tion rate and a practice life of 25 years. This shows a cost-benefit ratio of 1.19 to 1 and net-present value of .80/acre. A cow-calf operation would most likely show a higher return.

The improvement in ecological condition will have lasting benefits that can be also be measured by the overall health of the ecosystem. The soil environment—an important measurement of range health, is now much healthier evidenced by the many new seedlings, the improved aeration and water infiltration that now have enchanced plant succession. The future looks bright for these fields and any "on location" commercials in the years ahead will depict a scene the old-timers recall as belly-high grass.

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Water for Wildlife

Stephan A. Nelle

In the rugged, remote and arid Big Bend region of west Texas, permanent water is a precious asset. Because of the scarcity of natural water and the often prohibitive expense of traditional water developments, many hundreds of thousands of acres of desert rangeland are without a reliable water supply for wildlife.

Desert mule deer are the most important game animal in the region, and an asset to ranchers who lease hunting rights to sportsmen. Many landowners would like to increase deer numbers up to the stable carrying capacity of the land. Predation, drought, and poor water distribution are most often cited as reasons for low deer populations. Properly watered areas of good habitat in west Texas support deer densities of 35 to 75 acres per deer, while poorly watered areas with good food and cover may only support a deer to 300 to 500 acres.

Where rangelands produce a good food supply, many ranches could support significant increases in deer numbers utilizing rainfall catchment and storage devices commonly known as guzzlers. In a typical guzzler, an impervious catchment apron intercepts rainfall and directs it to a covered storage tank from which water is supplied to a small ground level drinking basin. In addition to mule deer, javelina, scaled quail, and numerous non-game animals benefit from these guzzlers.

On the nearby Black Gap Wildlife Management Area, owned and operated by the Texas Parks and Wildlife Department, a number of guzzlers have been successfully used for over

Ground level steel catchment anchored with rock. A gutter and sump divert rainfall to tank using a 4-inch pipe. The 630-square foot catchment will fill the 2,000-gallon tank with 5.1 inches of rain.

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20 years. These systems consist of an elevated catchment, supported by posts and framing. Studies at the Black Gap Area in the mid 1960's showed that guzzler installation shifted deer concentrations into the previously unwatered territory. There are no data to suggest that the total population increased.

While the use of guzzlers has become rather commonplace on federally owned land in the western states, they are rarely used on private land in west Texas. To introduce Texas ranchers to their use, the Soil Conservation Service developed and funded a guzzler field trial project with the Texas General Land Office (GLO) and two ranch lesses. Objectives of the field trial are to determine if deer numbers can be increased to huntable populations in water deficient areas, in a cost-effective manner. This field trial is intended to increase the population, not merely draw deer from one area to another.

Application of asphalt emulsion to polyester blanket. Blanket must be pre-wetted with water for asphalt to penetrate fabric. Catchment construction required 53 hours of labor.

The 1,600-square foot fabric and asphalt catchment will fill the 3,000-gallon tank with 3.3 inches of rain.

The Project Area

Two adjacent ranches in southern Brewster County owned by the GLO and leased to private individuals were selected as ideal locations. Large areas on these ranches have no permanent water, and deer populations have averaged about 600 acres per deer for the past few years. Natural depressions in the hard limestone called tinajas which hold water for several weeks after rains were the only source of drinking water for wildlife. The area receives an average of 9 inches of rainfall annually. It is not uncommon, however, to receive 5 inches or less in any given year.

With the historic lack of water, the area has apparently never been heavily grazed or browsed. Considering the harsh climatic conditions, the stable, year-round food supply for deer is excellent. An abundance of high quality browse and forbs are present including Roemer's acacia, whitethorn acacia, Texas kidneywood, heath cliffrose, guayacan, granjeno, evergreen sumac, Gregg ash, wooly butterflybush, skeletonleaf goldeneye narrowleaf forestiera, menodora, and sticky seolloa. Other common species which are used seasonally or during especially stressful periods include lechuguilla, sotol, pricklypear, and candelilla.

The cooperative field trial called for the SCS to provide materials for seven guzzlers. The GLO provided the land and conducts an annual deer census. The lessees will maintain the structures. All cooperating partners provided labor for actual construction.

Guzzler Design

Questions to be considered in designing a guzzler project for deer include the following:

1. How far will deer travel to and from the guzzler, and what spacing should be used for optimum habitat use?
2. What is the estimated maximum number of deer the area will safely support, and how much water will those deer drink?
3. What amount of rainfall can reasonably be expected in any given year?
4. What is normally the longest expected rainless period, and what

Inverted umbrella guzzler is easily assembled and requires very little site preparation. The 434-square foot catchment requires 8.3 inches of rain to fill the 2,250-gallon tank, making it less efficient than other designs.

size storage facility is needed for this period?

5. What size catchment is required to yield the needed amount of water?

The seven guzzlers in this project were installed in 1990. Guzzlers are spaced at an average 1.5-mile interval, thus providing water to about 10,000 acres of habitat. There are differences of opinion regarding water needs of mule deer, ranging from one-half to two gallons per day. Anticipating that deer density over time will increase to 100 acres per day, each guzzler will provide water to about 15 deer.

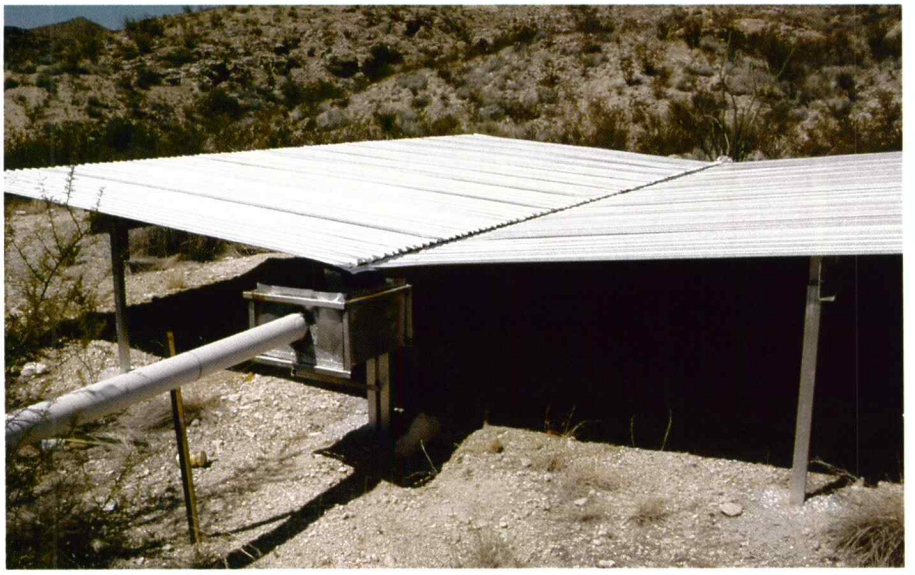
The guzzlers have storage tanks ranging in size from 2,000 to 3,000 gallons. Catchment sizes vary from about 400 to 1,600 square feet. The designs that will fill the needed storage capacity with the least amount of rain are considered to be the most effective. The most effective guzzler design used in this field trial will fill a 3,000-gallon tank with approximately three inches of rainfall. The least effective design requires about eight inches to fill a 2,250-gallon tank. Most of the rainfall in this region occurs in late summer. To insure adequate drinking water supplies, the guzzler storage tanks were designed to hold a one-year supply of water.

Guzzler Costs

A variety of construction materials and methods were used to gather data on material and labor costs as well as longevity and maintenance needs. Galvanized 30 gauge steel roofing material placed directly on the ground was used on four guzzler catchments. Polyester geo-textile fabric of 80 mil thickness impregnated with two coats of water based asphalt clay emulsion was used on two guzzler catchments. Material costs for both kinds of ground level catchments ranged from about 35 to 40 dollars per 100 square feet. Labor costs were also comparable and ranged from 3.5 to 5 hours per 100 square feet.

One commercially available inverted umbrella guzzler was installed. The circular catchment is constructed on top of the tank, funnelling rainfall to the center. Catchment cost on this design was about ten times higher at 400 dollars per 100 square feet. Labor cost was similar at 5.5 hours per 100 square feet.

Delivery pipe and drinkers averaged 400 dollars per guzzler except for the umbrella unit which required no delivery pipe. Tanks cost 1,000 to 1,300 dollars each. Total cost per



The Black Gap style guzzler with elevated catchment has been successfully used for years. Increased materials and labor make this design somewhat more expensive.

Wildlife drink from a small ground level basin that is regulated by a covered float box. This guzzler has been in use for over 20 years at the Black Gap Wildlife Management Area. Evaporation loss from this drink amounts to only about 100 gallons per year in this 100-inch plus evaporation zone.

guzzler ranged from 2,000 to 3,500 dollars each depending on size and design. These cost figures include materials and labor for installation, but do not include site preparation, vehicle expense, nor travel or overnight expenses for the work crew.

Initial Observations

Preliminary observations indicate that the least expensive type of guzzler that should require the least maintenance is the galvanized steel ground level catchment. Although of similar cost, the polyester and asphalt catchment may require greater maintenance since it is less durable. Tears, holes and wind damage appear to be more likely, requiring periodic repair. Since the asphalt coating is subject to oxidation, recoating may be needed every three to five years.

The inverted umbrella guzzler is by far the easiest and most convenient to transport and assemble. Another advantage of the inverted umbrella is the minimum site preparation needed. Catchment areas on the ground surface may require considerable site preparation, including removal of vegetation and large rocks, possibly requiring heavy equipment. However, the inverted umbrella is also the most expensive design and has a relatively small catchment size for low rainfall areas.

An important consideration is anchoring the ground level catchments to eliminate wind damage. Where the land is too rocky to dig trenches for burial of catchment perimeters, rocks can be placed around the edges. The umbrella catchment must also be anchored with wire, chain or cable into the ground to prevent wind damage.

Looking Ahead

Only time, probably 10 to 15 years, will tell whether the project will benefit the deer population as intended. The total cost to water the 10,000 acre area is about 20,000 dollars or two dollars per acre not including maintenance costs. Assuming that a deer herd of 100 animals will eventually develop, a managed buck to doe ratio of 1 to 1.5, and an average fall fawn crop of 30%, about 35 bucks would be present. A conservative harvest rate to achieve a good age structure would allow about three mature bucks to be harvested annually by hunters. At an average lease value of 800 dollars per hunter, the gross hunting revenue would be 2,400 dollars per year. At this rate, it would take about eight years to pay for the watering project. Heavier harvest rates and/or higher lease prices would improve the cost return scenario somewhat. However, guzzler projects using commercial contractors rather than ranch labor and equipment would cost considerably more. Contracted costs are probably closer to three dollars per acre, requiring an even longer payback.

Some ranchers realizing aesthetic benefits and personal satisfaction will make long-term improvements knowing that costs may never be recovered. Most ranchers, however, will find it difficult to install guzzler projects unless costs can be recovered or some incentives provided. It is hoped that this project will answer some basic questions and be the catalyst to encourage the use of guzzlers on private lands.