Conservation Management Plan for Burrowing Owls and Artificial Nesting Burrows

For

Appleton-Whittell Research Ranch

Developed by

Grace Igwe

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Appleton-Whittell Research Ranch

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Table of Contents

Executive Summary

Burrowing owls (BUOW) are small, sand-colored birds that nest and roost in ground burrows excavated by colonial mammals such as prairie dogs and ground squirrels. Population declines across North America have prompted much research into food, foraging, nesting, and mating behaviors of BUOW and encouraged conservation efforts. One such effort that the Appleton-Whittell Research Ranch (AWRR) will use is the installation of artificial burrows (ABs). This conservation management plan will provide guidelines for artificial burrow installation.

The goals of this CMP are to provide guidelines for:

- Provide 30 acres or more of land for nesting owls such that owl families are between 110 – 150 meters from one another
- Create burrow clusters that support 2 owl families with 32 or more burrows constituting one cluster
- Ensure clusters are 600 meters or more from one another and satellite burrows are within 50 meters of natal burrow
- Install wooden perches that rise approx. 1 meter off the ground and are 5 – 10 meters from a burrow
- Ensure artificial burrows contain a nest chamber, tunnel and perch
- Select materials that can withstand natural processes and are already suited for use in the ground (e.g. irrigation valve box as nest chamber, perforated tubing for tunnel)
- Install nest chambers with adequate space for owl family and tunnel at a gradual decline of 15° – 20°
- Use tunnel diameter between 10 – 12 in.
- Install burrows underground at 28 – 40 cm depth
- Relocate owl during non-breeding months

Plan Philosophy

This conservation management plan (CMP) was created to serve as a guide for burrowing owl (BUOW) conservation efforts. The goal for this CMP is to articulate guidelines for and consolidate information regarding researched strategies for artificial burrow installation. National BUOW populations have seen local increases; however, the general population is still considered to be declining due to loss and degradation of range lands and human development. Many groups have been established to stop burrowing owl population declines and the Appleton-Whittell Research Ranch is seeking to contribute to these conservation efforts.

The Appleton-Whittell Research Ranch

The Appleton-Whittell Research Ranch (AWRR) is an exclosure of 8,000 acres near Elgin, AZ. In 1968 the Appleton family turned their cattle ranch into what would later be called the Research Ranch to study the effects of livestock removal on the land. Today AWRR functions as a control site where agricultural practices and ecological changes can be measured. It is a nature sanctuary covered with grasses and perennials forbs. Annual precipitation at Headquarters was 18.50 inches in 2016, higher than the 17-year-average of 15.79 inches. Despite this, there was no significant stream flow in either of the major drainages (Kennedy *et al.* 2016). Wildlife drinkers set up at 12 locations, wetlands installed at Finley Tank and McDaniel Well and water tanks also augment the hydrology and provide a permanent water source and habitat for wildlife. As for climate, Elgin sees sun about 79% of the year (284 of 365 days) with average lows and highs at 45°F and 76°F respectively. Conservation on AWRR includes routine treatment of invasive species and the introduction and monitoring of Chiricahua Leopard Frogs and Desert Pup Fish.

*Burrowing Owls (*Athene cunicularia)

Introduction

BUOW are small birds who roost and nest in the ground. Although capable, they seldom excavate their own burrows, but instead rely on the burrows of other colonial mammals such as badgers or prairie dogs. For this reason, much research has been done to understand whether a correlation exists between burrowing owl populations and the mammals, mainly prairie dogs, whose burrows they takeover. These studies suggest pest control campaigns that decrease prairie dog populations negatively impact owl nest densities and populations (Alverson and Dinsmore 2014). To combat this, ABs can be installed to support owl populations in areas where colonial mammals have disappeared or where burrow availability has decreased or does not exist.

Habitat

BUOW inhabit open areas with short or sparse vegetation (Menzel 2014). Taller grasses reduce horizontal visibility and are not preferred (Green and Anthony 1989), but grasses between 30 and 60 centimeters are good for supplying sufficient numbers of prey items (Wellicome 1997). Recently excavated burrows in high density and proximity, proximity to occupied prairie dog colonies and presence of dried mammal manure lining are requirements that consistently emerge with burrowing owl habitat studies (McDonald *et al.* 2004). Nearby perches are also advantageous because they allow owls to watch for predators and identify prey. Proximity to active prairie dog colonies is important because prairie

dogs provide an alert system and may decrease predation on BUOW because more prey options are available (Desmond *et al.* 2000). In addition to this, manure is used to line the burrows and mask their smell from predators.

Food and Foraging Habits

BUOW food ecology studies invariably support the conclusion that arthropods compose the greatest number of prey items, insects being in the greatest quantity, while vertebrates compose the greatest biomass (Mrykalo *et al.* 2009, Moulton *et al.* 2005, Green *et al.* 1993). BUOW are opportunistic feeders, consuming a variety of prey including insects (hymenopterans, beetles, crickets, grasshoppers, butterflies, and moths), spiders, snails and slugs, rodents, reptiles, amphibians, small birds, and rabbits (Trulio and Higgins 2012). They are also known to eat caterpillars, centipedes, marsupials and dragonflies (Schlatter *et al.* 1980). Most foraging takes place within 600 meters of the burrow (Rosenberg and Haley 2004).

Known Threats

BUOW are predated on by raptors, coyotes, foxes, bobcats, snakes, skunks, and badgers. Pesticides, not thought to be a direct threat, may result in mortality due to ingestion of prey infected by pesticides or rodenticides (Klute *et al.* 2003).

Goals

1. To provide guidelines for preparing an area for the installation of ABs where maximum foraging capabilities may be achieved

2. To provide guidelines for artificial burrow material selection and installation

3. To provide guidelines for the introduction of BUOW to the property, following the *Burrowing Owl Management Guidelines for Municipalities in Arizona* by D. Abbate.

Goal 1

Clear away an area for the installation of ABs where maximum foraging capabilities may be achieved

Defining the area

Nesting sites. Nesting-territory sizes for BUOW can range from 10 – 18 acres (Grant 1965) but it is suggested that owls being translocated within Arizona be given no less than 30 acres of land, and that land be ≥ 150 meters from dense patches of mesquite (Abbate *et al.* 2007).

Distance from other pairs. If the property will support multiple owl families, it should be noted that decreasing distance between active nests increases competition and may result in nest abandonment (Green and Anthony 1989). To combat this, natal burrows should be placed 60 meters or more from each other. Green and Anthony (1989) observed that nest desertion occurred most frequently when pairs were within 110 meters from each other, but they recognized that other researchers did not observe the same behaviors. Rosenberg and Haley (2004) observed pairs nesting as close as seven meters to each other, with average nesting distance at 147 meters. Suggested range for distances between natal burrows is 110 – 150 meters.

Burrow availability and foraging. The Burrowing Owl Working Group of the Arizona Game and Fish Department (Abbate *et al.* 2007) suggests 32 or more ABs be installed to form one cluster, and these clusters be ≥ 600 meters from each other and ≥ 200 meters from the site boundary. Clusters may support between one and four owl families, two being ideal. Sufficient numbers of satellite burrows should be installed for each owl family because apart from being used as dispersal sites for juveniles, they allow families to disperse their young when predators are approaching and can be used to distract predators from burrows used by juveniles. No information can be found suggesting how many satellite burrows are sufficient for high rates of nest success but no less than 10 within 50 meters of the natal burrow is acceptable for typical brood sizes. Satellite burrows should be 5 – 10 meters apart (Johnson *et al.* 2010).

Perches. Perches are used by BUOW to detect predators and prey. Perches should rise roughly one meter from the ground (Abbate *et al.* 2007) and should be erected so they do not reduce visibility during sun and moonrises. Perches should be placed within 5 – 10 meters of a burrow.

Goal 2

Select durable materials for construction and a design that encourages successive artificial burrow use

Materials

ABs require a nest chamber, a tunnel and a perch. Various materials have been used to create ABs including drums, upside buckets and wooden boxes for the nest chambers; flexible perforated tubing, cement pipes, and clay sewer pipes for the tunnel; metal or wood for the perches. Materials should be able to withstand potential water damage, shifting soil, and other natural processes. When selecting materials, and likewise when choosing a design, consider the results of Smith and Belthoff's (2001) study in which they tested whether owls would choose small (707 cm^2), medium (900 cm^2) or large (1750 cm^2) nest chambers and whether they preferred small (10 *cm*) or large (15 *cm*) diameter tubing. Owls in this study

most frequently chose the larger nest chamber and the small tube diameter. Choose materials that can both provide a significant nesting chamber area and allow owls easy access in and out of the tunnel, while keeping predators out. Suggestions can be found in the Executive Summary.

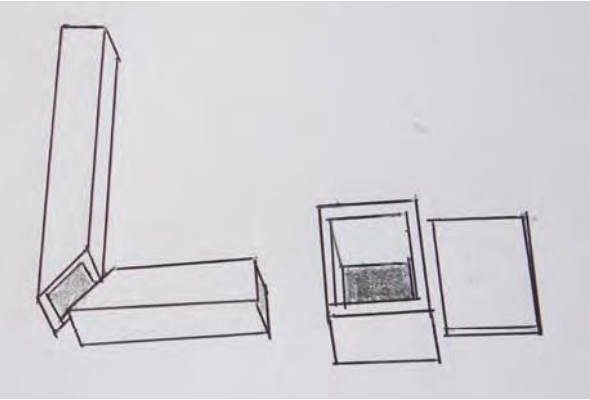
Design

Examples of artificial burrow designs are shown below. Figure 1 – 3 are taken from the *Users Guide to Installation of Artificial Burrows for Burrowing Owls* (Johnson *et al.* 2010).

Tunnel incline. One important consideration is the incline of the tunnel entrance. ABs on Kirtland Air Force Base, Albuquerque, NM have not been used by BUOW because the inclines are too steep. The odds of burrow use decline 17% for every 1° increase in slope (Belthoff and King 2002). Gradual steeping at 15° - 20° towards the nest chamber is suggested (Johnson *et al.* 2010).

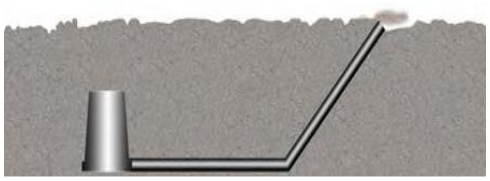
Above or below ground installation. Not having enough volunteers for an artificial burrow installation project could cause conservation groups to want to build burrows above ground. Natural burrows are subterranean and provide thermal refuge from above-ground temperatures. It is strongly suggested that ABs be placed in the ground to mimic natural burrow systems. The suggested depth range is 28 – 40 cm (Nadeau *et al.* 2015) however ABs in Oregon with an 86% occupancy rate for the 2010 breeding season had a nest chamber at 91 cm below ground (Johnson *et al*. 2010).

Figure 1. Collins and Landry (1977) in Johnson *et al.* (2010), Artificial nest burrows for burrowing owls.



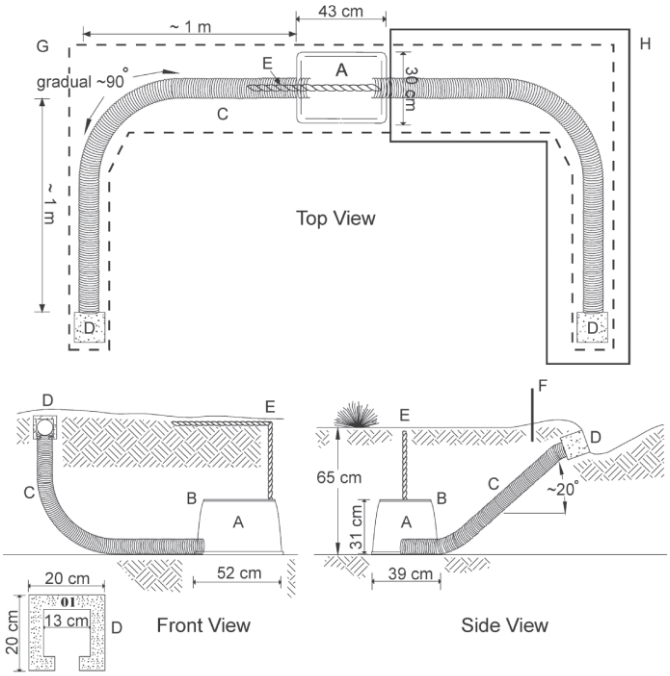
Chamber: warp-resistant plywood (30 x 30 x 20 cm). Tunnel: wood, 10 x 10 cm, 1.8 meters long, one 90°-turn 10 cm from entrance. Chamber and tunnel had natural dirt floor. Depth 15 cm. Flooding and silting occurred from winter rains – burrows had to be renovated prior to each breeding season. Concerns: poor durability of wood and susceptibility to fire.

Figure 2. Clark (2001) in Johnson *et al.* (2010), Arizona Partners in Flight Habitat Substitution Project.



Chamber: 5-gallon plastic bucket. Tunnel: 12 feet of 4 in. flexible perforated irrigation hose. PVC pipe used at burrow entrance to protect from predators. Holes drilled in bucket and hose to help water escape. Depth 4 ft. Two feet of dirt on overturned bucket. Concerns: small nest chamber; hard to inspect/maintain.

Figure 3. Barclay (2008) in Johnson *et al.* (2010), A simple artificial burrow design for burrowing owls.

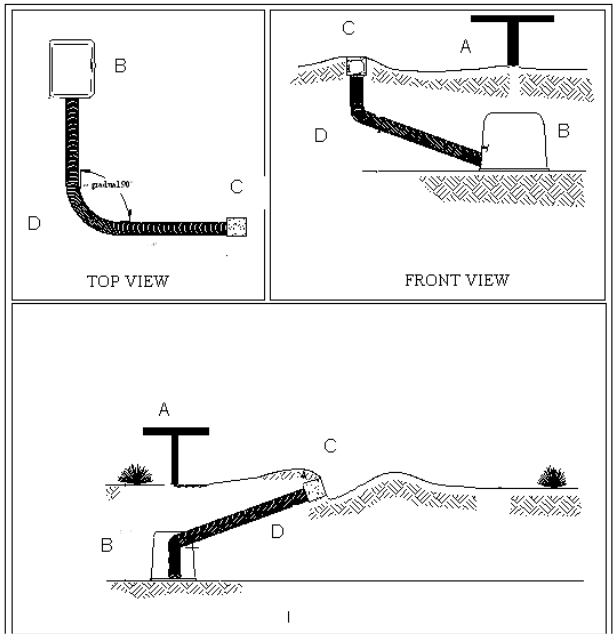


Chamber: extruded plastic irrigation valve box with removable lid (48 x 35 27 cm). Tunnel: 2 m of flexible perforated plastic drain pipe with 10 cm dia. Design includes one 20 x 20 x 15 cm hollow concrete block to anchor tunnel to soil surface and optional second entrance (H). Provides 1680 cm^2 of chamber space and natural soil substrate.

Key:

A-chamber
B-removable lid
C-tunnel
D-concrete block
E-plastic rope marking chamber location
F-0.5 m perch
G-excavation footprint

Figure 4. Alexander *et al.* (2005), Use of artificial burrows by burrowing owls (*Athene cunicularia*) at the HAMMER facility on the U.S. Department of Energy Hanford site



Chamber: 5-gallon bucket. Tunnel: 8 – 10-foot long, 4 in. dia. perforated corrugated plastic pipe with 90°-bend to keep out sunlight. Top 5 feet of pipe covered with 6 in. dia. PVC pipe to protect pipe from deterioration and predators. Spray foam and spray paint used to hold PVC to tunnel. T-shaped perch placed directly over chamber to mark location. Concerns: small nest chamber.

Key:
A-wooden perch
B-chamber
C-entrance
D-tunnel

Goal 3

Introduce owls to the property

Breeding Season

BUOW breeding seasons vary according to geographic region, but generally occur between February and early August, with most breeding taking place between March and August (Bouglouan). To avoid disturbing breeding behaviors, owls should be introduced during the non-breeding months, from September to January.

Active Translocation

BUOW must be removed by personnel holding the appropriate permits and held in captivity for two months to break fidelity and increase likelihood of occupancy at the new location. Release sites should be $\geq$ 600 meters from AB colonies to decrease aggressive interactions among neighbors (Abbate *et al.* 2007). BUOW should be monitored for at least two weeks after relocation to ensure ABs are being used and determine whether rehab time should be modified.

Conclusion

The information provided in this document serves as a guideline and is in no way a complete reference manual to artificial burrow installation. Suggestions outlined in the Executive Summary and throughout the document may be modified upon application, with discretion and input from individuals experienced in BUOW handling and monitoring.

The Appleton-Whittell Research Ranch has recognized the need for BUOW conservation and aims to use this documents to fulfill the needs of owls residing in southeastern Arizona. This plan aims to be a comprehensive document that may be used on multiple properties across multiple geographic regions. This plan is a reference to researched methods but should be followed loosely, as more information becomes available regarding nesting behaviors and preferences of BUOW.

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