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*Harvesting*  
**Rainwater**  
*for* **Wildlife**





# Harvesting Rainwater for Wildlife

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People are intrigued by wildlife and enjoy watching different species interact. Many Texans have been introduced to the outdoors through hunting and fishing, activities that have contributed an estimated \$3.3 billion annually to the state's economy.

Wildlife viewing, including bird-watching, is gaining in popularity among outdoor enthusiasts. For example, the number of bird-watchers nationwide has increased from 21 million in 1983 to 68 million in 2000.

With increased enthusiasm for wildlife comes a growing economic potential for landowners to offer nature-based tourism. To attract wildlife—and in turn, people—to their properties, land managers have worked to improve the habitat on their properties by using management techniques such as shallow disking, prescribed burning and livestock grazing.

One underused method for attracting wildlife is the installation of watering devices to provide a supplemental source of water for animals. Land managers are also harvesting rainwater to better distribute water on the landscape, thus increasing the amount of usable space for wildlife.

Rainwater can be captured using several kinds of devices and management techniques.

To make the best choice for a specific property, land managers should consider many factors, including the sources of water used by animals, the number and diversity of wildlife on the land, differences in mobility for various species, rainfall patterns in the area and options available for harvesting, storing and conveying rainwater.

## Wildlife water sources

Just as for humans, water is essential for all animals, including wildlife. Animals obtain water in three basic forms:

- **Free water** (drinking water), which is surface water taken from ponds, creeks, water troughs, bird baths and other similar sources.
- **Metabolic water**, which is derived from breaking foods down (digestion) into their chemical components.
- **Preformed water**, which is bound within a food itself. For instance, prickly pear cactus contains about 85 percent water (preformed water) and 15 percent solid material. Prickly pear cactus comprises a large part of the diet of the javelina (collard peccary). Javelinas are often found in southwestern Texas, where free water is sparse. Consequently, javelinas rely on the water contained in cactus pads. Some songbirds get much of their water not from bird baths and other free-water sources, but from the water held within worms, grubs, insects and various plants.

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## Wildlife management considerations

When making decisions about modifying your land to attract wildlife, it is important to consider the factors that contribute to the attractiveness of a habitat for animals, including wildlife diversity, home-range size and animal mobility.

**Wildlife diversity:** Although management efforts often are tailored toward attracting the species that are economically important and aesthetically pleasing, all animals play important roles in nature. Diversity is an indicator of ecosystem health. Therefore, the success of watering devices may be measured in part by the numbers and different kinds of animals using them.

**Home-range size and animal mobility:** Different kinds of animals use free water at different rates. They also require varying amounts of energy to crawl, walk or fly to a water source (Table 1). When considering where and how many watering points to provide, think about how an animal might move over a square mile (640 acres). Then break this acreage into smaller blocks (such as 320, 160 and 80 acres) for animals that can move far and for those that are more sedentary.

In livestock management, it is generally recommended to place watering points about 1 mile from each other, the idea being that a cow located at the midpoint would need to travel only 1/2 mile to acquire water. Such placement lessens the chances of cattle “walking off” weight gains. It also minimizes the habitat damage resulting from prolonged use, as some animals will not forage far from a water source.

These livestock management considerations are good starting points for wildlife management plans. Large mammals can easily travel 1/2 to 1 mile to obtain water; medium-sized

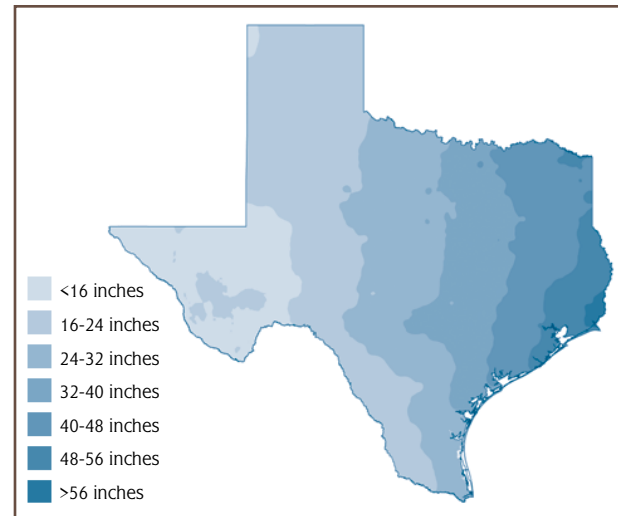
mammals would benefit from closer water point spacing (such as one per 320 acres); and smaller mammals are better served by water points distributed one per 80 to 160 acres.

Similarly, wild turkey and mourning dove can travel farther than can other birds, so water distribution for these two birds should be one water point per mile (640 acres). Conversely, the home ranges of bobwhite and scaled quail are much smaller, and water points placed at one per 80 to 160 acres would be more suitable. This density of water sources is also appropriate for most Texas songbirds.

## Rainfall

In some parts of Texas, rainwater is an important source of free water for wildlife. The supply of rainwater available depends on three key factors: the amount of rainfall, the type of surface on which rainfall lands (runoff coefficient) and the size of the area that catches rainwater (catchment area).

The amount of rainfall in Texas varies dramatically from east to west (Fig. 1). The East Texas Pineywoods region averages more than



**Figure 1.** Long-term average rainfall in Texas.

**Table 1.** Recommended water distribution according to animal group.

Animal group	Recommended water-point spacing
Large mammals (white-tailed and mule deer, coyotes and bobcats)	1/2 to 1 mile (1 per 320-640 acres)
Medium-sized mammals (javelinas, foxes, skunks and raccoons)	1 per 320 acres
Smaller mammals (ring-tailed cats, armadillos, squirrels and rabbits)	1 per 80 to 160 acres
Wild turkey and mourning dove	1 per 320-640 acres
Bobwhite and scaled quail and most songbirds	1 per 80 acres

48 inches of rainfall annually, while the Post Oak Savannah of Central Texas averages 32 to 48 inches a year. The High, Rolling and South Texas plains generally receive 16 to 32 inches of rain, and the Trans-Pecos region gets only 8 to 16 inches of rain each year.

Table 2 shows the long-term average-annual rainfall amounts for various Texas cities. Please note, however, that annual and seasonal rainfall can deviate significantly from these long-term averages.

Because of rainfall distribution patterns across Texas, wildlife watering devices will have greater impact in the western half of the state (west of Interstate Highway 35) than in the eastern half.

Rainfall across Texas varies by season as well. For example, El Paso typically receives its peak rainfall in July, August and September (mid to late summer), while San Antonio has two rainfall “peaks,” in May and June (early summer) and in September and October (early autumn) (Fig. 2).

## Catchment area and runoff coefficients

The amount of a particular surface that is available to capture rainfall is called the catchment area. Some of the rain in an area will soak into the ground and the rest will leave as runoff. The fraction of the total rainfall that will run off (and be available to be harvested) from a particular surface is known as the runoff coefficient (Table 3).

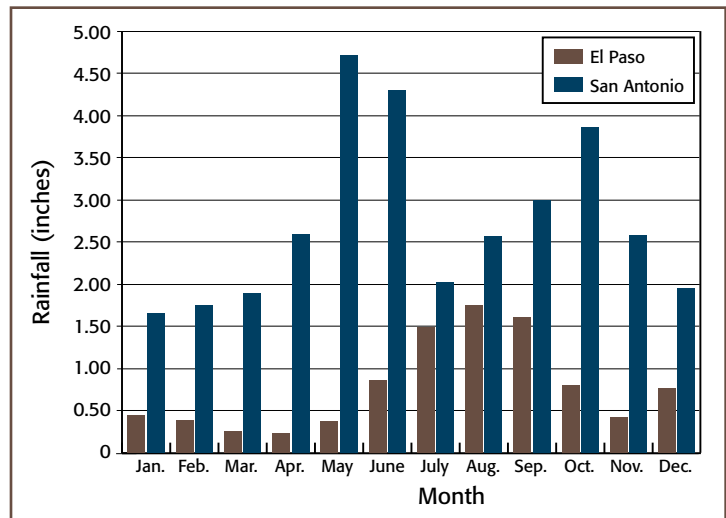


Figure 2. Long-term average seasonal rainfall distribution.

Table 2. Long-term average monthly rainfall (inches) for Texas cities.\*

Cities**	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Abilene	0.97	1.13	1.41	1.67	2.83	3.06	1.69	2.63	2.91	2.90	1.30	1.27	23.77
Amarillo	0.63	0.55	1.13	1.33	2.50	3.28	2.68	2.94	1.88	1.50	0.68	0.61	19.71
Austin	2.21	2.02	2.36	2.63	5.12	3.42	2.03	2.51	2.88	3.99	3.02	2.53	34.72
Brownsville	1.36	1.18	0.93	1.96	2.48	2.93	1.77	2.99	5.31	3.78	1.75	1.11	27.55
College Station	3.32	2.38	2.84	3.20	5.05	3.79	1.92	2.63	3.91	4.22	3.18	3.23	39.67
Corpus Christi	1.75	1.62	1.84	1.73	2.05	3.48	3.53	2.00	3.54	5.03	3.94	1.74	32.25
Dallas/Fort Worth	1.90	2.37	3.06	3.20	5.15	3.23	2.12	2.03	2.42	4.11	2.57	2.57	34.73
Del Rio	0.57	0.96	0.96	1.71	2.31	2.34	2.02	2.16	2.06	2.00	0.96	0.75	18.80
El Paso	0.45	0.39	0.26	0.23	0.38	0.87	1.49	1.75	1.61	0.81	0.42	0.77	9.43
Galveston	4.08	2.61	2.76	2.56	3.70	4.04	3.45	4.22	5.76	3.49	3.64	3.53	43.84
Houston	3.68	2.98	3.36	3.60	5.15	5.35	3.18	3.83	4.33	4.50	4.19	3.69	47.84
Lubbock	0.50	0.71	0.76	1.29	2.31	2.98	2.13	2.35	2.57	1.70	0.71	0.67	18.68
Midland	0.53	0.58	0.42	0.73	1.79	1.71	1.89	1.77	2.31	1.77	0.65	0.65	14.80
Port Arthur	5.69	3.35	3.75	3.84	5.83	6.58	5.23	4.85	6.10	4.67	4.75	5.25	59.89
San Angelo	0.81	1.18	0.99	1.60	3.09	2.52	1.10	2.05	2.95	2.57	1.10	0.94	20.90
San Antonio	1.66	1.75	1.89	2.60	4.72	4.30	2.03	2.57	3.00	3.86	2.58	1.96	32.92
Victoria	2.44	2.04	2.25	2.97	5.12	4.96	2.90	3.05	5.00	4.26	2.64	2.47	40.10
Wichita Falls	1.12	1.57	2.27	2.62	3.92	3.69	1.58	2.38	3.19	3.11	1.68	1.68	28.81

\*Data obtained from the Office of the State Climatologist (<http://climate.tamu.edu>).

\*\*Average rainfall for locations near those listed or for specific time periods may vary from the averages shown here.

**Table 3.** Runoff coefficients for various surfaces.\*

Type of surface	High	Low
Roof		
Metal, gravel, asphalt shingle	0.95	0.75
Paving		
Concrete, asphalt	0.95	0.70
Brick	0.85	0.70
Gravel	0.70	0.25
Soil		
Flat (2% or less), bare	0.75	0.20
Flat (2% or less), with vegetation	0.60	0.10
Lawns, sandy soil		
Flat (2% or less)	0.10	0.05
Average (2% to 7%)	0.15	0.10
Lawns, heavy soil		
Flat (2% or less)	0.17	0.13
Average (2% to 7%)	0.22	0.18

\*Data obtained from: Haan, C.T., B.J. Barfield and J.C. Hayes, 1994, Design Hydrology and Sedimentology for Small Catchments, Academic Press; and Waterfall, P.H., 1998, Harvesting Rainwater for Landscape Use, Arizona Department of Water Resources.

The amount of rainwater that runs off an area depends partly on the type of surface there. Take for example a 10-foot by 10-foot surface. If that surface is a metal roof, it could be expected to yield as runoff about 95 percent (0.95) of the rainfall it intercepts. If the surface is flat, bare soil, it would be expected to yield as runoff no more than 75 percent of the water intercepted.

To calculate the rainwater supply (in gallons) for your area, use the following equation:

$$\text{Supply (gallons)} = \text{Rainfall (inches)} \times \text{Catchment area (square feet)} \times \text{Conversion factor (0.623)}$$

## Wildlife tax valuation and supplemental water

Changing trends in land ownership have contributed to a growing number of absentee landowners and small-acreage properties in Texas. Land fragmentation has affected property tax valuations as well as the feasibility of conventional production agriculture.

Before 1995, land that was used to manage wildlife did not qualify for the same tax valuation as did similar properties managed for agricultural purposes. However, that has since changed. The state has altered Article VIII, Section 1-d-1 of the Texas Constitution to include wildlife management and its subcomponents as options for agricultural land use. According to the new tax law, land changed from traditional agricultural use to wildlife use now carries the same property tax assessment.

For land to qualify for wildlife valuation, it must have been entered previously into the agricultural appraisal process under Section 1-d-1. The land must be able to sustain breeding populations of indigenous, migrating or wintering wild animals. Also, the property must have a wildlife management plan detailing strategic goals and practices aimed at improving wildlife habitat there.

Providing supplemental supplies of water is one of seven components accepted in a wildlife management plan. Three devices that can be used to provide supplemental water to improve wildlife habitat are the Black Gap Guzzler, the Elephant Mountain Guzzler and a concrete rainwater catchment (Texas Parks and Wildlife Department). Also available for consideration are other catchments, wildlife watering facilities and modified livestock trough methods.

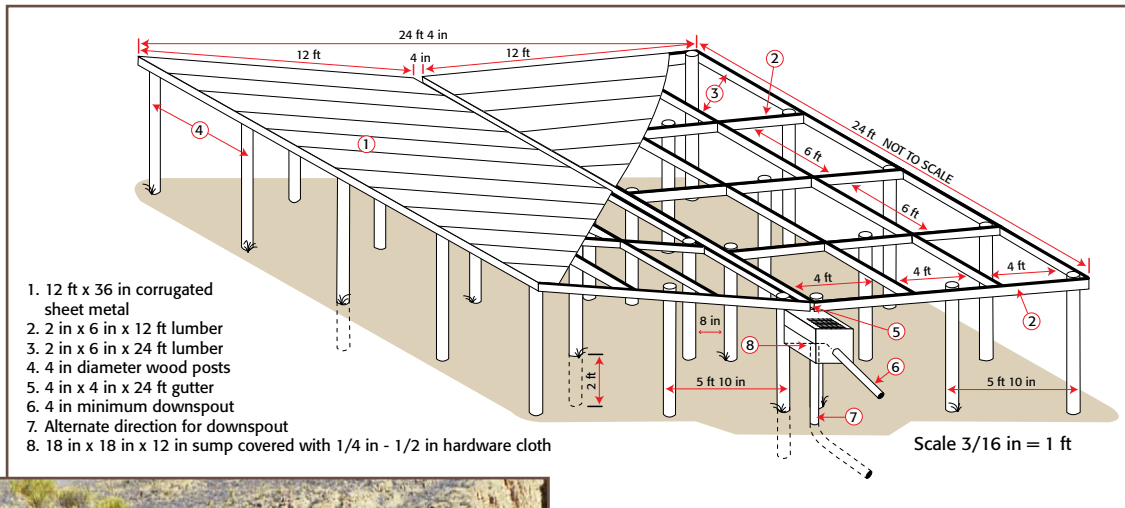


Figure 3. A Black Gap Guzzler rainwater catchment.



## Black Gap Guzzler

The Black Gap Guzzler is a well-designed catchment that requires minimal maintenance. This system works in areas with a minimum of 8 inches of rainfall per year. It requires few construction materials and little maintenance after the system is built.

Materials needed:

- 12 ft x 36 in corrugated sheet metal
- 2 in x 6 in x 12 ft lumber
- 2 in x 6 in x 24 ft lumber
- 4 in diameter wood posts
- 4 in minimum downspout
- 18 in x 18 in x 12 in sump covered with 1/4 in - 1/2 in hardware cloth
- 2,250 gallon storage tank
- Plastic/aluminum pipe, 4-inch diameter (length to be determined from sump box to storage tank)
- Galvanized pipe 3/4-inch diameter (length as needed from storage tank to trough)
- Float and valve
- Cement for posts

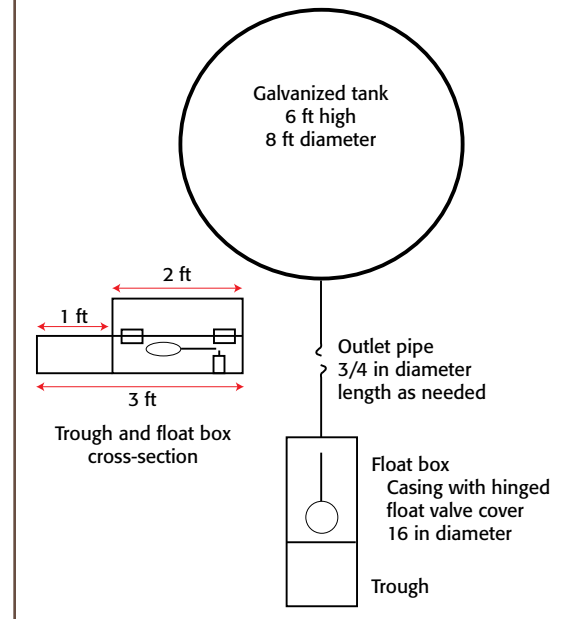


Figure 4. Black Gap Guzzler storage tank and trough detail.

- #12 x 3/4 self-drilling galvanized tex screws – about 450
- Steel casing 16 inches in diameter, 3 feet long for trough, with sheet metal welded on the ends and hinges for float cover

## The Elephant Mountain Guzzler

The Elephant Mountain Guzzler is designed for areas not accessible by land vehicles. The prefabricated parts can be air-lifted by helicopter, then set up once they are on location.

Materials needed include

- Outside support panels:
  - 6 pieces – 2 in square tubing, 32 in long
  - 8 pieces – 2 in square tubing, 13 ft long
  - 8 pieces – 2 in square tubing, 18 in long
  - 12 pieces – 2 in x 2 in angle iron, 2 in long
- Middle support panels:
  - 6 pieces – 2 in square tubing, 26 in long
  - 8 pieces – 2 in square tubing, 13 ft long
  - 8 pieces – 2 in square tubing, 16 in long
  - 24 pieces – 2 in x 2 in angle iron, 2 in long
- Inside support panels:
  - 6 pieces – 2 in square tubing, 20 in long
  - 8 pieces – 2 in square tubing, 13 ft long
  - 8 pieces – 2 in square tubing, 10 in long
  - 12 pieces – 2 in x 2 in angle iron, 2 in long
- 12 pieces – 2 in square tubing, 66 in long
- 12 pieces – 2 in square tubing, 66 1/4 in long
- 12 pieces – 1 in x 1 in angle iron, 71 11/16 in long

- 8 pieces – 2 in x 2 in angle iron, 153 in long
- 6 pieces – 2 in x 2 in angle iron, 12 in long
- 16 pieces – 2 in x 2 in angle iron, 2 in long
- 18 pieces – 36 in coverage galvanized “U” panel
- #12 x 3/4 self-drilling galvanized Tex screws (~600)
- Ridge roll – 26 ft
- 29 gauge sump box with dimensions 18 in x 18 in x 12 in with 4 in collar
- Plastic/aluminum pipe, 4 in diameter (length to be determined from sump box to storage tank)
- Galvanized pipe 3/4 in diameter (length as needed from storage tank to trough)
- Float and valve
- 76 pieces – bolts 5/16 x 2 1/2
- Hail screen to cover sump box
- 36 pieces – 1 in round rod, 36 in long (used to anchor)
- 2,250 gallon storage tank
- Steel casing 16 in diameter, 36 in long with sheet metal welded on ends and hinges for float cover

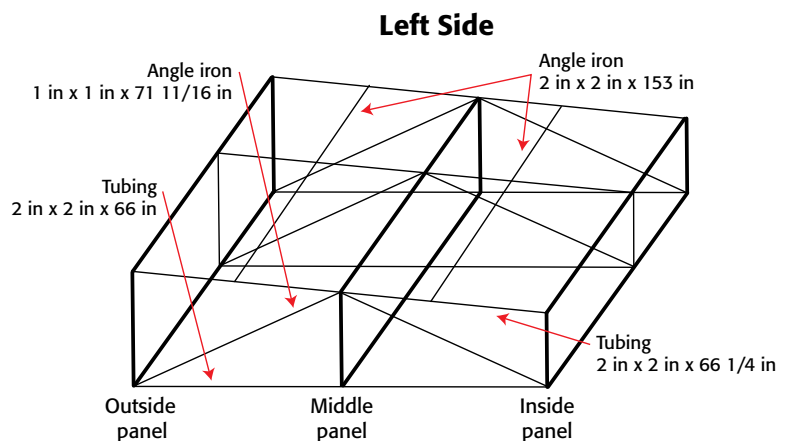
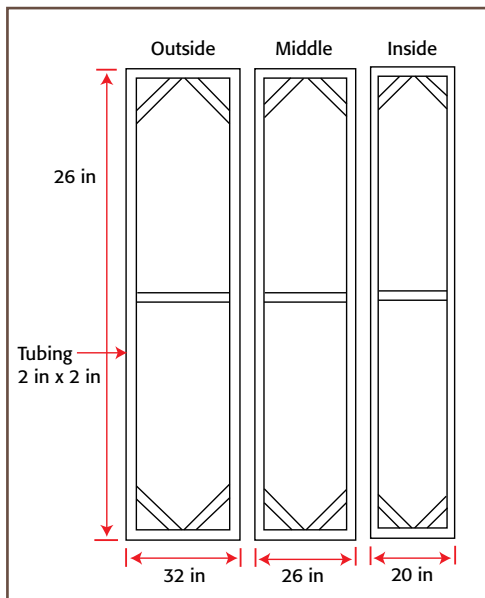


Figure 5. Prefabricated panels (above) and completed support section (right).



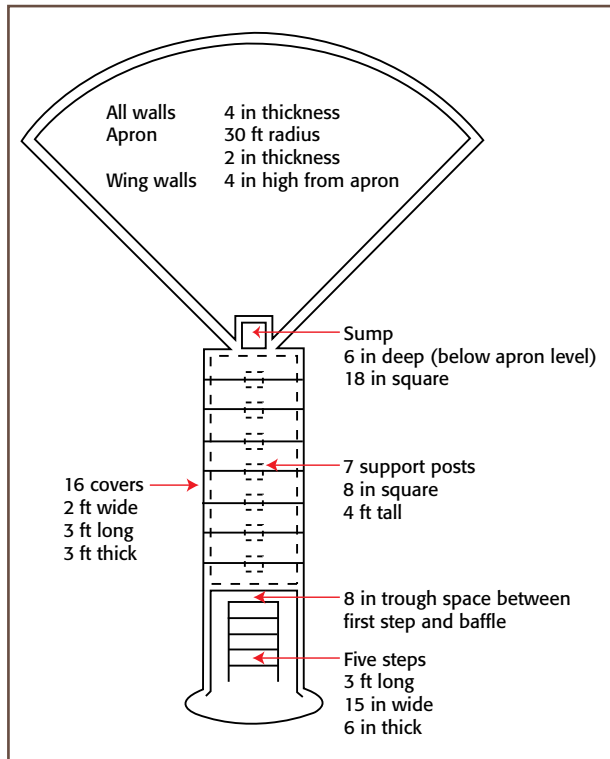


Figure 6. Top view of a concrete rainwater catchment.

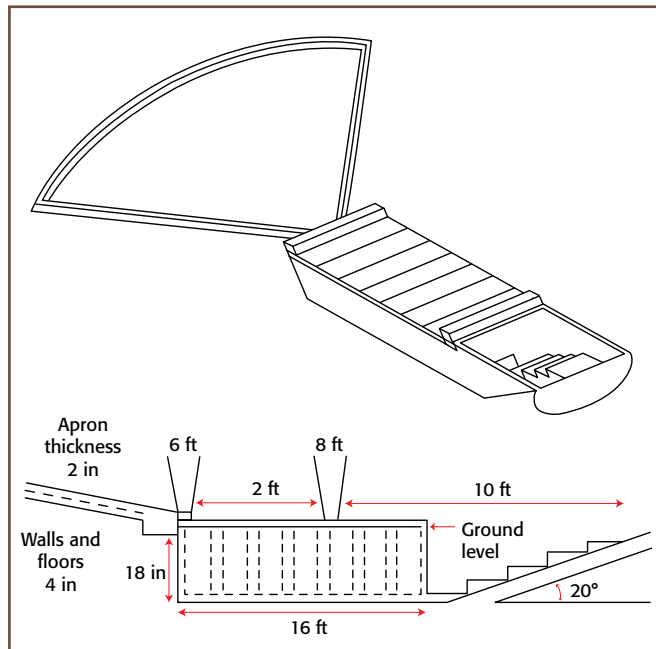


Figure 7. Isometric and side view of a concrete rainwater catchment.

## Concrete rainwater catchment

A concrete rainwater catchment system is permanent and requires very little maintenance.

Materials needed:

- Concrete – about 14 yards
- Rock, <sup>3</sup>/<sub>4</sub>-in – 23,000 lbs
- Sand – 21,000 lbs
- Water – 490 gallons
- Reinforcing steel and mesh, to reinforce sides, bottom and collecting apron
- Hail screen to cover sump box
- Framing materials
- Plywood, <sup>1</sup>/<sub>2</sub>-in for wall framing
- Lumber, 2-in x 4-in
- Lumber, 1-in x 1-in
- Nails

## Other systems

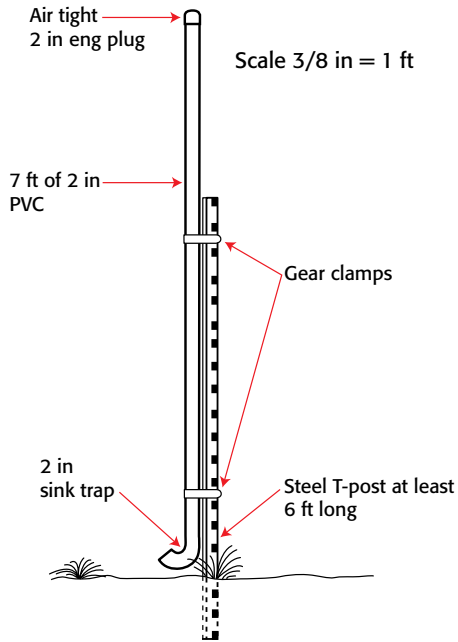
The drawings and diagrams on the following pages provide additional rainfall harvesting, storage and conveyance ideas for landowners.



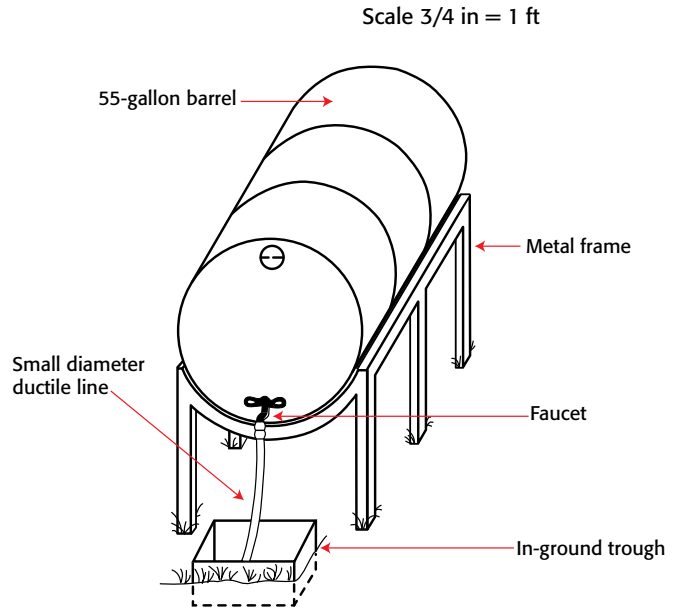
Figure 8. Underground storage tank (above) and trough (below) for concrete catchment.



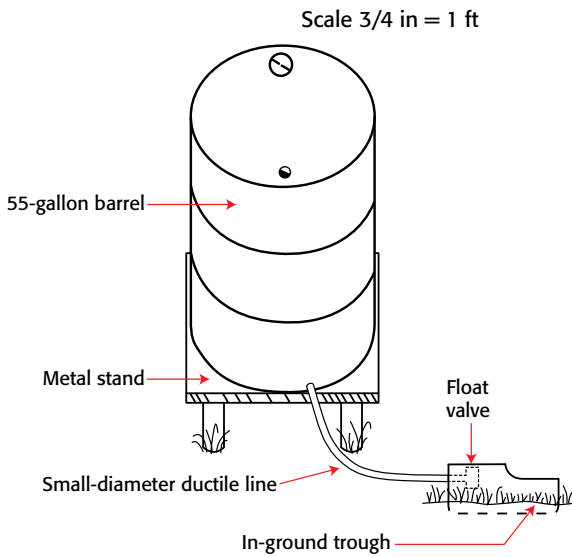
### PVC Pipe Facility



### Drum with Faucet



### Drum with Float



### Small Game Guzzler

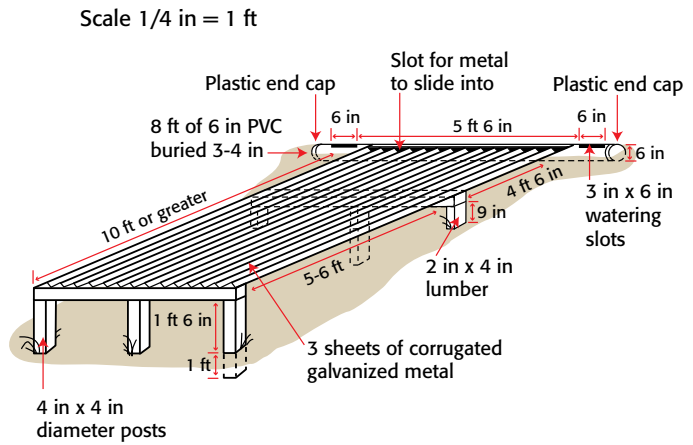
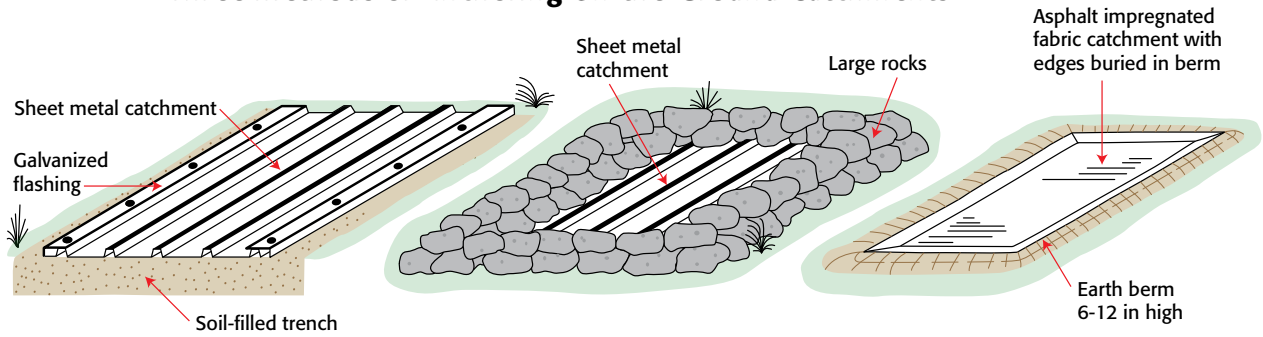
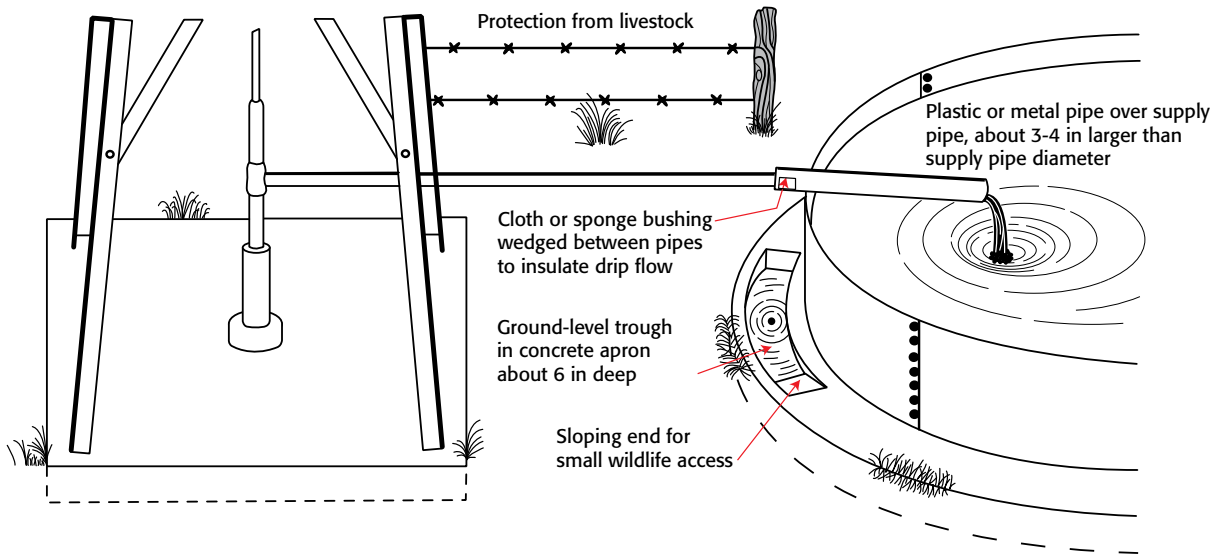


Figure 9. Wildlife watering devices.

### Three Methods of Anchoring On-the-Ground Catchments



### Windmill Supply Pipe Dripper



### In-Ground Bowl Troughs

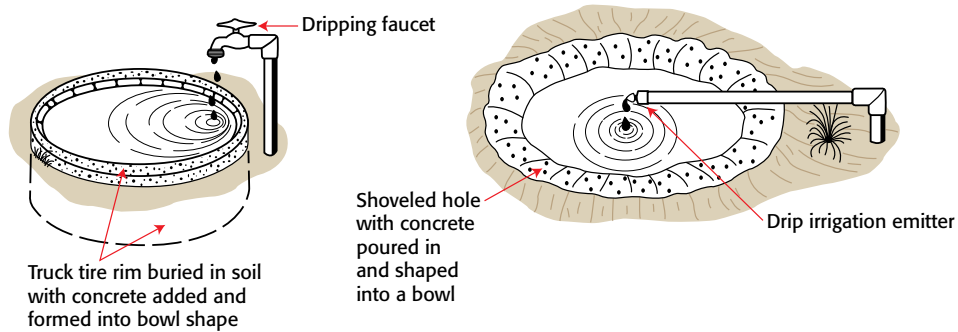


Figure 10. Methods of anchoring and types of troughs.

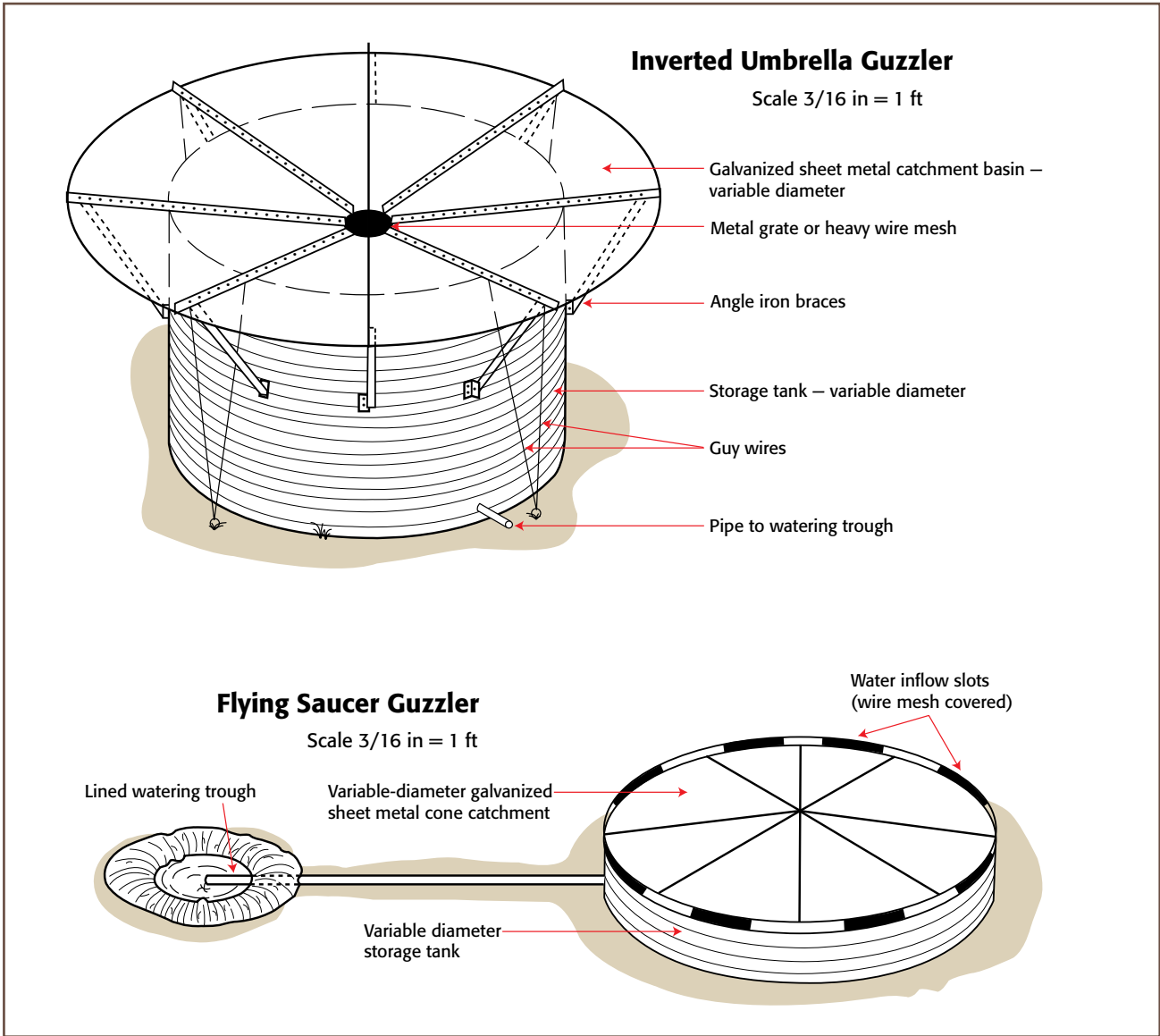


Figure 11. Rainwater catchments.

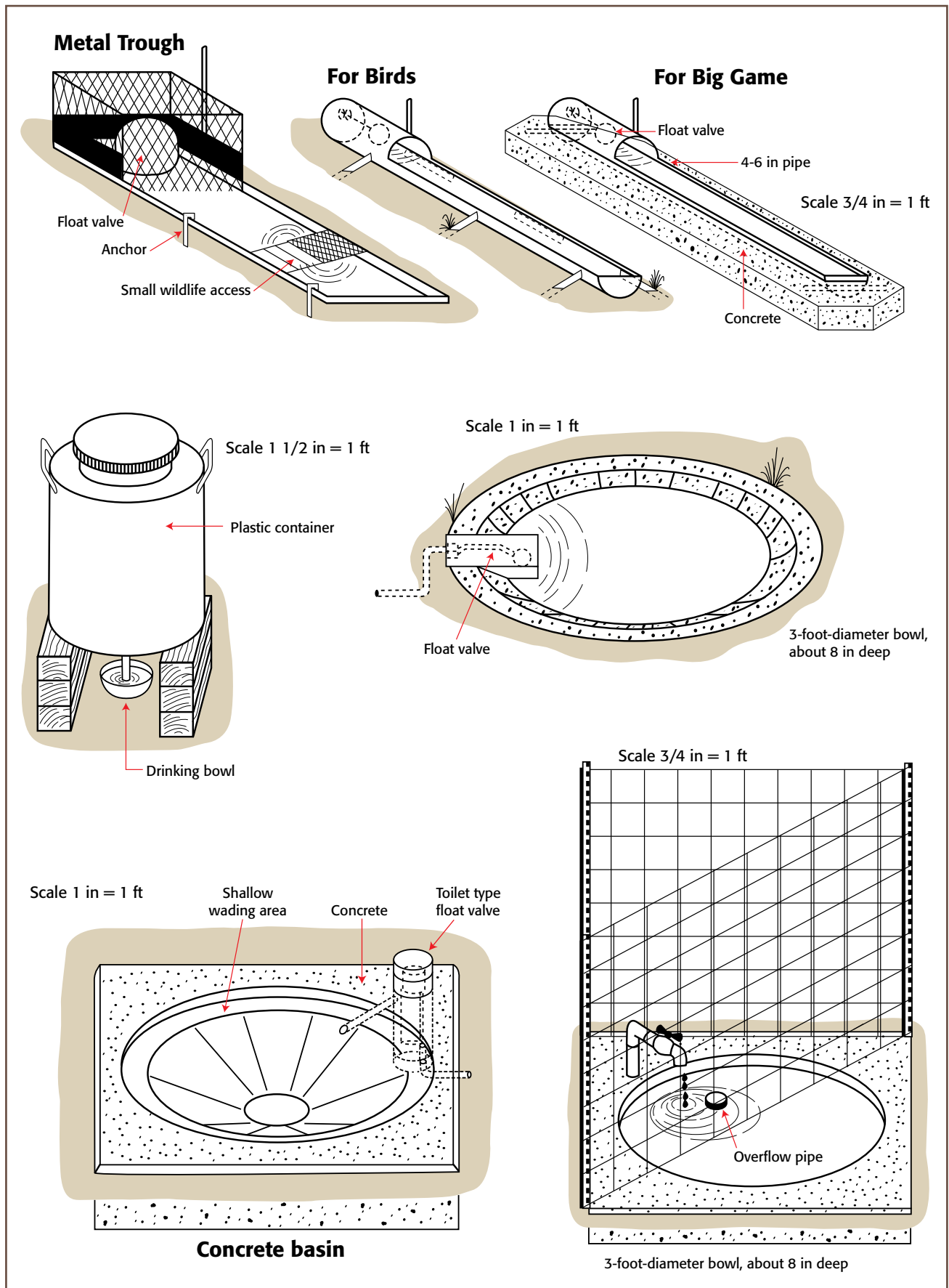


Figure 12. Rainwater conveyance devices.

## Other considerations for water-supply systems

Consider these tips on providing water for wildlife:

- In areas with seasonal cold temperatures, be sure to build and protect your system properly. This can be accomplished by burying or insulating water pipes susceptible to freezing.
- Cut costs by modifying existing water structures such as windmills and water troughs. The concrete aprons around livestock water troughs can be modified to hold overflow water. A shallow groove (about 3 inches deep and 6 inches wide) in concrete will catch and retain overflow water.
- Provide water at ground level for birds and small mammals because their size limits their ability to reach water. Seeps from stock tanks or dripping windmill pipes can provide additional ground-level water for wildlife.
- Eliminate drowning hazards.
- Make sure that all water-delivery mechanisms slope gently from shallow to deep.
- Place ramps made of expanded metal on the outside and inside of water troughs to allow access and exit.
- Pile rocks or use floats or mats at the edges of water troughs to allow escape.
- Use infrared-triggered cameras placed near watering points to monitor use by wildlife species.

## For more information

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Quail photo courtesy of David L. Alford.

Bighorn sheep and guzzler photos courtesy of Justin Foster, Texas Parks and Wildlife Department, and the Texas Bighorn Society.



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