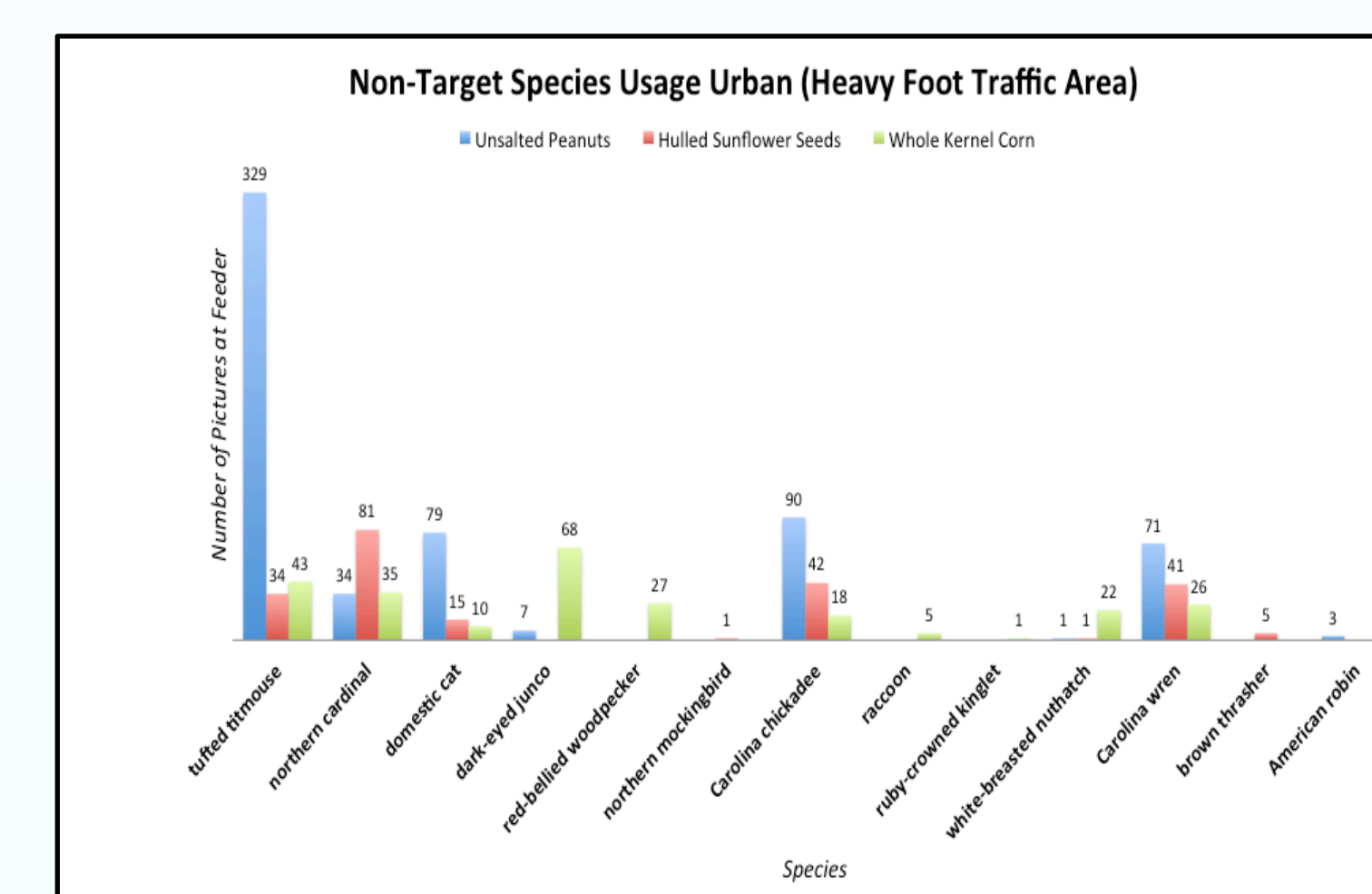


Figure 9. Number of Non-target Species Pictures at Urban Site (High Foot Traffic)

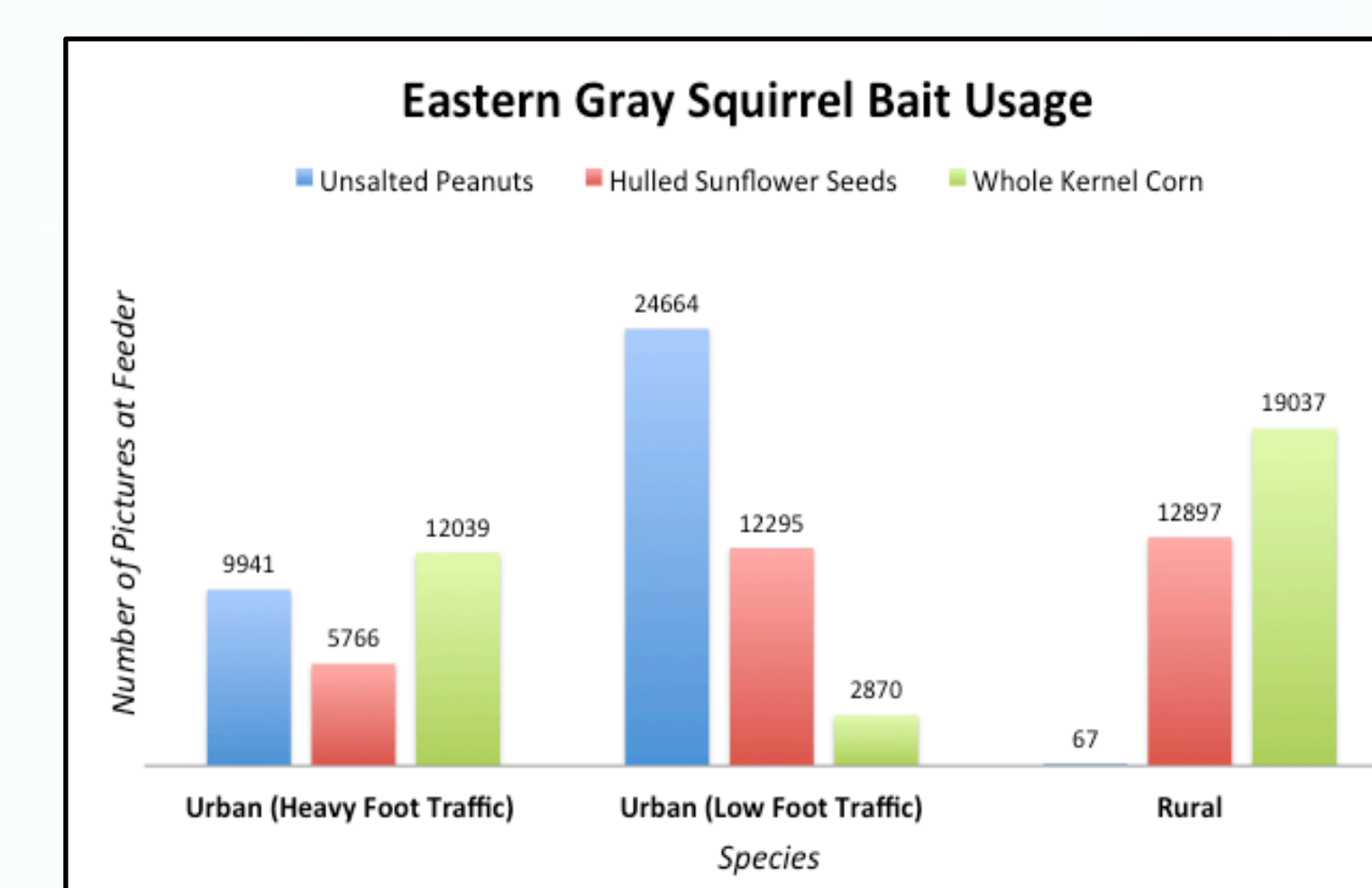


Figure 10. Number of Eastern Gray Squirrel Pictures (All Sites)

Discussion

Testing of various baits for contraceptive administration to EGS resulted in inconsistencies between the different test sites. This was attributed primarily to variations from site to site such as weather, tree usage by EGS, and degree of disturbance. Every test site resulted in different bait preferences being exhibited by both EGS and non-target species. The rural sites tested showed whole kernel corn to be the preferred bait with over 99% of corn consumption attributed to EGS. Urban sites with little foot traffic showed unsalted peanuts to be the preferred bait with approximately 93% being consumed by EGS. Finally, the urban site, with heavy foot traffic, resulted in inconclusive data as to best bait type, as consumption of all bait types by EGS ranged from 93%-98%.

Results from this study suggest that managers wanting to limit non-target usage when conducting EGS oral contraception projects, should select bait types based on the habitat type in which they place feeders. If there are no differences in habitat type, then managers may want to select bait type based on price and its ability to retain the DiazaCon™.

Future Research Needs

In order to complete this research, at least one additional field-testing season is needed. In order to assess seasonal differences of non-target species usage, it would be beneficial to test these three baits during the spring EGS breeding season. Currently there is no data to present regarding the efficacy of each bait type to retain the contraceptive DiazaCon™. All baits types have been mixed with the DiazaCon™ mixture, but are awaiting analysis.

Additionally, there are other non-target exclusion techniques that may be useful at reducing non-target usage that would be valuable to test, such as redesigning the feeders or scare tactics. Finally, a study should be done to determine whether DiazaCon™ travels up or down the food chain to determine if it is capable of affecting reproduction capacities at higher trophic levels.