2025

Statewide Upland Game Guzzler Plan

Utah Upland Game Program

An appendix to the Utah Upland Game Management Plan

Prepared by the Utah Division of Wildlife Resource

Acknowledgments

The upland game program of the Division of Wildlife Resources would like to acknowledge the committee members as essential contributors to the creation of this plan. Our university partners provided literature and nuances from past studies they've conducted to guide this document's accuracy and comprehensiveness.

Our federal partners, Utah Chukar and Wildlife Foundation, and internal employees offered support from their programs to ensure the implementation of this plan is successful. The individuals from the UCWF donated their time to contribute to this plan and continue to volunteer to assist with the maintenance and construction of upland game guzzlers. Daniel Sallee undertook this plan's development as a special project last year, which fomented a time-conscious and successful process.

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Executive Summary

This statewide Upland Game Guzzler Plan (Plan) provides overall guidance and direction for Utah's upland game water development activities. This plan includes a brief history of water development in the western United States and Utah, identification of issues and concerns relating to water development constructions, how different species utilize guzzlers, current management practices, and a list of guzzler priorities for each region. These details will guide the future projects in the state of Utah. Although multiple upland game species may benefit from upland game guzzlers, the upland species most impacted include: chukar partridge (*Alectoris chukar*), California quail (*Callipepla californica*), and Gambel's quail *(Callipepla gambelii*).

Utah Code §23-14-1 grants the Utah Division of Wildlife Resources (DWR) management authority for wildlife within the state, under the authority of the Wildlife Board, to serve as the trustee and custodian of protected wildlife to protect, propagate, manage, conserve and distribute protected wildlife throughout the state. The implementation of the Plan will guide how the DWR will establish, augment, or maintain upland game guzzlers, both in geographical placement and in design. These directives will correlate with the existing goals of the Upland Game Management Plan.

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Introduction

History

Wildlife managers are tasked with managing populations of wildlife species across the landscape. To efficiently regulate wildlife populations, it is necessary to identify limiting factors impacting each species. As early as 1933, Aldo Leopold identified food, water, and cover as the three fundamental requirements of wildlife (Leopold 1933). Of the three fundamental needs Leopold proposed, water is often identified as the most limiting factor in the arid western United States (Krausman et al. 2006). Due to the limited amount of water on the western landscape, many springs have been developed to pipe water many miles from the natural source for human uses, further reducing the amount of water available to wildlife. To increase the amount of water available to wildlife on the landscape, wildlife agencies have constructed artificial water catchments (hereafter "water developments" or "guzzlers") for decades (Rosenstock et al. 1999). Artificial water developments are built to capture and store rainwater for wildlife use during dry periods of the year. As early as 1967, wildlife managers in Utah began constructing artificial water developments in an effort to increase and restore available surface water with the goal of expanding populations (Shaw 1971). Since that time, 511 upland game water developments have been constructed across the state; 424 of them directly targeting chukar.

Concern surrounding the need for available surface water has increased in recent years as weather patterns have become increasingly dry and springs have been developed to move water to lower elevation areas for agricultural purposes. Over the past 50 years, the mean annual temperature has increased by over 2oC while precipitation has decreased by approximately 20% (Rapacciuolo et al. 2014). In conjunction with increasing effort to construct water developments, scrutiny about the efficacy of water developments has elevated. Critics of artificial water developments have raised concerns about the efficacy of guzzlers for xeric-adapted species, increased competition or predation at guzzler sites, and negative health consequences of concentrating animals around stagnant water (Broyles 1995, Krausman et al. 2006, Griffis-Kyle et al. 2014). Despite the identification of potential negative effects of guzzlers on wildlife populations, there have rarely been documented cases of those aforementioned impacts occurring (Krausman et al. 2006, Mattson and Chambers 2009, Simpson et al. 2011). Continued research is needed to ensure any unintended consequences of water developments are identified and mitigated for future projects.

This document will serve as Appendix 3 in the Utah Upland Game Management Plan (page 20). The following objectives are outlined in that plan:

1. Needed density of water developments for chukar partridge

2. Areas where water development is complete

3. Areas in which additional water developments are needed

4. Potential unintended consequences of water developments including predator subsidies

5. Effectiveness and need for water developments targeted at species other than chukar partridge

The referenced literature encompasses these objectives and will be utilized to create best management practices for guzzlers throughout the Plan.

Figure 1. *A guzzler in Shadescale Canyon on the Dugway Range*

Issues and Concerns

Need

Animals can obtain water through three different mechanisms: preformed water available in food items, metabolic water obtained through breaking down molecules in digestion, and free water obtained as surface water on the landscape (Robbins 2001). Xeric-adapted species, such as Gambel's quail and kit fox (*Vulpes macrotix*), have developed behavioral and physiological adaptations to maximize intake of preformed and metabolic water, thereby reducing the need for free water on the landscape (Schemnitz 1994, Golightly and Ohmart 1984). Due to the adaptations of xeric-adapted species, it has been questioned whether water developments are needed in arid environments. However, during severe heat and drought, it has been documented that free water is necessary to alleviate physiological stresses, even for species that evolved in xeric environments (Larsen et al. 2012, Hall et al. 2013). Further, documentation affirms that those species that can survive without free water have higher reproductive and survival rates when they have access to free water (Simpson et al. 2011, Rich et al. 2019).

Though access to free water likely benefits most wildlife species, there are circumstances in which water developments would not allow for increased reproduction or survival. For example, if a landscape has abundant water but limited access to food or if a water development is constructed in an area without adequate forage, increasing access to free water will not benefit wildlife in that area (Larsen et al. 2007, Simpson et al. 2011). Furthermore, if food is limited in an area and a water development is constructed to increase use by an animal in that area, it is possible that survival would decrease due to overutilization of the food resources (Broyles 1995, Simpson et al. 2011). Therefore, careful planning and vegetation surveys should be conducted during selection of sites for water developments to ensure adequate forage and cover are available for the target species.

Direct Mortality

Artificial water developments are often constructed out of human-made materials, including metal troughs, plastic or fiberglass tanks, or recycled vehicle tires (Wilson and Hannans 1977, Natural Resources Conservation Service 2020). These artificial structures often have steep sides with little or no traction, which can result in the entrapment or drowning of animals. There have been countless instances when small animals have drowned in water developments and at least one recorded occurrence when bighorn sheep fell into a guzzler (Rosenstock et al. 1999). However, numerous tools have been developed to minimize entrapment risk and provide an escape route if it occurs. Water development troughs can also be equipped with escape ramps that allow animals a way to remove themselves from the water (Tsukamoto and Stiver 1990, Natural Resources Conservation Service 2020). Animals can be prevented from climbing on guzzler structures using exclusionary fencing (Brigham 1988, Larsen et al. 2011). Through proper planning and construction, direct mortalities due to water developments can be greatly reduced or eliminated.

Increased Competition

Guzzlers have been shown to increase reproductive rates of multiple species, which can lead to an increase of the total number of animals using the adjacent habitat (Benolkin 1988, Simpson et al. 2011, Rich et al. 2019). Increased numbers of animals in an environment can lead to concern over both inter- and intra-specific competition for resources (Rosenstock et al. 1999). There have been documented cases in which domestic livestock and feral horses and burros have congregated around artificial water sources to outcompete native wildlife (Gooch et al. 2017, Hall et al. 2018). It is plausible that artificial water sources could also cause increased competition among native wildlife species as well, however, there has been little documented evidence of this occurring (Rosenstock et al. 1999).

Increased competition from some species, such as feral horses and large ungulates, can be mitigated through installation of perimeter fencing designed to prevent those species from accessing the guzzler (Larsen et al. 2011). It is more difficult to prevent smaller animals from accessing water resources, particularly if they are similar in size to the species the project is intended to benefit. Therefore, proper planning and placement of guzzlers is needed to prevent or mitigate the negative effects of increased competition. For example, installing guzzlers in areas with abundant forage and cover resources can prevent overuse of those resources by increased numbers of animals at a water source. Further, wildlife managers may choose to avoid guzzler construction in areas where congregating or increasing a resident species is detrimental. Through careful planning and design, the problem of increased competition can be mitigated at artificial water sources.

Increased Predation

One concern of artificial water developments is that they concentrate animals to a small location, thereby making them more susceptible to predation (Broyles 1995, Rosenstock et al. 1999). It is possible that drawing animals into a guzzler could result in a higher predation rate, however, no studies have found evidence that this occurs (Rosenstock et al. 1999, Kluever et al. 2015). Attempted predation events have been observed at artificial water sources, however, relatively few predation incidents occurred compared to the number of animals utilizing the guzzler (O’Brien et al. 2006). Natural sources of water, such as seeps and springs, may also function as a point source to draw animals into a small location, so this is not only pertinent to artificial water sources.

Predation rates could also increase around guzzlers because the availability of more free water on the landscape may allow for predator species to have higher survival and reproductive rates (Broyles 1995, Rosenstock et al. 1999, Rich et al. 2019). Coyotes (Canis latrans) and ravens (Corvis corax) have been observed to use guzzlers and, therefore, could experience an increase in population (DeStefano et al. 2000, Kristan and Boarman 2007). Coyote sign, including tracks and scat, has been shown to increase significantly around water sites, however it is unknown if overall density increased due to artificial water sources or if space use changed (DeStefano et al. 2000, Kluever et al. 2015). In contrast, when water sources were removed, the overall home range of coyotes did not change, and some coyotes were observed to establish home ranges with no water sources present (Kluever et al. 2015). Similarly, raven sign is known to increase around human-made structures, such as roads, powerlines, and water developments, but it has not been demonstrated that water developments alone increase raven density on the landscape (Kristan and Boarman 2007).

Human development of perching sites (e.g. power lines) may increase the presence of other avian predators, such as hawks and raptors, but little is known about use of water developments by these species. Some raptor species have been observed using and hunting near guzzlers, but observations are sparse (O'Brian et al. 2006). Research in Utah has indicated Golden Eagles will use guzzlers if placed in areas that meet certain criteria (Finlayson 2021). Despite increased sign of predator species near water sources, the abundance of prey species — including rabbits and rodents — was not influenced (Kluever et al. 2015). More research is needed to establish the relationship between water developments and predator-prey relationships.

Water Quality

Artificial water developments are typically constructed of metal, plastic, or rubber catchments designed to capture rainwater in a storage container by which animals have access (Tsukamoto and Stiver 1990, Wilson and Hannans 1997, Brigham and Stevenson 2003). In some cases, natural landscape features have been reinforced with concrete to serve as artificial ponds as well (Tsukamoto and Stiver 1990, Griffis-Kyle et al. 2017). The design of guzzlers is intended to capture rainwater sporadically throughout the year and make it available for wildlife during the driest seasons. Due to the infrequent intake of water, infiltration of dust and other substances, and evaporation of water inside the system, there is concern about the quality of water made available to wildlife by guzzlers (Tsukamoto and Stiver 1990). Some research has been conducted regarding water quality and has found increased levels of ammonia and other harmful chemicals (Griffis-Kyle et al. 2014). That research found decreased abundance of insects and amphibians in those water systems. However, that analysis focused on tanijas, which are natural rock structures reinforced with concrete to hold more water. Tanijas rely more on overland flow of rainwater, which may lead to higher contamination than manmade materials. Further research is needed to assess the quality of water in artificial water systems and the impact on wildlife.

Guzzlers may also serve as a site for increased disease transmission due to high concentrations of animals using a small area (Tsukamoto and Stiver 1990, Rosenstock et al. 1999). For example, avian influenza is known to spread at water sources and it is recommended to remove standing water when an outbreak occurs (USDA 2022). Similarly, Mycoplasma ovipneumoniae can be spread through direct contact of bighorn sheep (Ovis canadensis) and domestic sheep (Ovis aries), which may occur at water sites (Spaan et al. 2021). It may be advisable to temporarily limit access to guzzlers during acute disease outbreaks to reduce disease transmission.

Benefits

Despite the issues and concerns surrounding construction of artificial water developments, there are documented benefits of increasing water on the landscape. Utah is often cited as one of the driest states in the United States (Sowby 2023). Further, the growing human population and expansion of agricultural operations over the past century has greatly reduced the amount of free water available in the environment. Guzzlers can be a form of habitat restoration work aimed at increasing the number of available water sources. Construction of guzzlers cannot restore mesic habitat and vegetation associated with natural springs, but they can provide free water in areas that have been affected by anthropogenic development. There is also documented evidence of increased reproductive rates of wildlife with access to free water in xeric environments (Simpson et al. 2011, Rich et al. 2019). Greater reproductive rates have led to increased abundance of wildlife around guzzlers when compared to unwatered sites (DeStefano et al. 2000, Kluever et al. 2015). Access to free water can also reduce physiological stress of xeric adapted species, which can lead to increased survival and access to more food resources (Gullion and Gullion 1964, Larsen et al. 2012, Hall et al. 2013). Although there are many concerns regarding guzzlers, the restorative nature of their construction and documented benefits should allow wildlife managers to continue implementation while conducting research of any adverse effects.

Species-specific Habitat Needs

Chukar (*Alectoris chukar*)

Chukar partridge are a non-native species that was successfully introduced to Utah in 1951 (Mitchell 2003). Chukar prefer habitat with steep, rocky slopes that provide cover and escape terrain. Shrub cover is also important to chukar, as they have been documented to avoid water sources when shrub cover is less than 11 percent in the immediate vicinity (Larson et al. 2007). Chukar typically roost in rocky outcrops with moderate shrub cover in the surrounding area (Knetter et al. 2017). Foraging habitat can vary widely, with chukar consuming grass and forb shoots, seeds, and bulbs from a variety of native and invasive species (Knetter et al 2017). Cheatgrass can be a preferred forage species for chukar during many times of year, however monocultures have negative effects on populations (Lindbloom et al. 2004, Knetter et al. 2017). Insects can also be an important source of protein when abundant, and chicks rely upon insects during the early stages of development (Chistensen 1996). Chukar have been observed to persist in areas with little or no available surface water when bulbs and tubers are plentiful (Larsen et al. 2010).

Early research on use of artificial water developments by chukar indicates populations of 50 birds can be maintained on a single guzzler, with up to 300 birds using one guzzler during peak years (Benolkin 1988). However, it has been documented that guzzlers constructed in inadequate locations will not entice birds, so the location of developments is important. It was theorized that chukar would only use guzzlers placed in locations natural water may occur, such as concave drainages and valleys (Benolkin 1988). However, further research found topographical placement is much less important than habitat immediately surrounding the site (Larsen et al. 2007). Chukar require sites with at least 11 percent shrub cover within 30 meters of water (Larsen et al. 2007). Chukar did not use water sites with less than 11 percent shrub cover, but use also did not increase as shrub cover increased past the 11 percent threshold. Larsen et al. 2007 did not find any significant impact of distance to nearest rock cover, slope, distance to nearest shrub, or shrub height. Therefore, artificial water developments constructed for the benefit of chukar should only be placed in areas with adequate forage resources and at least 11 percent shrub cover within 30 meters of the development site.

Previous research has indicated that chukar have short daily movements of less than 300 meters and small home ranges of less than one km2 (Lindbloom 1988, Walter and Reese 2003). Based on this research, it has been assumed that chukar found further than 300 meters away from a water source did not access water every day or relied on vegetation to meet their water demands (Larsen et al. 2010). Furthermore, it has been recommended that water developments be built at a distance no greater than one-quarter mile (~400m) away from each other to provide chukar with multiple water opportunities in a home range (Benolkin 1988). However, current research using wild chukar captured at guzzlers and fitted with GPS transmitters in the Fish Springs area of Utah has indicated that chukar regularly move distances of over 1,600 meters in a day (Barnes et al. unpublished data). That research has also indicated that most chukar only have a single guzzler in their home range, even if there are multiple guzzlers available to them. Using this up-to-date research, it may be advisable to build guzzlers at much further distances apart; for example, one mile (~1,600 meters) in areas where the goal is to increase the density of chukar where habitat can sustain growth (Krausman et al. 2006). Building guzzlers further apart (>3,200 meters) may be more advantageous where the goal is to expand the usable range of summer habitat. Natural water sources must also be considered when selecting sites for guzzlers to avoid placing them in areas where water is not needed. Guzzlers should also be placed in areas that include brood rearing habitat, as most observations of chukar at guzzlers occur when chicks are less than 80 percent grown (Utah Division of Wildlife, unpublished data).

Figure 2. *Chukar partridge*

Hungarian or Grey Partridge (*Perdix perdix*)

Research about habitat needs of grey partridge in the United States is very limited. In their native range, grey partridge are closely associated with agricultural fields and require shrub and tree cover to evade predators (Rantanen et al. 2010, Bro et al. 2004, Harmange et al. 2019). In Utah, grey partridge can be found in close association with some agricultural areas, but they have also been observed in lower elevation sagebrush habitats in close proximity to chukar (Utah Division of Wildlife, unpublished data). Due to the apparent similarity in habitat preferences with chukar, it is recommended that guzzlers constructed for the benefit of grey partridge use the same guidelines as those provided for chukar. It is also advised to pursue the research of habitat requirements of and use of artificial water sources by grey partridge.

Gambel's Quail (*Callipepla gambelii*)

Gambel's quail are a native desert-adapted species; the largest populations in Utah inhabit the southwestern corner of the state. Gambel's quail prefer shrubby desert habitat with abundant native grasses, shrubs, and forbs (Brown 1982). Controlled laboratory studies have shown that Gambel's quail can survive for long periods of time without surface water if succulent vegetation is available, but if birds are relying on dried seeds for forage, which may occur during prolonged severe droughts, surface water is necessary for survival (Gullion and Gullion 1964). In observational and experimental studies in native habitat, artificial water sources have been found to increase abundance of quail in the immediate vicinity of the guzzler, but no population level increases have been observed (Gallizioli 1961, Rich et al. 2019). It appears that survival of adult Gambel's quail is not affected by access to water, but chick survival may be affected (Skidmore 2016). Access to free water can also increase the diversity of Gambel's quail diets, by allowing them to make use of dried seeds (Gullion and Gullion 1964). Access to free water reduces home range size of adult quail, but home range location is not affected (Skidmore 2016).

Figure 3. *Gambel's quail*

Habitat immediately surrounding the guzzler should provide greater than 40 percent tree or brush canopy cover, 30-50 percent grass cover, and ensure that less than 40 percent of annual vegetation growth is grazed to function as cover from predators. In addition, the habitat in the vicinity of the guzzler should provide adequate forage and cover resources to meet the demands of increased density of quail, including desert almond, blackbrush, Joshua trees, brush piles and/or bunch grasses. Similarly, in areas with a goal of expanding the accessible range of Gambel's quail, guzzler placement of 1 mile (~1,600 meters) from existing water sources is recommended (Krausman et al. 2006). In areas with a goal of increasing the density of Gambel's quail, spacing guzzlers approximately 200 meters apart is advised.

California Quail (*Callipepla californica*)

California quail are a nonnative species that have been successfully introduced into Utah as early as 1896 (Calkings et al. 1999). California quail inhabit areas of dense shrub cover, typically near water sources (Leoplod 1977, Howell and Webb 1995). Research of California quail use of artificial water sources is limited, though it is apparent that free water is necessary for survival of this species in arid climates (Leopold 1977). California quail also rely on mesic habitat surrounding natural resources, so it is unlikely that adding guzzler to a dry landscape will make it suitable for use by the species. Research focusing on habitat needs of California quail in Utah is necessary for targeted species management.

Figure 3. *California quail*

Greater Sage-grouse (*Centrocercus urophasianus*)

Greater sage-grouse (hereafter sage-grouse) are a native species that is dependent on intact sagebrush habitat for survival. Sage-grouse habitat has been reduced significantly throughout its range by human development and landscape use change (USFWS 2010). Sage-grouse are a species of concern for wildlife managers and have been petitioned for listing on the endangered species list several times (USFWS 2010). Due to the decline in habitat and population, habitat alterations — including artificial water developments — undergo a higher degree of scrutiny when they affect sage-grouse.

Early research on sage-grouse inferred that they require water daily and water is a limiting resource for the species (Autenrieth 1981, Autenrieth et al. 1982). However, one study that used radiotelemetry found that sage-grouse did not commonly use artificial water developments, even during relatively dry years (Connelly and Doughty 1988). Sage-grouse leks and brood-rearing habitat are found in closer proximity to water than would be expected in a random distribution, indicating that water is an important component of their habitat (Donnelly et al. 2016). It has been suggested that mesic habitat is integral for brood rearing, which would indicate sage-grouse select for areas near water due to the increased access to green forage and insects rather than the water itself (Connelly and Doughty 1988). Artificial water developments do not provide mesic habitat or access to green forage, so it is unclear whether they would improve sage-grouse habitat or increase populations. Sage-grouse have been observed using artificial water sources by multiple Utah Division of Wildlife personnel, so it is possible guzzlers would provide some benefit to the species in specific situations.

A major concern of constructing guzzlers in close proximity to sage-grouse habitat is subsidization of resources for mesopredators (O'Niel et al. 2018). Predator sightings are much higher at artificial water developments than at unwatered sites, though it is not clear if overall predator density increases (DeStefano et al. 2000). There is also uncertainty that predation rates increase around artificial water sources (Rosenstock et al. 1999, O'Brien et al. 2006, Simpson et al. 2011). Despite the lack of conclusive evidence that guzzlers increase predator populations and predation rates, land managers may remain reluctant to approve construction of new guzzlers in sage-grouse habitat due to the potential negative impacts. Sage-grouse populations have experienced significant declines over the last 100 years, and any management action that may lead to increased predation rates faces increased scrutiny (USFWS 2010). Further research on the direct impact of guzzlers to sage-grouse populations is needed before artificial water developments are constructed for the sole purpose of benefitting sage-grouse. If guzzlers are to be constructed for other target species, but will be built within sage-grouse habitat, it is recommended that care be taken to avoid placing guzzlers in areas of high sage-grouse densities. It is also recommended that guzzlers be placed at further distances from other water sources (> 1,600 meters) to avoid providing areas of high water density that may subsidize predators. A buffer of at least three miles (~4.8 km) is required around lekking locations to eliminate anthropogenic disturbance. A comprehensive document of the UDWR's efforts for sage-grouse conservation can be found at the following link: https://wildlife.utah.gov/sage-grouse/Utah_Greater_Sage-grouse_Plan.pdf

Management

Planning and Location

Target Species

The first step in selecting the site of a new water development is to determine the species intended to benefit from the project. Habitat surrounding the potential site must have adequate forage and cover resources to support the target species. Research has shown that guzzlers can only increase local density of animals if water is the only component missing from the site. Unless the goal is to release or transplant the target species to the area, it is also advisable to ensure the target species inhabits the area or can be found on water sources adjacent to the intended site. Site selection must be approved by both the local wildlife and habitat DWR biologists.

Nontarget Species

In addition to considering the target species intended to benefit from guzzler construction, it is also important to consider nontarget species in the area that may use the guzzler. Big game, domestic livestock, and feral horses are all known to use guzzlers and consume large quantities of water. If these species are present in the area, it may be necessary to fence off the guzzler to limit use. If big game utilization is a desired goal of a new water development, the guzzler construction must include large tanks to prevent overuse of the limited water resource. If feral horses or domestic livestock are present, wildlife friendly fencing, such as pipe rail, must be used to prevent non-wildlife species from accessing the guzzler. If big game animals are present in the area but not desired to access small game guzzlers, a barrier must be constructed to safely prevent access.

It is also possible that undesirable species are present in the area but cannot be prevented from accessing the water development. If this is the case, it is essential to determine if the benefit of constructing a guzzler outweighs the negative impacts of supplementing the undesirable species. It may be necessary to develop a mitigation plan for the nontarget species to monitor and remove them. For example, constructing a guzzler in sage-grouse habitat may increase use of the site by foxes. If it is determined the guzzler is necessary but there is concern that increased use of the area by foxes may negatively impact sage-grouse, it may be necessary to monitor fox use at the guzzler and perform targeted removal if excessive use occurs.

Site Selection

Once a general area has been selected and all target and nontarget species in the area have been considered, it is necessary to select individual sites for each new guzzler. First, new guzzlers must not be placed too close to other water sources. In areas where the primary goal is to increase local density of the target species, it is recommended to construct guzzlers an appropriate distance from other water sources. The recommended distance between water sources differs by species. Second, there must be at least 11 percent shrub cover within a 30-meter radius of the site for chukar, and greater than 40 percent shrub cover for quail. Third, there must be adequate forage resources, shrub cover, and escape terrain (e.g. rocky outcroppings for chukar) present within a few hundred meters of the sites, as determined by both the local wildlife and habitat UDWR biologists. Fourth, the ground at the site must be adequate for construction. Areas that are excessively rocky, rough, or sloped should be avoided. In the past, guzzlers for chukar have been constructed in areas with steep slopes, and subsequent anecdotal evidence suggests these sites receive little or no visitation. The slope of the guzzler site should be relatively low for ease of construction and maintenance, as well as promoting use by the target species. Fifth, the area should be selected to prevent view from high-use roadways, but close enough to allow relatively easy access for construction and maintenance. Care should be taken to avoid making a new roadway to the guzzler. It may be advisable to designate a “parking area” for workers near the closest main road and take only a limited number of vehicles to the site. Guzzlers are typically constructed on public lands, such as SITLA, BLM, or USFS, to ensure upland game using the water development are available for public use. In rare circumstances, guzzlers have been constructed on private lands, though this is typically discouraged due to the possibility that landowners may eliminate public use agreements or sell their land and nullify previous hunter access agreements.

Adapting Big Game Guzzlers

Guzzlers are also constructed for big game animals throughout Utah. If these guzzlers are constructed within the range of an upland species, big game species should be considered during the planning process. If it is possible to locate the big game guzzler in an area that includes adequate brood-rearing habitat, then the guzzler should be placed within adequate shrub cover to promote use by upland game species. The drinker should be built at or near ground level, or a ramp should be constructed to allow upland species to easily access the water. An escape ramp should also be fitted inside the drinker to allow any small animals that may become entrapped to escape. It may not be possible to construct big game guzzlers in an area while simultaneously promoting use by upland game, but if the primary goals for the guzzler can be achieved while still allowing use by other species this should be considered during the planning process.

Converting Small Game Guzzlers

There are guzzler sites within the state that currently have small game guzzlers constructed, but are either being used by big game animals or are in a location that would benefit big game animals. In these situations, it may be appropriate to construct a big game guzzler instead to create a better multi-species site. The species and number of large animals that could potentially use the site should be carefully considered. It may be appropriate to leave the current small game guzzler in place and construct a new big game guzzler in an adjacent location. If space is limited, it may be appropriate to expand the existing guzzler with additional tanks and/or aprons to hold and capture more water.

Water Rights

Water rights are required on new and refurbishment projects where guzzler tanks are greater than 2,500 gallons. This is rare for upland game guzzlers, but may be an important consideration with larger multi-species guzzlers. Water rights should be secured through the Utah Division of Water Rights. The local UDWR biologist leading the project should work closely with UDWR Water Right Specialists to apply for and secure any necessary rights for a project. Water rights do not need to be obtained for guzzlers that are under 2,500 gallons, but they must be registered with the Utah Division of Water Rights under the Rainwater Harvesting Registration (waterrights.utah.gov/forms/rainwater.asp). When registering the guzzler with the Division of Water Rights, please do not list the exact location, only list the mountain the guzzler is located.

Best Construction Practices

There are many ways to successfully build a guzzler, though some best construction practices have been developed. The most up-to-date (at time of publishing) cost and construction sheet can be found at the following link: Upland Game Guzzler Apron and fence specs and cost 2019.pptx. The current tank used for upland game guzzlers is the RotoGuzz brand guzzler with a 500 gallon capacity (Figure 1). This tank has a built-in skirt for capturing rainwater. However, the total rain gathering capacity can be extended by constructing a metal apron on top of the tank (Figure 2). Additional benefits of adding a metal apron above the tank are: protection from UV radiation, improved resistance to wildfire, protection from damage from large animals walking on the tank, and protection from bears. Big game guzzlers can be tailored for upland game use by placing the drinker at or near ground level. Boss Tank branded guzzlers can be dug into the ground to enhance use by upland game species (Figure 3). Big game guzzlers can also be constructed with underground tanks and a drinker placed at ground level (Figure 4). As best construction practices further develop and new building techniques, materials, or manufacturers are used, the UDWR should share information internally to ensure each region has access to the most up-to-date construction information.

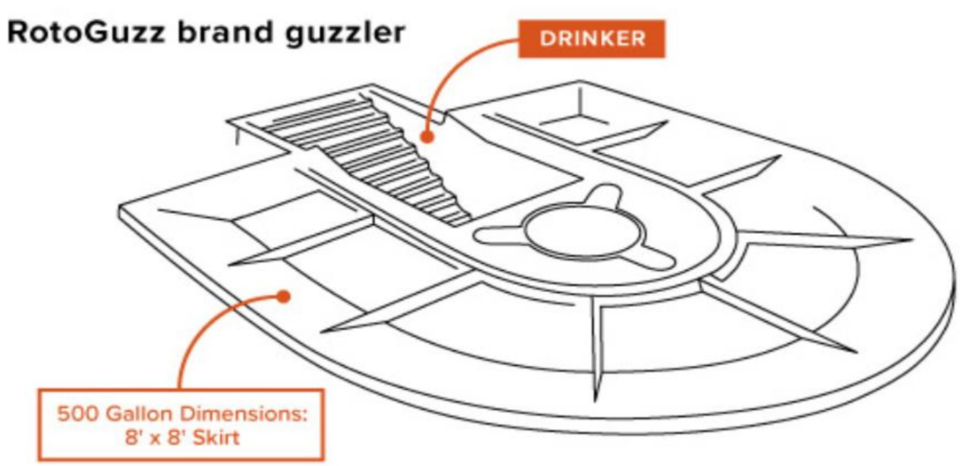

Figure 3. *RotoGuzz brand guzzler for upland game species*

Construction of fencing around the guzzler may also be required to prevent use from nontarget species. Small game guzzlers that are not intended for large animal use should have a tight four-six strand barbed wire fence constructed within three feet of the apron. Guzzlers with this type of fencing have been implemented in areas with cattle, elk, and feral horses and have remained protected for many years. If the guzzler is intended for use by large game species, it is best to leave the guzzler unfenced. However, if domestic cattle or feral horses are in the area, a pipe rail or buck-and-pole fence should be assembled. Fences on big game guzzlers should cover a large area to allow animals to access the water, and avoid stress reactions that could occur in small, closed off locations.

Figure 4. *RotoGuzz brand guzzler with a metal apron constructed on top of the tank to enhance rain-gathering capability and increase protection*

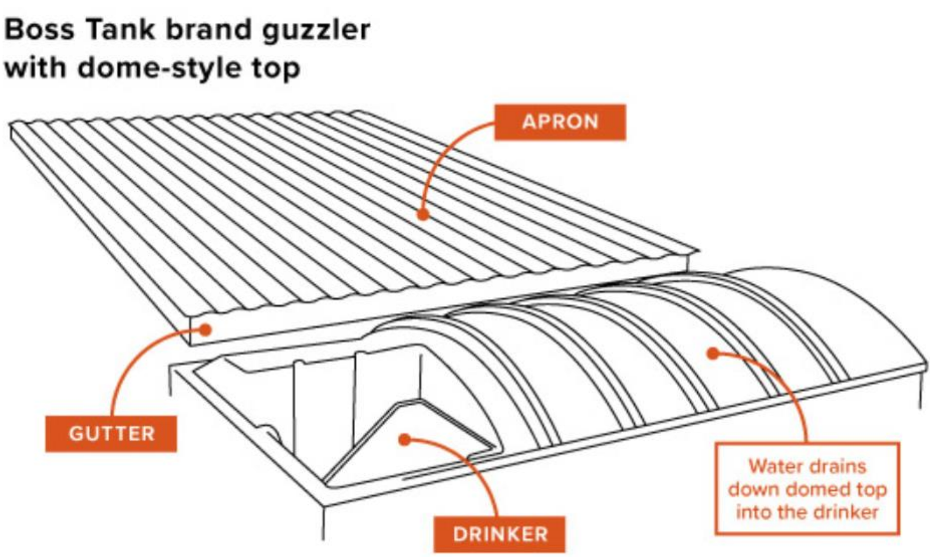

Figure 5. *Boss Tank branded big game guzzlers can be dug into the ground to lower the drinker and allow use by upland game species.*

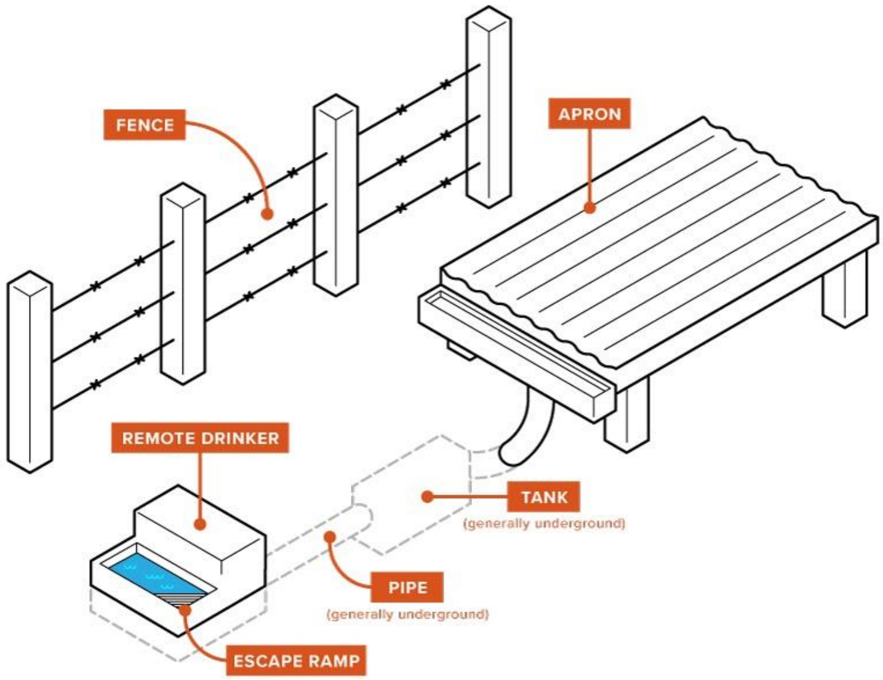

Figure 6. *A big game guzzler with a drinker at ground level to allow for use by upland game species.*

Approval from Land Management Agencies

Permission to construct water developments on federally owned land must first gain approval from the managing agency. Typically, the construction will need to be approved through the National Environmental Policy Act (NEPA), which includes a categorical exclusion. This determines the environmental effects of human disturbance. This process can take several years, so it is best to start early. In the initial planning stages, the federal agency responsible for the guzzler sites should be contacted to determine the level of NEPA needed for approval. A proposal should include:

- map of potential sites
- shapefiles
- description of the guzzler (type, capacity, apron, whether it will be fenced, etc.)
- how it will be installed and
- the guzzler's intended target species (what species will it benefit, why is it necessary, and the distance to the nearest existing available water sources)

The UDWR biologists taking the lead of the project should work closely with their federal partners through the entire process. It is most efficient to take multiple guzzler sites through the NEPA process in one document. The regions should prioritize areas where multiple guzzlers can be constructed, identify sites for each guzzler in one document, and route that document through the NEPA process. This will provide approval for multiple guzzlers at one time and allow multiple guzzlers to be constructed in a single season. When the assembly of all approved guzzlers is almost complete, the region can begin the NEPA process for another group of guzzlers, if needed.

Maintenance

Monitoring and maintenance of water developments is vital to ensure proper function and reliable access of water to wildlife. Given the large and increasing number of guzzlers across the state, it is unreasonable to expect monitoring efforts to be the responsibility of a single DWR section. Further, it is typically not necessary for guzzlers to need maintenance annually due to the robust construction and longevity of the components. However, flooding, fire, vandalism, or other unforeseen events may necessitate maintenance. Each guzzler should receive monitoring every five to seven years to ensure proper function. Monitoring efforts may be completed by the district wildlife biologist, habitat biologists, seasonal employees, partnership employees, or other DWR personnel. If deemed necessary, partnering with other organizations, such as the

Utah Chukar and Wildlife Foundation, may be implemented to complete monitoring efforts. Partnering organizations or volunteers must sign a data sharing agreement or nondisclosure agreement to ensure guzzler locations remain protected. If a catastrophic event such as wildfire or flooding occurs in the vicinity of a water development, then monitoring efforts should be conducted as quickly as possible.

All monitoring efforts must be documented using either the Field Map form or Survey 123 form. The Survey123 reporting form can be found at the following links:

For guzzlers with a known ID:
https://survey123.arcgis.com/share/114eae5674514b12a070762eb2891fc4

For guzzlers with an unknown ID:

https://survey123.arcgis.com/share/705a1d1b2bb642b8a664e85431a93211.

Location services on the device should be turned on to allow a precise location of the guzzler being visited. If location services are not available, record the latitude and longitude of the guzzler location, as well as the guzzler name, if displayed. Follow the prompts and questions for the rest of the survey and submit the form when complete. All aspects of the guzzler should be closely inspected, including integrity of the apron, functionality of any gutter or water collection system, rigidity of the protective fence (if applicable), and any other accessible component.

If any problems or concerns are discovered, they must be promptly input into the guzzler monitoring forms. Verbal communication of the problem to the Regional Habitat Manager or UDWR personnel responsible for guzzler maintenance within the region should also occur promptly. In order to allow members of the public to report guzzler conditions, a QR code system has been developed. Signs with QR codes are being installed at guzzler locations. The QR codes will direct those who scan them to the public reporting database. This process will alleviate some of the workload placed on UDWR biologists. The Habitat and Wildlife sections in each region should work together to deploy all QR code signs in a timely manner.

Restoration

Many guzzlers throughout the state have been affected by wildfires, overgrazing, or other adverse events that have reduced or eliminated use by the target species. Additionally, some guzzlers were constructed in areas that do not promote use by the target species due to inadequate habitat (e.g. no shrub cover in the immediate vicinity). Use by the target species at these guzzlers should be inventoried via scat or camera surveys. If it is evident that inadequate habitat is limiting use, restoration efforts should be pursued. Targeting seeding of forage species and planting of shrubs should be conducted to improve habitat surrounding the guzzler. However, if restoration efforts prove ineffective or the disturbance event has rendered the location uninhabitable at a larger scale around the guzzler, then construction of new guzzlers in undisturbed habitat within the range should be pursued. The cost of relocating guzzlers is likely too high to justify, so it may be necessary to abandon sites that have failed restoration efforts to make best use of resources. Abandoned sites should still be surveyed every 15 years to monitor regrowth of disturbed vegetation and determine if additional efforts may be successful as habitat reaches more advanced successional stages. Guzzler sites that have water rights owned by the UDWR should not be abandoned unless there has been full-scale development rendering the habitat surrounding the guzzler inhospitable. Sites with water rights should rank as high priority for restoration efforts and continued monitoring as with other guzzlers.

Regional Priorities

This document serves as a statewide overview of current research on water developments, best practices for new constructions, monitoring efforts, and species-specific guidelines. Appendix 1 lists priority sites selected within each region and will be reviewed in conjunction with the 10-year plan for upland game guzzler construction and management. The 10-year plan represents priorities at the time of Plan implementation and does not limit the work the regions may conduct for upland game or guzzlers. If opportunities arise for guzzler construction that are not listed in Appendix 1, they should be pursued. Size of the workforce, seasonal conditions, and other priorities may change the amount of work that can be completed over the next 10 years of upland game management.

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Utah Chukar and Wildlife Foundation (UCWF):

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Central Region: 801-491-5678

Southeastern Region: 435-613-3700

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Appendix A

Upland Game Water Developments

Northern Region

- Install 5 new big game/upland game guzzlers in the Newfoundland Mountains
- Install up to 10 guzzlers in the Hogup Mountains
- Construct 2-3 water developments in Swan Creek
- Install 1-2 guzzlers southwest of Bear Lake to mitigate development
- Install 2-3 guzzlers east of Bear Lake
- Construct 1-3 guzzlers on or adjacent to the East Canyon WMA
- Construct 1-5 guzzlers on the Henefer Echo WMA
- Identify Sites in the Wellsville Mountain for guzzler construction
- Identify sites in the Crawford Mountains for guzzler construction

Central Region

- Add or replace some upland game guzzlers to the Rotto guzzler design to make water available to all wildlife.
    - North Cedar Mountains – BLM lands
    - Long Ridge west of Nephi – BLM lands
    - Dugway mountains – BLM lands
    - Thomas mountains – BLM lands
      Install 5 new big game/upland game guzzlers in the Newfoundland Mountains
    - Identify sites in the Crawford Mountains for guzzler construction
- New guzzlers to fill gaps in water sources
    - North Cedar Mountains – BLM lands
    - Long Ridge west of Nephi – BLM lands
    - Dugway mountains – BLM lands
    - Thomas mountains – BLM lands
      Install 5 new big game/upland game guzzlers in the Newfoundland Mountains
    - Identify sites in the Crawford Mountains for guzzler construction

- Adding maintenance free Boss tank guzzler tanks to some BLM west desert maintained guzzlers.
- Add new guzzler app signs on all guzzlers in the next 5 years

Southern Region

- 10 upland guzzlers along the west side of the Sevier Valley. Starting North of Richfield to Aurora then crossing into the Valley Mountains (northeast of Salina).
- One East of the Glenwood fish hatchery 38.75829, -111.96025
- One East of Monroe near Sand Canyon
- 15 upland game guzzlers in the Mud Springs, Table Butte, Hot Springs Canyon and areas of the Black Hills between Cedar City and Minersville.
- One to two guzzlers along the base of the Sawmill burn scar on the northeast side of the Pahvant from Raspberry Canyon to the north behind Scipio
- Ten along the 50 Mile Bench, 50 Mile Mountain, Grand Bench, and Croton Canyon areas.
- Cedar Wash, south of Escalante (big game/upland game combined)
- Capitalize on other opportunities as they become available

Southeastern Region

- Install guzzler app signs on all guzzlers within the region in the next 5 years
- Create a guzzler maintenance plan to ensure all guzzlers are in proper functioning condition
- Work with BLM field office to get a guzzler technician back in place (mostly sheep guzzlers but there is chukar benefit)
- Capitalize on other opportunities as they become available.

Southeastern Region

- Upgrade or replace guzzlers in the area surrounding the Sand Wash Boat Ramp: 591207 m E, 4410515 m N

- Add 3 Rotoguzz guzzlers in Three Corners, Daggett County (BLM lands)
- Add 5 Rotoguzz guzzlers in Book Cliffs, Uintah County (SITLA lands)
- Monitor for success, add additional guzzlers accordingly