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Anni E Bladh
2935 Hacienda Blvd
Hacienda Heights, CA.

WILDLIFE ASSOCIATIONS WITH GUZZLERS PROVIDED IN A HABITAT AREA NEAR AN URBAN ENVIRONMENT

Anni E. Bladh, Department of Wildlife Management, Humboldt State University, Harp Street Arcata, CA 95521-8299

Abstract: Wildlife guzzlers are commonly constructed in natural areas with the intent of creating additional habitat for wildlife by providing a critical resource. I attempted to determine what types of animals, if any, were attracted to human-constructed water sources (guzzlers) when compared to similar habitats that lacked water. I found a strong association between mule deer (*Odocoileus hemionus*) and presence of guzzlers and a weak association between some rare mammals such as bobcat (*Lynx rufus*) and the presence of guzzlers. I found no significant differences in avifaunal or herpetofaunal use of guzzlers when compared to areas with no water. Providing water may be a useful tool in the management of a natural area, however, guzzlers affect the associations of many species and this must be taken into consideration when managing natural areas.

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Water guzzlers are used by wildlife managers to provide water in arid climates that otherwise have little natural water resources. Wildlife managers use them under the premise of generating additional habitat by providing a critical resource in an area that would otherwise remain unused despite the attractiveness of the rest of the habitat (Rollins 1997). However, by

providing guzzlers to wildlife, we may potentially be altering the natural habitat for the animals that normally exist in the effected area. This is because the use may potentially attract animals that would not otherwise be present or not as abundant as they would be with guzzlers.

In largely urban environments, there are few resources available for the native wildlife. Small habitat areas are often placed within the vicinity of urban areas to act as havens and provide habitat for native wildlife communities. Wildlife managers try to create suitable habitat for a wide variety of species to attract them to the habitat area and keep them out of the urban areas. Providing guzzlers is one method of containing the wildlife to the habitat area. However, by introducing a resource and thereby changing the initial conditions of the area can result in large-scale effects to the environmental system and the outcome of interactions among community components in complex metacommunities (Wilson 1992).

Guzzlers are thought by many wildlife professionals to inherently benefit wildlife (Gullion 1960, Hervert and Krausman 1986, Rollins 1997). These authors, however, only indicate the benefits of guzzlers for ungulates such as sheep, deer, and elk and gallinaceous birds such as quail, and turkey. There is some discussion in the wildlife community that the guzzlers are also used by neo-tropical migrant songbirds in their annual movements (Burkett and Thompson 1994). This assumption, however, is based on observation and not scientific study. Small mammals and herpetofauna are found to use guzzlers as well but are found to use them primarily for shelter and not for a water source (Burkett and Thompson 1994). Water can be obtained by other means, either metabolic or through their food. Burkett and Thompson (1994) also found that feral horses, whose metabolic requirements require large quantities of water, were attracted to the artificial water sources.

When examining the possible costs and benefits of using guzzlers to provide additional habitat potential, it is crucial to understand what organisms are using the guzzlers. I hypothesize that more animals will be found on areas that have guzzlers than on areas that have no water. This data will be useful for future studies involving further analysis into the potential costs and benefits of providing guzzlers in arid wildlife areas surrounded by urban development.

STUDY AREA

The study area I used is a 3,775-acre preserve managed by the Puente Hills Landfill Native Habitat Preservation Authority. The preserve runs from the area adjacent to the Puente Hills Landfill to Harbor Boulevard and is bordered by the urbanized areas of Hacienda Heights, La Habra Heights, and Whittier in southern California. Scattered throughout the preserve are 4 working guzzlers that are filled by the local rangers with potable water and one guzzler that is self-filling. The habitat area is frequently used by residents of the surrounding community for hiking and mountain-biking.

METHODS

Three of the five guzzlers in the preserve were used for this study as well as three control areas in sites similar but separate from the guzzlers on the preserve (Fig. 1). Control sites were chosen randomly among plots determined to be similar to the guzzler plots based on the vegetation surveys. Each study site consisted of a 5x5 m plot with a central axis at the guzzler on watered sites or bucket without water in each of the control sites. Guzzlers were of different construction, one was a bath-tub, one was a large bucket and the third was a concrete watering hole. The control guzzler buckets were of all the same size and color. Each study site was

visited daily over a period of two weeks. Visits were conducted early every morning and completed before noon.

Mammal Sampling

At each of the study sites, one baited track-plate was established to sample small mammals. Each track-plate consisted of a Rubbermaid square kitchen garbage can laid on its side with a piece of aluminum sheeting covered by a white imprint surface (contact paper). Blue surveyors chalk was spread on the inside surface of the garbage can. Each track-plate was baited with peanut butter and nuts at the end of the box causing the animal to walk over the chalked area and leave a positive impression on the white imprint surface (Zielinski and Stauffer 1996). Bait was chosen with the intent of attracting small mammals whose tracks would be indistinguishable on the sand plots. This detection method made it possible to determine species present by comparing the foot prints with known samples and is a relatively easy process (Zielinski and Truex 1995). Each track plate was placed within 3 m of the guzzler or control bucket. Direction of the track-plate faced was determined randomly. Each track-plate was checked every morning and changed when needed for a period of 2 weeks.

Large Mammal tracks were sampled using sand. Sand was spread 0.5 m around all guzzlers and control buckets. These sand plots were checked every day, plaster casts were taken of tracks that were not immediately identifiable and left to dry over night. After being checked, the sand plots were smoothed out and reset for the next day.

Herpetofauna Sampling

Herpetofauna were sampled using a combination of drift fences and pitfall arrays. The direction of the array was selected randomly and was placed within 2 m of the central guzzler or control bucket. The drift fences consisted of a 5 m piece of aluminum flashing that was partially

buried in the ground to lead the animals to the pitfall traps buried at each end of the array. The pitfall traps consisted of a plastic bucket buried at each end of the drift fence. Each bucket had a square cardboard lid raised above the ground and supported by rocks to provide shade and protection from the elements. A stick was placed in each of the pitfall traps to allow small mammals to escape to minimize the event of bi-catch and mortality that can result from two species being caught in the same trap. Each of these traps was checked every morning for 2 weeks and then removed. All species of herpetofauna were photographed, identified and released.

Sampling Bird Species

Bird species were sampled by conducting point counts every day at each of the study sites for a two week period. Point counts were conducted for the entire duration of checking the site. Presence or absence was recorded for each species on each visit.

After two weeks of surveys, comparisons between guzzlers, control sites were made on the basis of a t-test analysis, after which correlations and significant differences were compared and analyzed.

RESULTS

On all surveys combined, 586 animals representing 40 species were detected on 6 study sites (appendix 1).

Birds

Twenty-seven species of birds were detected on the 6 study sites. Species richness for these birds was similar in both control and guzzler sites (Table1), and no significant results could

be found when comparing all combined conditions (all guzzler sites vs all control sites) with a paired t-test analysis. When examining the sites individually, significant results were found when comparing the Chevron Control vs Helipad Guzzler (t-stat=2.565, t-crit=2.03, df=23, p=0.015) and also for the Chevron Guzzler vs the Helipad Guzzler (t-stat=2.265, t-crit=2.039, df=31, p=0.030).

In the control sites 3 species were found to be completely unique: phainopepla (*Phainopepla nitens*), song sparrow (*Melospiza melodia*), and red-shouldered hawk (*Buteo lineatus*). In the guzzler sites, there were also three species of birds that were unique: rock dove (*Columba liva*), Cooper's hawk (*Accipiter cooperii*), and black-headed grosbeak (*Pheucticus melancephalus*). These birds were rare sightings seen only once or twice during the study period.

Mammals

I detected 10 different species or genera of mammals among the 6 study sites. Species richness differed greatly among study sites (Appendix 1). When comparing guzzler sites with control sites using a paired t-test analysis, no significant difference was found. When comparing sites individually, I found two conditions with significant results: Chevron Guzzler vs Helipad Guzzler (t-stat=3.019, t-crit=2.178, df=12, p=1.01) and Chevron Guzzler vs Ford Guzzler (t-stat=4.051, t-crit=2.17, df=12, p=0.002). The guzzlers in this study area were found to attract local mule deer with 89% of the total detected number found on guzzler sites (Fig. 2), furthermore, half of the species of mammals detected were found only on the guzzler sites (Table 2). The control sites had a greater number of small mammal detections than the guzzler sites (Table 2). This trend suggests that small mammals are possibly avoiding the guzzler sites, however, no significant results could be obtained.

Herpetofauna

I detected only 1 species of reptile, the Western fence lizard (*Sceloporus occidentalis*). I detected the lizards 3 separate times, once at the Helipad Guzzler and twice at the Orange Grove control site. Due to the small numbers of detected lizards, no reliable statistical data could be found.

DISCUSSION

Potential use of Guzzlers by Mammals

Guzzlers in this study showed trends that indicated that they are used primarily by mule deer and also by medium sized mammals. Traditionally, guzzlers are used as additional water sources for ungulates and are thus designed with them in mind (Burkett and Thompson, 1994). The abundance of mule deer at guzzler sites is consistent with other studies examining the use of artificial water sites on deer (Hervert and Krausman, 1986). The high species richness of the guzzler sites gives some indication that the guzzlers may be important to the other wildlife in the area besides mule deer. However, too few animals were detected to verify the trends and compile any statistical significance.

The similarity of small mammals found on both control and guzzler sites indicates that the small mammals may have been attracted to the bait in the track plate boxes and were returning every night to feast. Other studies found a related result where the small mammals were found to be using other elements of the study areas (such as cover) and were not considered to be choosing an area based on the presence of guzzlers (Burkett and Thomson 1994; Bradford, 1975).

The Chevron Guzzler had the highest species richness out of all study sites with a richness of 10 when compared to a maximum of 4 for all other study sites (Appendix 1). When examining the difference between the Chevron Guzzler and the other two guzzler sites in both cases there was a significant difference between sites. The Chevron Guzzler was similar to the other two guzzlers in many aspects, however it was unique in that it was placed in an area where people were not allowed to go. Both the Helipad Guzzler and the Ford Guzzler were adjacent to trails where people would frequently jog and bike, and though speculative, I believe the large detection of mammals at this site was due in part by the absence of people. More study is needed to determine why the Chevron Guzzler was so species rich.

Potential Use of Guzzlers by Birds

The birds species detected are common to scrub communities and, based on the time of year and the absence of any neo-tropical migrant species, can be assumed to be year-round residents to the area. The birds were not found to be using either the control sites or the guzzler sites different from each other at any significant level and the presence or absence of water did not affect the assemblages of birds. Both the control and guzzler sites had birds that were unique to those environments, however, the unique birds were very rarely encountered at all and they were probably detected by chance rather than the birds actually being attracted to the areas.

The Anna's hummingbird was an exception and was found to be attracted to guzzler sites. At the Helipad guzzler, the design of the guzzler was slightly different than the other guzzlers; the container for the water was a bathtub fed by a drip pipe. As a consequence of the constant flow of new water, the tub was regularly overflowing and caused a shallow edge of water at one end of the tub. Every day the hummingbirds were found drinking and bathing, using the guzzlers. They would not likely have been there without the presence of the guzzler.

Design Evaluation

This study was designed with the intent of identifying species associated with the presence of guzzlers. I believe the design I used was effective in determining the assemblages of avifauna and mammals for the study area, but was unsuccessful in determining any significant results for herpetofauna. The use of a motion sensor camera would be valuable in helping to identify mammals using the sites as some of the tracks were smudged and indistinguishable. I also suggest that any future projects of this type consider first sampling dry guzzlers and then filling the guzzlers and checking the same sites with water to determine any differences in animal usage based on water presence/absence. I recommend a longer period of data collection to obtain more detections of mammals and herpetofauna that could be statistically evaluated.

MANAGEMENT IMPLICATIONS

When deciding whether to install wildlife guzzlers, it is important to understand what the goal of the managed area is to be. If the goal is directed toward increasing species richness, the guzzlers may not have the desired effect. There is no strong evidence to suggest that guzzlers are useful to a wide variety of species. In arid environments, the animals that live there are adapted to that community and have other means of obtaining water aside from free water. For example, the desert adapted Pińon mouse (*Peromyscus truei*) will obtain water from its food sources and does not require free water (Bradford, 1975). The natural assemblages of animals in the community would be present regardless of the existence of an artificial water source. If the goal of the managed area is to increase populations of animals, then the guzzlers may be effective for a few species, such as deer, that showed some attraction to the guzzler sites. Guzzlers may prove helpful if the goal of the managed area is to keep animals out of urban areas or concentrate

wildlife in the preserve. Concentrating species in such a way may provide viewing opportunities for the people who use the area, but also has potential problems. Though the population of mule deer may increase with the presence of guzzlers, there is potential risk that the population will eventually become too large for the area creating a hazard to the closely surrounding urban environment either by attraction of predators or road kills. Burkett and Thompson (1994) explain the perceived benefits of guzzlers to wildlife should be evaluated in the context of natural adaptations of species involved. It is important to take into consideration the effects of providing water to an existing biotic community and careful measures must be taken to not change or damage the natural assemblages of organisms already present in the managed area.

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SUMMARY OF FIGURES