

TEXAS

PARKS & WILDLIFE



July 1980 • 50¢



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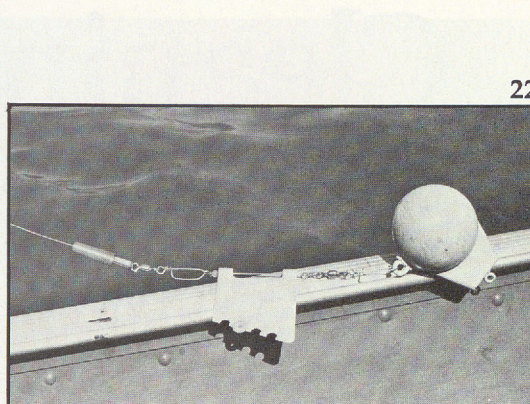
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6



22

TEXAS PARKS & WILDLIFE

July 1980, Vol. XXXVIII, No. 7

- Cleaning Up the Countryside** by *Mary-Love Bigony* 2
Their appearance and habits may be repulsive, but the black and turkey vultures help keep the landscape free of carrion.
- Spend the Day at Big Spring** by *Jim E. Melton* 6
An impressive view and a 12,000-square-foot prairie dog town attract visitors to this state recreation area.
- Angler's Guide: Greenbelt Reservoir** by *Jim Cox* 10
Substantial aquatic vegetation provides good habitat for a variety of game fish.
- Champion Broadjumpers** by *Ilo Hiller* 12
These numerous plant-eating insects can be found in every part of the state.
- Headhunters** by *Jim Cox* 16
Demands for deer antlers have spawned a new kind of poacher—the headhunter.
- Around the State** 20
News briefs compiled by the department's news service.
- Downriggers Come to Texas** by *Jim Cox* 22
Anglers are discovering the success controlled-depth trolling can bring.
- Young Naturalist: Rainbows** by *Ilo Hiller* 28
Sunlight and raindrops produce these spectacular bands of color.
- Letters to the Editor** 32

Front Cover: One of the most brightly colored grasshoppers is also the most destructive, the lubber grasshopper, *Romalea microptera*. (See photo story on page 12.) Photo by Bill Reaves.

Inside Front: Located on the Colorado River in San Saba County, Gorman Falls provides a respite from the summer heat. P&W File Photo.

Cleaning Up the Countryside

Vultures, nature's efficient scavengers, are on the decline.

by Mary-Love Bigony

Graceful and impressive describes the turkey vulture and black vulture in the air, but these birds, commonly called buzzards, most often are associated with their habit of feeding on decaying animal carcasses. Over the years the word buzzard has become a metaphor for a repugnant, greedy person, which indicates many people's opinions of these large birds of prey.

Buzzard is derived from *buteo*, the Latin word for hawk, but vultures do not have the hawk's sharply hooked bill and their talons are dull and only slightly curved, physical characteristics responsible for their unsavory eating habits.

Unlike eagles, hawks and owls, the vulture's flight is too slow and measured to overtake live prey, and its feet are too weak for grasping and killing. Therefore, vultures often do not eat on a regular schedule, but must resort to waiting for an animal to be killed or die from disease. The vultures' digestive juices and digestive systems make them resistant to the diseases which infect many of the carcasses they eat.

The turkey vulture, *Cathartes aura*, and the black vulture, *Coragyps atratus*, both are members of the family Cathartidae, from a Greek word meaning "cleanser." By the habits that make them distasteful to so many people, these benefi-

cial birds transform the carcasses they find into materials more rapidly usable by other living things.

Differences of opinion still exist over whether vultures locate their food by sight or smell. Experiments have been conducted along this line, including covering carrion and arranging a stuffed animal skin to resemble a carcass. Since the smell of decaying flesh is so obvious to humans, for a long time it was believed that smell alone guided the birds to their food. But since there is some contradictory evidence, now it is believed their extremely keen eyesight is more important, particularly in flight. Vultures in flight continuously turn their heads from side to side as though on the lookout for food. Most bird species have poorly developed senses of smell and taste.

When a vulture spots a likely meal it approaches the carcass carefully and surveys the area. It may pass the animal and double back, making sure the victim is indeed dead. While the vulture is surveying the ground from the air, it also is watching other vultures. If one bird makes a descent, others within range follow quickly until there are dozens of birds around the carcass. When turkey vultures and black vultures compete for the same food the black vultures usually win, despite their smaller size. Both essentially are voiceless, but when squabbling over a carcass they emit a hissing sound.

Black vultures seem to prefer softer, more decayed food than turkey vultures. Turkey vultures will attack a freshly killed animal, but black vultures prefer to wait until decomposition is more advanced. Both use their beaks to tear flesh away from a carcass, propping themselves with their legs and tail feathers and often flapping their wings rapidly to help them pull. The turkey vulture's naked red head is an advantage here, since it lets the bird feed inside a carcass without soiling its feathers. Both vultures' feet are too weak to carry food, so they usually gorge them-

Bill Reaves





Bill Reaves

Its naked red head distinguishes the turkey vulture from the black vulture, which has a naked black face and short blackish-gray feathers covering its neck and head. Since both vultures' excellent soaring ability depends on the proper air currents, they seldom fly early in the morning. Instead, they wait for the earth to warm and create thermal drafts. By sitting atop fence posts with their wings outstretched, they can tell when the air currents are right.

selves on the spot and many times eat so much they are too heavy to fly. When this happens they regurgitate to make themselves lighter. Sometimes after a heavy meal on the highway they are unable to get away quickly and are killed by oncoming cars. But neither vulture has many predators; turkey vultures can live to 100 years of age, and black vultures have been known to live 75 years.

Although carrion is the birds' main food, turkey vultures occasionally eat grasshoppers, snakes, toads, rats, mice and young birds. Black vultures sometimes take the eggs of young sea turtles and shorebirds, young animals and rotting fruit. But animal carcasses remain the easiest food for them to find and handle.

Regurgitation also plays a part in the vulture's defense and in feeding their young. If a vulture is threatened by another animal, or if a person tries to capture one, the bird will regurgitate the already foul carrion it has eaten so that it may flee easier. When they are brooding the young, the adult vulture will disgorge the half-digested carrion in its stomach if an intruder threatens the nest. Vultures' weak talons make it necessary for them to feed their young by some other way than carrying food in their feet, so they regurgitate food they have eaten recently into the open mouths of the young birds.

Awkward and repulsive as both vultures are on the ground, in the air they are elegant. Both are skilled flyers, but the turkey vulture is much more adept. Holding its wings in a shallow V, it can soar for hours without a single wingbeat if the air currents are right. The black vulture's shorter wings and its greater weight are a disadvantage when its flight is compared to the turkey vulture. Using the same wind currents as the turkey vulture, the black vulture must flap its wings more often to stay aloft.

Vultures and other soaring birds rarely fly early in the morning, but

usually sit atop fence posts or dead trees waiting for the earth to warm and create the thermal drafts that enable them to soar. When outstretched wings tell the bird the air currents are right, it leans forward, stumbles awkwardly for a couple of steps, pushes with its legs and takes off with great effort.

In the air, the two vultures usually can be distinguished from each other by the black vulture's more frequent wingbeats as well as the white patches on the ends of its wings. When they are perched, the turkey vulture can be identified by its naked red head, whereas the black vulture has short blackish-gray feathers covering the back of its neck and head and a naked black face. The turkey vulture is 26 to 30 inches long with a six-foot wingspan, compared to the black vulture's 54-inch wingspan and its 25-inch body.

Neither vulture builds a nest in the conventional sense. The black vulture prefers to nest in large hollow trees, but if it cannot find one, it deposits its eggs directly on the ground. It may lay the eggs on dead leaves or under thickets, but it does not collect such materials to build any sort of nest. When it lays eggs on the ground, it does not hollow out a place in the dirt to resemble a nest.

Turkey vultures look for steep cliffs, caves or hollow stumps relatively inaccessible to predators. Some even nest in abandoned houses. When it finds a spot it may make a half-hearted attempt to build a simple nest of leaves and twigs, but more often just lays its eggs on the ground.

Both vultures usually lay two eggs. Turkey vulture eggs are oval and blotched with different shades of bright brown. Black vulture eggs are larger and less marked. Incubation period for both is around 30 days, and the male and female alternately sit on the eggs. Young turkey vultures fly at about 10 weeks of age and black vultures fledge after about 14 weeks.

Both vultures are declining in number. Food no longer is as abundant, since ranchers destroy dead livestock, hunters leave fewer dead or mortally wounded animals, city dumps are more sanitary and open-air butchers' shops are a thing of the past. But turkey vultures are better flyers and more migratory than black vultures and can find more of this disappearing food, thus their slower decline.

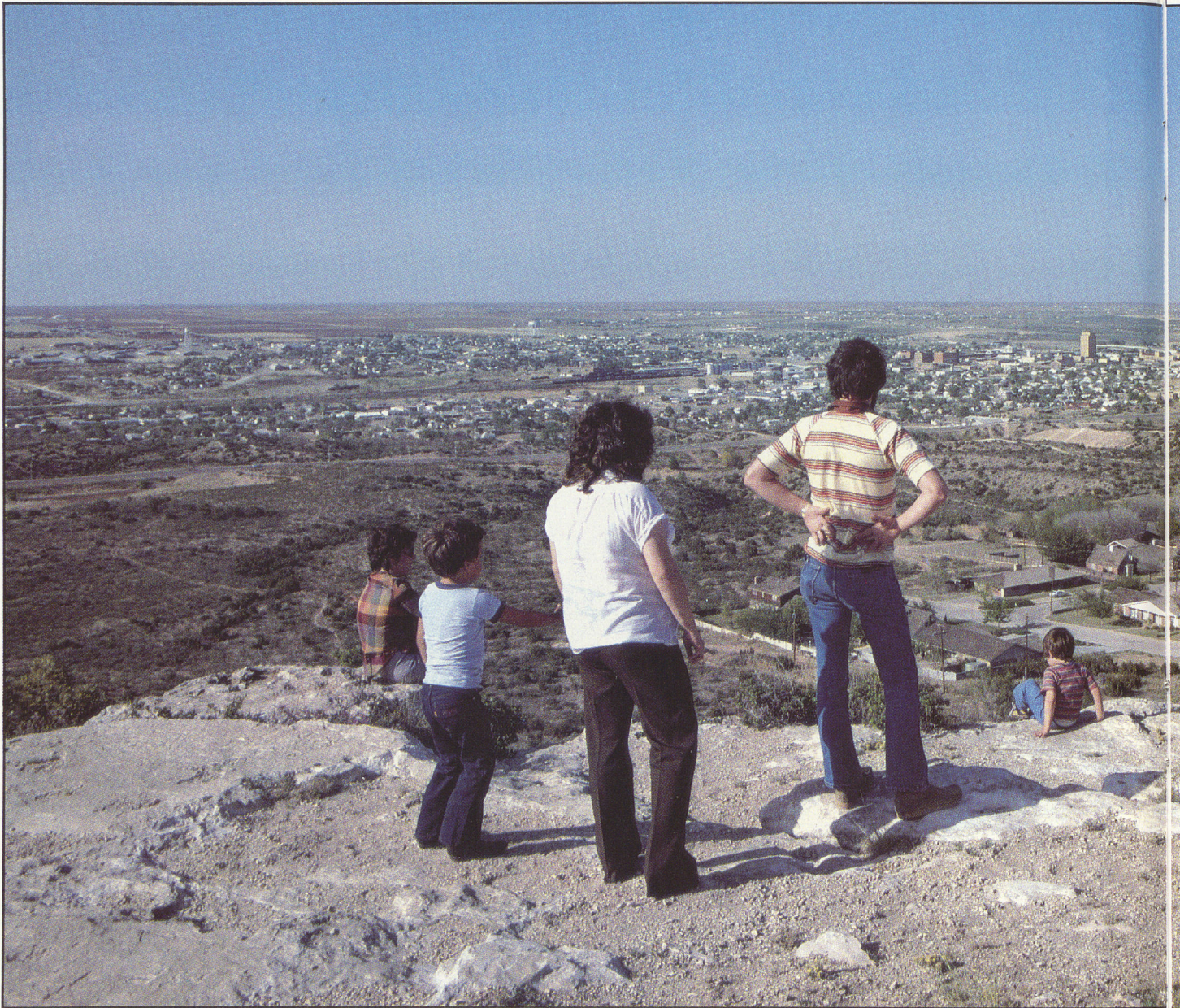
Although the black vulture is the most numerous bird of prey in the Western Hemisphere, the turkey vulture is more common in Texas and in most of the United States. Both are migratory; the turkey vulture can be found from southern Canada into portions of South America, and the black vulture's range extends from Arizona to Chile and Argentina. The black vulture is more social and gregarious, and often travels in large groups of its own kind.

But populations of both are declining, the turkey vulture moderately and the black vulture drastically. At one time, ranchers who believed vultures were responsible for spreading livestock diseases killed thousands of the birds in "buzzard traps," cooplike structures baited with dead animals. Once lured inside, the bird was unable to get out of the trap, and the rancher would let it starve or club it to death.

Food no longer is as abundant, either. Ranchers destroy dead livestock now instead of leaving it to be cleaned up by vultures, and hunters do not leave as many dead or mortally wounded game animals. City dumps are more sanitary than they used to be and there are fewer open-air butchers' shops in southern cities. Turkey vultures, being better flyers and more migratory than black vultures, can find more of this disappearing food, which may account for their slower decline in number.

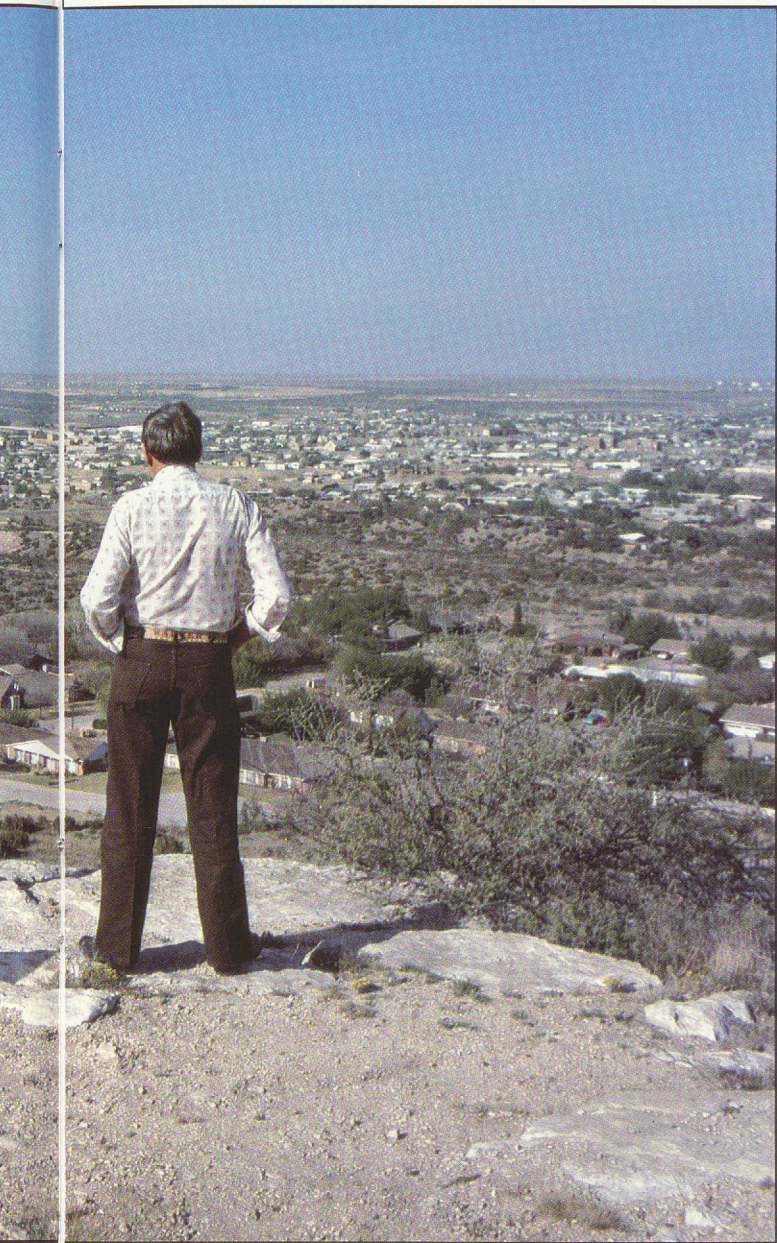
Despite their unfavorable reputation, vultures serve their purpose in keeping the landscape clean. Ugly in appearance and habits, vultures nevertheless are remarkably efficient birds. **





Atop a limestone hill on the northern margin of the Edwards Plateau lies Big Spring State Recreation Area. Located in the city limits of Big Spring, the park attracts local walkers, joggers and picnickers as well as tourists traveling Interstate 20. A 12,000-square-foot prairie dog town at the end of the one-third-mile nature trail has benches available for visitors who want to spend some time watching the playful rodents. Big Spring State Recreation Area is open for day use only.





SPEND THE DAY AT BIG SPRING

Article by Jim E. Melton, Park Manager
Photos by Glen Mills



Westward-bound settlers making their way across Texas in the late 1880s were drawn to a scenic mountain on the northern margin of the Edwards Plateau where the impressive view made it a popular gathering spot. Today local joggers and walkers and tourists traveling Interstate 20 visit the mountain, on which Big Spring State Recreation Area is located. The view still is impressive and now includes the City of Big Spring.

The State Parks Board acquired the site in 1934-35 by deed from private landowners and the City of Big Spring. Some 200 men from the Civilian Conservation Corps (CCC) worked for 1½ years on the original construction, building the park headquarters, pavilion and restrooms from limestone quarried on the site. Most of the work was done with hand tools. CCC workers also constructed the three-mile drive around the mountain and built a retaining wall patterned after the mortarless masonry used by the Romans.

The 332-acre park sits atop an almost solid limestone hill. Grasses which cover the park have not been grazed by domestic livestock for more than 45 years, making it a prime example of climax vegetation on the rolling hills of this area.

Park facilities include 11 picnic sites with shade shelters; five picnic sites without shade shelters; a lighted, open-air pavilion which can accommodate up to 25



An open-air pavilion (above) was constructed by the Civilian Conservation Corps in the 1930s from limestone quarried on the site. It can accommodate groups of up to 25 people and is lighted for evening use. The pavilion is open from 8 a.m. to 10 p.m. during the summer and 8 a.m. to 9 p.m. in the winter. Individual picnic sites also are available, both with and without shade shelters. Playground equipment in the park includes merry-go-rounds, swings, slides and seesaws.



persons for group outings; playground equipment including swings, slides, seesaws, merry-go-rounds and climber; modern restrooms; and an unusual headquarters complex. The headquarters building is actually three structures in one, housing park office facilities, an interpretive center and another smaller open-air shelter with picnic tables. The interpretive center includes an Indian artifact display, assorted fossils, an exhibit of plant species and mounted wildlife representative of the area.

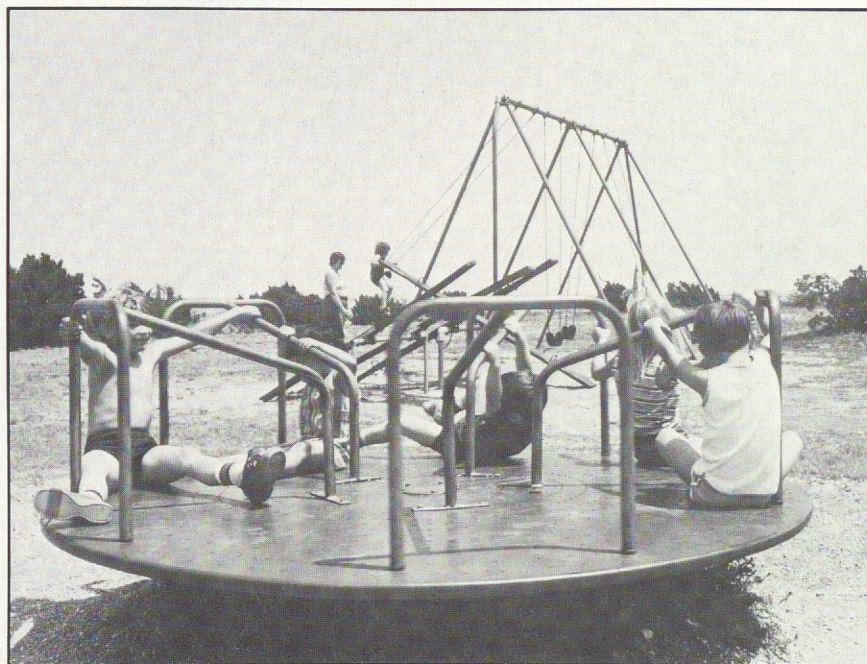
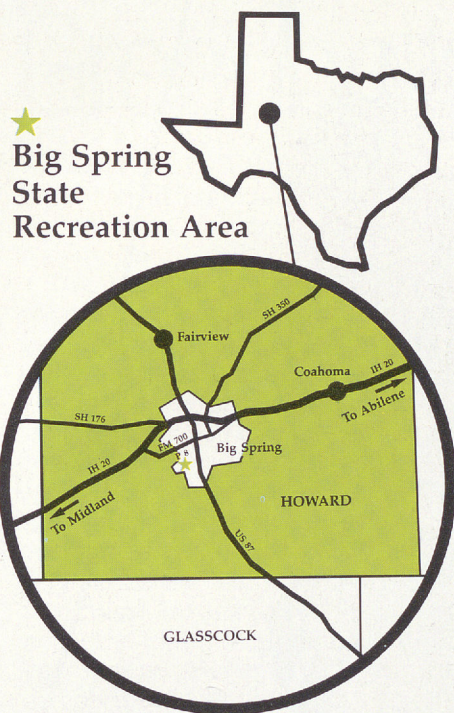
Walking down the one-third mile nature trail, the visitor might see some of the wildlife native to the park. Cottontails, jackrabbits and ground squirrels are the most numerous, and various bird species also can be observed.

At one end of the nature trail is the park's prairie dog town. Started in 1970, the town covers a 12,000-

square-foot area surrounded by a chain link fence. A parking area, drinking fountain and benches are provided for those who stop to watch the prairie dogs. During the hot summer months these interesting rodents are most active in the cooler periods just after sunrise and before sunset.

Park visitors may want to take a side trip to the nearby big spring which once was the only watering place in a 60-mile radius. Comanches regularly used the spring as a campsite and resting point on their raids into the more populated areas of Texas and Mexico. It also was a favorite campsite for early explorers and settlers. The Heritage Museum, in which the history of West Texas and the Big Spring area is presented, is another nearby point of interest.

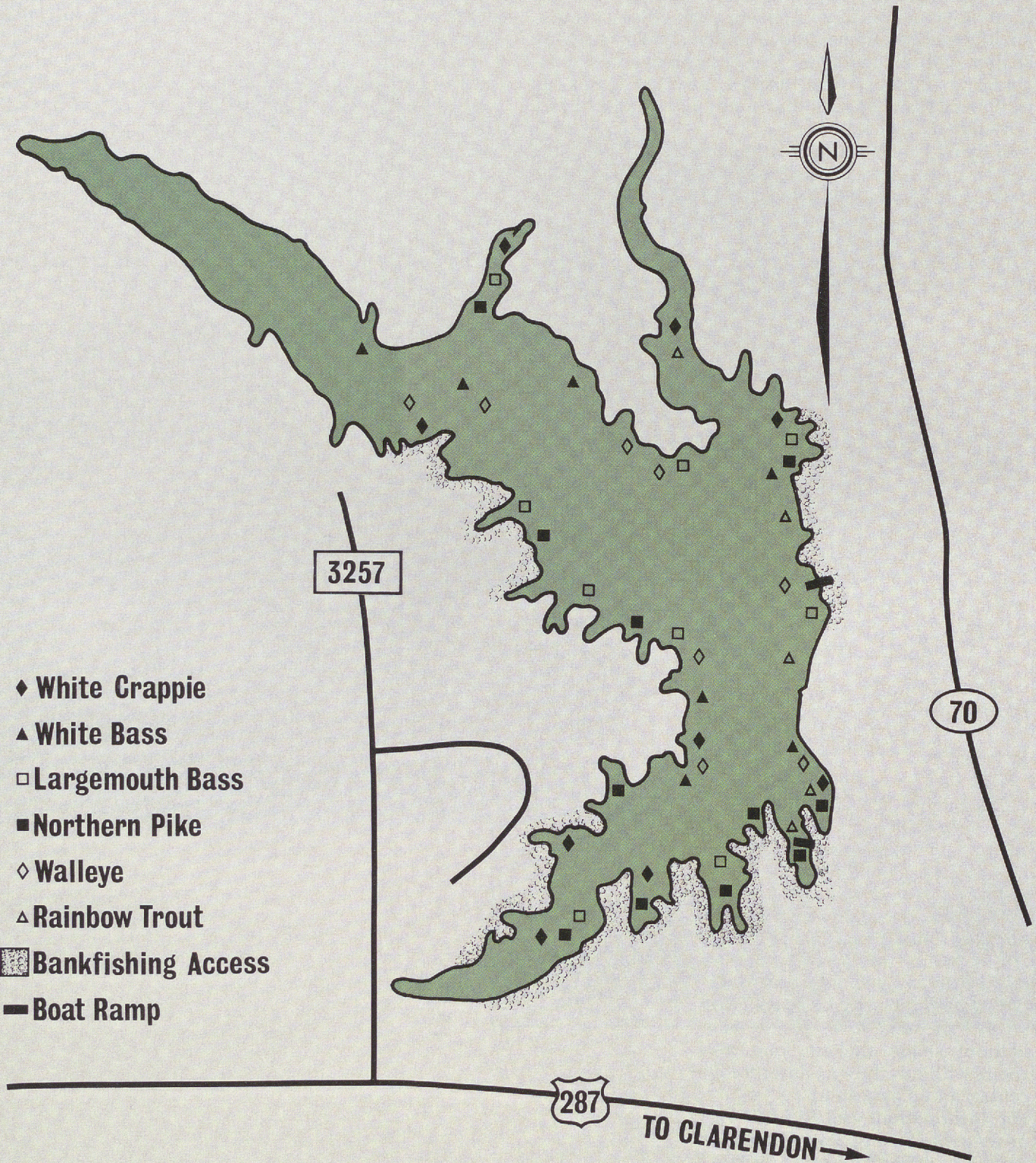
Big Spring State Recreation Area, located inside the city limits of Big Spring, is open for day use only. **



Location: Howard County, in the City of Big Spring; one mile west on FM 700 from intersection of FM 700 and US 87 to Park Road 8.

Facilities: Day-use only; group picnic shelter; 11 picnic sites with shade shelters; five picnic sites without shade shelters; one restroom without shower; interpretive center; and playground.

For information: call 915-263-4931 or write Big Spring State Recreation Area, Box 1064, Big Spring 79720.



Angler's Guide:

by Jim Cox

Greenbelt Reservoir

No lake in Texas can offer the variety of fishing found at Greenbelt Reservoir near Clarendon in the Texas Panhandle.

The reservoir not only has good populations of native sport fish, such as largemouth bass, sunfish, crappie, white bass and channel catfish, it also has the state's only self-sustaining population of imported northern pike. Add to that lineup a growing walleye population and rainbow trout stockings each year and you have unmatched angling variety.

Greenbelt is not an undiscovered lake. West Texans by the thousands enjoy the clear, deepwater reservoir year around. Fishermen, picnickers, campers, swimmers and water-skiers all find ample resources to keep them occupied at the lake which was impounded in 1967.

Unlike some reservoirs in West Texas, Greenbelt is blessed with substantial aquatic vegetation that provides good habitat for its sport fish populations. This feature of the lake also helps the northern pike, a species which spawns in vegetated areas during the spring. The state record pike, weighing 18 pounds, two ounces was caught at Greenbelt in 1975. Northerns in the 10- to 16-

pound range are caught fairly frequently.

Pike are caught most easily in March and April after the spawning period is over. They can be tricked with artificial lures, mainly weedless spoon/pork rind combinations, or on live minnows fished under a bobber. Shallow water areas with vegetation always are best for northerns at that time.

The lake's rainbow trout are stocked periodically by the Greenbelt Municipal and Industrial Water Authority. They do not reproduce in the lake. Most trout are stocked in the winter months, and a good portion are caught by June.

Rainbows at Greenbelt are caught on a variety of baits. Small spinners and flies produce well, as do salmon eggs, corn, cheese, marshmallows, earthworms, grasshoppers and the like. Light tackle is recommended. There is no size limit, but the daily bag limit is five, with a possession limit of 10.

Walleyes spawned in the lake in 1978, and fishing for this nonnative species is expected to improve as a result. The best fishing occurs in the spring when they concentrate along shallow, rocky shorelines and along

the dam riprap. During the rest of the year, they remain fairly deep, especially during the daylight hours. Live minnows, night crawlers or combinations of live bait and spinners are popular. It usually is necessary to fish near the bottom for walleyes, regardless of the depth. The daily limit is five, 10 in possession. There is no length limit.

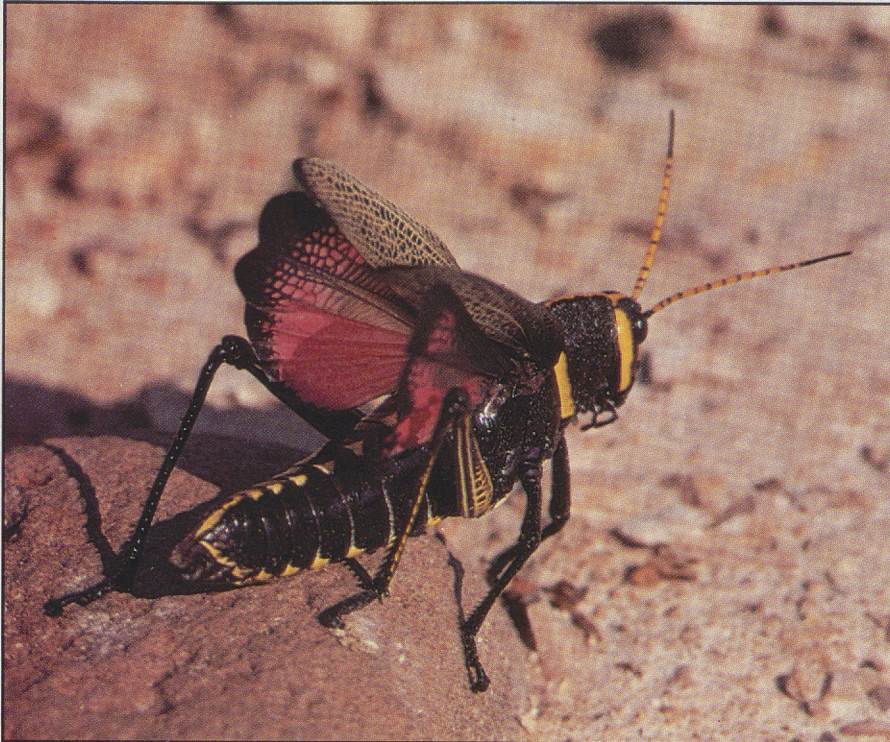
As most walleye fishermen have learned, this species is touted as being the most palatable of all. They are easily filleted, and are delicious prepared by any of the traditional recipes.

White crappie are an important sport fish at Greenbelt, and the average one is larger than those found in most other Panhandle lakes. Fishing methods are the same as in other lakes, with minnows and small jigs heading the list of prime baits. The spring spawn is a peak time, since the fish are more concentrated and in shallower water than the rest of the year.

Greenbelt is reputed to be one of the better largemouth bass fishing lakes in West Texas, and tournaments frequently produce bass in the six- to nine-pound class. Fishing around vegetation or submerged structures is best, varying the depth with the season. As in other lakes, early mornings and late evenings are usually the best times to go after largemouths. **

Champion Broadjumpers

by Ilo Hiller

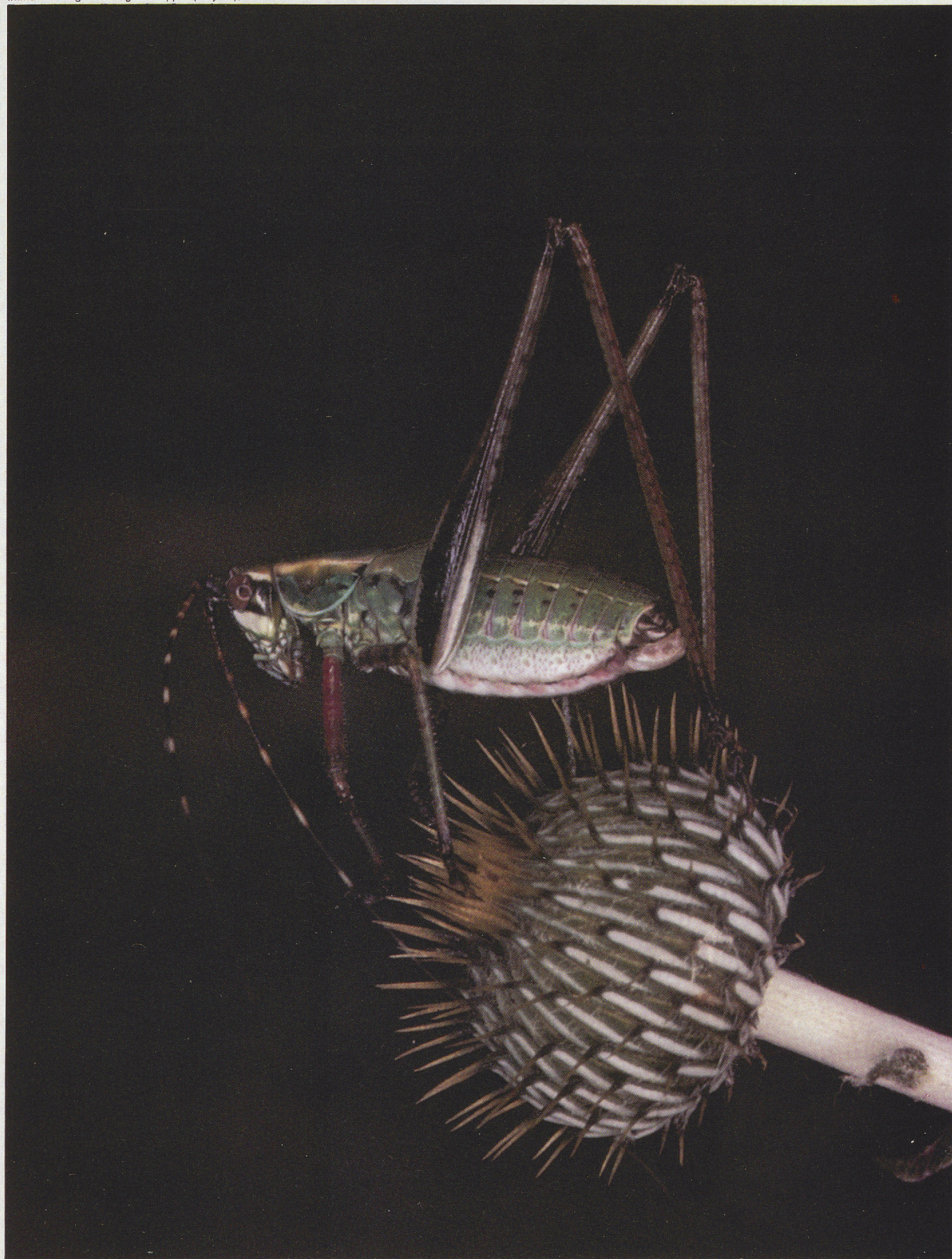


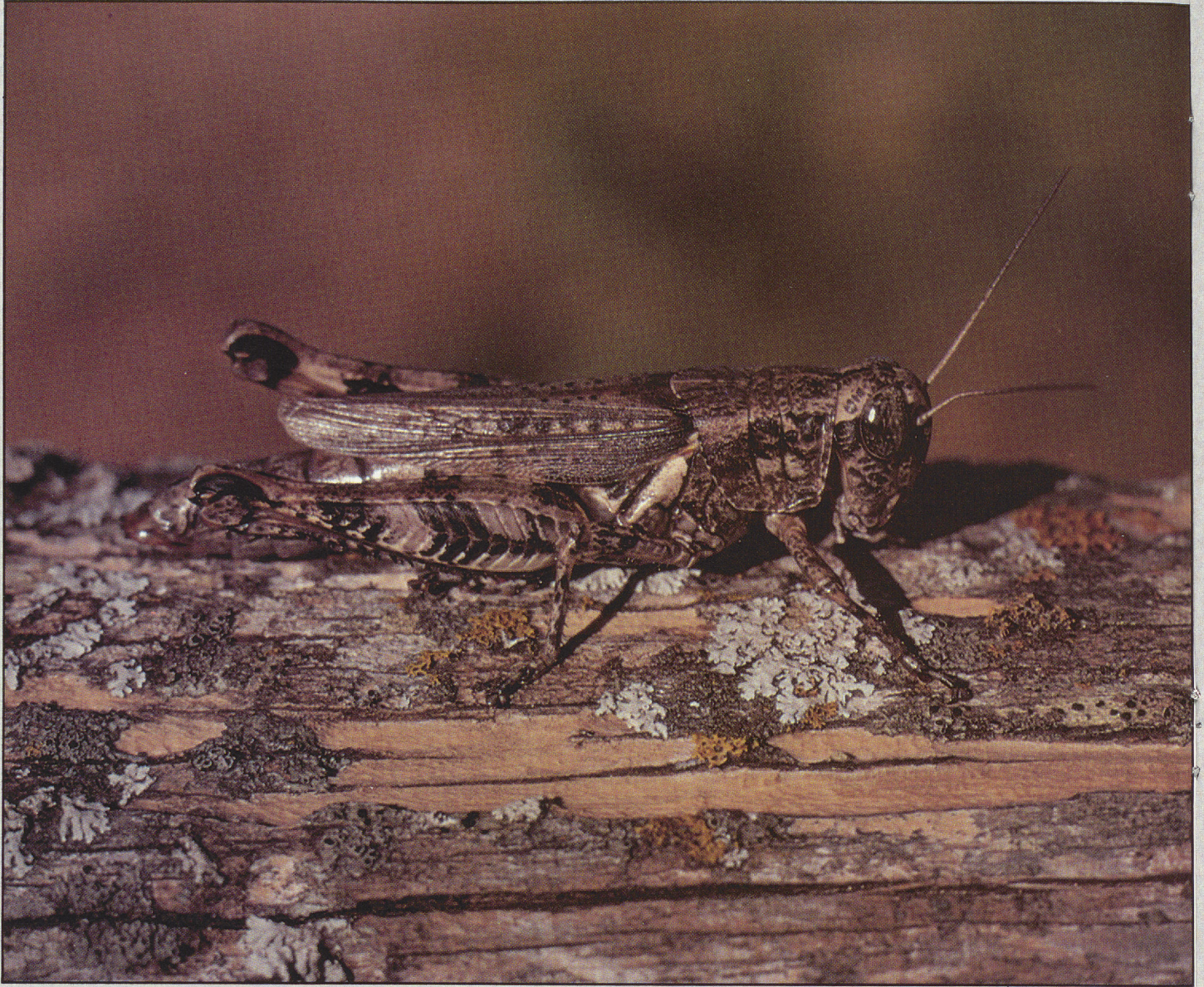
Horse lubber grasshopper, photo by Bill Reaves



Bird grasshopper, P&W File Photo

What a remarkable accomplishment is the leap of a common grasshopper. The tiny muscles in its hind legs must produce a thrust equal to eight times the insect's weight. Since they seem to jump for no apparent reason and remain still when they should have jumped, the leap may not be a reflex action, but the result of controlled stimulation. If the two tail-like sense organs on the end of the abdomen are stimulated, a jump always results. The first impulse stops the muscles that control walking, and cocks the jumping muscles. A second burst of impulses triggers the leap. Whether it is a short hop or a gigantic leap depends upon the number of impulses in the second message. Although this entire sequence of events takes place in a thirtieth of a second, some 3,500 muscle fibers in each hind leg are activated. This champion broadjumper may leap 20 times its body length, the equivalent of a human jumping one-third the length of a football field with a trajectory equal to jumping over a five-story building. The landing may not be graceful, but its body is light enough to be uninjured by the fall. Unless the grasshopper actually is flying, it has no control while in the air. Its hind wings fold fanlike beneath its hard, protective forewings. The lubber grasshopper (top left) will hiss and display its wings in a threatening manner when disturbed, and the males sometimes clack their forewings together loudly. They feed on mesquite and other desert shrubs and annuals.





Champion Broadjumpers



Immature band-winged grasshopper, photo by Bill Reaves



Grasshoppers serve as food for many wildlife species, especially birds. However, since grasshoppers eat grass and other vegetation, including crops, they are not considered beneficial to man. In fact, every year grasshoppers destroy crops in various parts of the state. Losses can run into the millions when heavy infestations of these insects occur in agricultural or rangeland areas. Six or seven grasshoppers per square yard on 10 acres can eat as much grass as a cow, but all grass in the infested area can be destroyed when the density reaches 30 to 60 grasshoppers per square yard. In many instances, populations have exceeded 100 per square yard. Populations vary considerably from year to year. One year a certain species may represent half the state's grasshopper population. The next year this same species might make up 90 percent of the population or its numbers could be so low that it has no significant impact on the vegetation. Those species that feed primarily on crops and rangeland survive the winter in the egg state, hatching in April, May and June when their food source is adequate. Abnormally warm temperatures in the early spring may cause the eggs to hatch too soon, leaving the young hoppers at the mercy of subsequent colder temperatures. A week or more of cloudy, wet weather also will take its toll of the newly hatched grasshoppers, since such weather is favorable for the development of bacterial and fungal diseases to which they are susceptible. Length of the wet weather, not amount of rainfall, is the important factor. Conditions during the egg-laying process also affect the next year's population. Low temperatures will greatly reduce the number of eggs laid by the female.



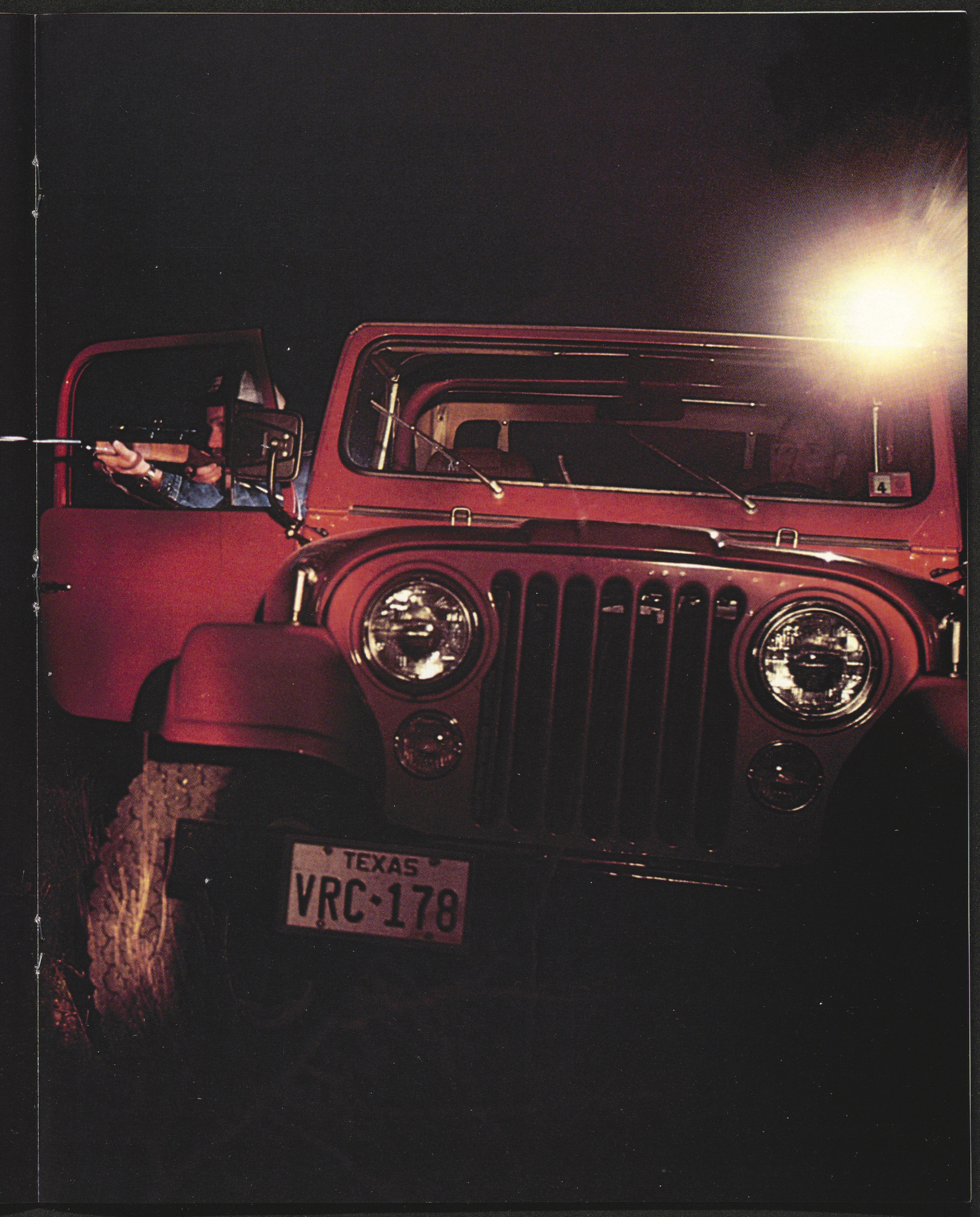
Headhunters

Article by Jim Cox Photo by Bill Reaves

In these days of runaway prices, Americans hardly notice when an oil painting sells for \$500,000, and they take in stride the fact that a new car may cost more than a house did a few years ago. But many might be shocked to learn that the mounted deer head gathering dust over their mantelpiece might fetch a price in the four- to five-figure range.

During the past 10 years in Texas, the antlers of trophy white-tailed deer have become so valuable as to

spawn a dramatic increase in illegal head-hunting by poachers who abandon the carcasses of trophy deer after sawing off the antlers. This flurry of antler-hunting activity represents a radical change, as most illegal deer hunting in the 1950s and 1960s was done for meat. Perhaps no one could have predicted a decade ago that antler prices would have escalated to the point where road hunters consider the risk of arrest a small matter in view of the potential profit.



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Headhunters

Not surprisingly, the center of this head-hunting activity is in the vast, rolling Brush Country of South Texas. Hunting lease prices on the prime Brush Country ranches have, in the eyes of the average hunter, gotten entirely out of hand. And the ever-increasing toll of big buck poaching may be adding even more pressure to this valuable resource.

John Caudle, law enforcement regional director from San Antonio, has spent most of his lengthy career pursuing deer poachers across the South Texas countryside, and he readily admits the current escalation of antler prices has him baffled. "It seems that everything has a price nowadays," he said, shaking his head. "Deer antlers are bringing unbelievable prices, and the trouble with that is if a poacher gets away with the actual killing part, he's absolutely free to sell the antlers."

The situation has caused more than a simple rise in traditional poaching. Deer antlers and heads are being stolen by burglars who break into deer-processing plants, club houses, hunting lodges and private residences. "One locker plant in Cotulla was burglarized three times during the past deer season, and one of the times the burglars just chopped off the heads of two big bucks and left the carcasses," Caudle said.

Tickling off some examples of prices being paid for antlers, he said, "One rancher whose wife died decided to sell his ranch and move to town. He gathered up 12 sets of average-sized antlers he had in the bunkhouse and sold them for \$5,000. None of the antlers would be considered really outstanding, just typical Brush Country bucks."

A mounted head which is of sufficient quality to be ranked in the Boone & Crockett standings is for sale in one South Texas city, and the price tag reads \$25,000. "They probably will get that price for it," Cau-

dle said. Two other heads at Freer are being priced at \$5,000 each, and only one of them is good enough to make the Boone & Crockett listings. Even tiny antlers from undersized Hill Country bucks bring \$15 from hunters who use them to rattle up bucks during the winter rutting season.

Game wardens always have had problems catching deer poachers in Texas, simply because of the vast areas to be patrolled with the available manpower. The evolution of head-hunting has compounded their problems, since poachers going strictly for trophy antlers can use even more indirect and furtive techniques than they could if meat spoilage were a factor.

"They (poachers) are using every trick in the book on us," Caudle said. One of the most disgusting road-hunting methods goes like this. The poacher cruises a highway or ranch road at 45 to 55 miles per hour to avoid appearing suspicious. When he sees a buck in the headlight or spotlight beam he continues down the road for a short distance before turning around. Usually the buck can be spotted again, and the poacher shoots it from the vehicle. Often, if the deer is in thick brush, the poacher speeds away without picking up the animal and returns later. "This way, he can come back without a gun or spotlight in his vehicle, jump the fence, saw off the antlers and be on his way," Caudle explained. "It's very difficult to make a case against a person unless he's caught in the act, since possession of the antlers is not illegal in itself." Even in the case of green or freshly removed antlers, it still is difficult to prosecute without more solid evidence. Another twist to the road-hunting technique is when a poacher shoots a buck, drags it to a suitable hiding place away from the road and then wires the animal's antlers to a tree or bush to keep large predators from dragging the

carcass away. "Sometimes they leave a buck staked out like that for a couple of weeks," Caudle said. "This gives the coyotes time to devour the carcass and allows the antlers to dry out. Then the guy just goes back, saws the antlers off and is gone in a couple of minutes."

Of course, a poacher is taking a chance when leaving his prize too long, as circling vultures often lead game wardens to the deer. "We took turns waiting for one guy seven days and nights before he finally returned. It cost us a lot of time and work, but it cost the poacher \$500, too," said Caudle.

Several other new twists have been developed by road hunters in recent years to escape arrest. Those after only antlers have been known to paint their rifles with camouflage-colored paint and conceal them along the roadside before and after making a kill, thereby reducing the likelihood of being caught with a fresh set of antlers and a gun at the same time.

Citizens' band radios also have seen increased usage recently. The usual technique calls for a CB-equipped scout vehicle to drive ahead of the hunters' vehicle to determine if the coast is clear for a kill. "We have even heard rumors of road-hunting clubs being formed to coordinate illegal hunting efforts in South Texas," Caudle said. "So far, though, it appears that most road hunting is done by isolated small groups of poachers."

Road hunting is only part of the warden's headache nowadays. "We've seen a big increase in the backpacking type of illegal hunting," said Caudle. "They're hard to catch because they have someone drop them off along a road and then they just hike into remote areas and set up a small camp for two or three days." Using the camp as a base of operations, the poachers hunt night and day for big bucks. This is becoming a problem in South Texas because of the vast size of some of the ranches involved. "These hunters know the area real well, and they have a pretty good idea where they can escape detection," Caudle asserted. "This is practiced in particular on ranches which don't allow

hunting. This makes it less likely that the poacher will encounter someone, and it also increases their chance at a real trophy buck."

Law enforcement officials are hard put to explain the reasons for the remarkable rise in values for deer antlers, but the trend is well documented. Classified advertisements frequently are placed in newspapers across the state by persons wishing to buy or sell antlers or mounted heads. "Really, a mounted head is not necessarily more valuable than a plain set of antlers," said Caudle. "A taxidermist can mount any set of antlers on almost any cape (the skin of a deer's head, neck and shoulder) to make a trophy mount."

One lease operator in charge of hunting on a relatively small ranch in South Texas said he believes the growing demand for trophy antlers is simply a result of economics. "A hunting lease in this area is going to cost an individual from \$1,500 to \$2,500 just for a chance to bag a trophy buck," he said. "There always has been a premium placed on trophies, but I think the trend is growing because people consider a trophy head part of an ever-diminishing resource." He added that many people will buy a trophy deer head for the same reason they would buy an out-of-production pistol or other commodity which may be difficult or impossible to obtain later.

As for poaching, he said, "We're finding it harder every day to keep poachers off our ranch, and it's almost to the point that it would take an armed guard at each corner of the property to keep them all out."

It is commonplace to see poachers scale eight-foot deer fences and then use wire cutters to make a hole large enough to drag a deer out. "Let's face it," he said, "most of these guys figure they are locked out of good deer hunting by the high lease prices. They also figure they're only likely to get caught by a game warden some of the time. A \$200 fine looks cheap to them compared to a \$2,500 per year lease."

Since an average Brush Country set of antlers currently will bring \$500 if advertised in the right places, many outlaw hunters con-

sider the stakes high enough to justify possible arrest.

Comments from game wardens in other sections of the state indicate that head-hunting is not nearly as prevalent elsewhere as in the Brush Country. Game Wardens J. C. Moore of Mason and Jack Woodford of San Angelo, whose territories include large portions of the popular Edwards Plateau deer range, said most poaching there still is done for meat rather than trophy racks. "Of course, we just don't have the size bucks that can be found in South Texas, and so far head-hunting has not been that much of a problem," Woodford said.

Biologists point out that the Edwards Plateau once was a haven for trophy-sized bucks, but overpopulation of deer, overgrazing by domestic livestock and other factors have combined to cause a gradual reduction in the size of bucks—both in body weight and antler configuration. This trend is increasingly being observed in South Texas as well, and the department fears that unless overall deer populations are reduced, the decline will continue. An increased harvest of antlerless deer and spike bucks is one factor which could help the situation—illegal harvest of trophy bucks is not. Horace Gore, Texas Parks and Wildlife Department deer program leader, said, "The poaching of trophy bucks is contrary to all we (the department) are trying to do, because it removes the best animals of the herd and leaves the lesser animals." He added that the illegal harvest creates an unknown factor which makes management of the South Texas deer herd difficult.

Joe Burkett of Fredericksburg, who is president of the Exotic Wildlife Association and founder of Burkett Trophy Game Records of the World, said there's no doubt that head-hunting both for native whitetails and imported exotic species is on the rise. "Current laws simply are not enough deterrent," Burkett said. "A game warden can file on a poacher for trespassing, discharging a firearm from a public road, killing deer in a closed season and any number of other charges, and

the fine usually won't exceed \$200."

Burkett added that landowners who have exotic imports such as Nilgai antelope, sika or axis deer are in an even more difficult position than those who have only native whitetails. "Right now the exotics are not under either domestic livestock or Parks and Wildlife Department statutes, so a landowner can't get restitution for animals lost to poachers. We are trying our best to get the Texas Legislature to rectify this situation," he said.

Asked to speculate on why native deer heads have risen so sharply in price, Burkett said, "I think many people are just beginning to recognize the true worth of these animals as natural phenomena and unfortunately some unscrupulous individuals are willing to pay a high price for a trophy which simply is a personal ego trip." The trophy antler boom is real, in Burkett's view, as he said he knew of one South Texas whitetail head which sold for \$10,000.

Whatever the reasons, Burkett said he is sure that illegal head-hunting is growing in Texas. "I believe Texas should look at New Mexico's new system of strict penalties," said Burkett. "They increased penalties for illegal hunting and started a reward program for turning in violators. That just about stopped poaching cold," he said.

Law enforcement officials point out that while illegal deer hunting affects the landowner most directly, it's the legitimate hunter who may be cheated the most. Most hunting leases are expensive, and a trophy buck is difficult to bag even under the most favorable conditions. Poaching deprives the sport hunter of a chance at a trophy animal for which he has made considerable investment in time and money.

Sportsmen can do their part in helping to curb this destructive activity by reporting suspected violations to the nearest game warden. In most cases, game wardens' telephone numbers are listed in local telephone directories, or they may be reached by calling department field offices. Also, local sheriffs' offices often are able to contact game wardens by radio. **

AROUND the STATE

NEWS OF THE TEXAS OUTDOORS FROM THE PARKS & WILDLIFE DEPARTMENT'S NEWS SERVICE

DON'T PLAN WEDDING ON OPENING DAY

The setting of hunting seasons apparently has sociological implications far beyond game management.

Evidence of this came to light recently when a Houston woman called on the Texas Parks and Wildlife Department's toll-free telephone line and inquired when this year's dove hunting season opens.

When told the season dates will not be set until July, she said, "I'm getting married in September, and I sure don't want to set the wedding date on opening day of the dove season." For any others involved in such serious scheduling, the department's statewide toll-free number is 1-800-252-9327.

WARDENS CONFISCATE NETS ON FALCON RESERVOIR

Game wardens confiscated more than three miles of illegal Mexican gill nets at Lake Falcon during April.

Texas Parks and Wildlife Department Regional Supervisor John Caudle of San Antonio said 16,500 feet of nets were picked up on the Texas side of the border reservoir in two separate operations.

In an early morning raid, wardens confiscated 9,900 feet of nets containing about 3,000 pounds of fish, including more than 50 striped bass ranging in size from three to 15 pounds.

The second raid, conducted in the evening shortly after the nets were placed for the night, yielded 6,600 feet of gill nets but fewer fish. Two arrests were made, Caudle said.

All the illegal netting activity currently is being done by Mexican citizens who cross over from the Mexican side after dark, Caudle said. He added that except for a brief period in the spring, use of gill nets is legal on the Mexican side of the reservoir.

Caudle said the nets usually are 1½- to three-inch mesh, and they are effective mostly on striped bass, white bass, tilapia, drum, carp and sometimes catfish.

Caudle said 12 game wardens coordinated their efforts in confiscating the nets, with some operating as spotters from the shoreline for boat crews.

"We've seen a significant increase in this activity lately," Caudle said, "but those nets cost 60 cents a foot and I think the loss of this much netting may discourage a lot of the illegal netters."

OUTLOOK BRIGHT FOR TEXAS PHEASANTS

Things never looked better for the ring-necked pheasant in Texas.

Both in its Panhandle stronghold and along the Southeast Texas prairies where it is a relative newcomer, the colorful pheasant is thriving.

Harvest data from last fall's hunting season show that an estimated 38,685 hunters took 36,581 pheasants in the Panhandle area. This is an all-time high, and amounts to about 10,000 more pheasants than were harvested the previous year.

Also, crow call counts this spring in a dozen Southeast and Central Texas counties are showing that enough pheasants survived the heavy summer rains and flooding last year to expect good reproduction this year.

While the expansion of pheasant range in the southeast is proving to be slow, populations in established areas apparently are becoming progressively more dense, according to Upland Game Program Leader Don Wilson.

With patient stocking and cooperation from landowners, the department hopes to make the pheasant a huntable game bird in the southeastern third of Texas as it has been since 1958 in the Panhandle.



Dioramas and historical artifacts highlight the new interpretive exhibit at Fort McKavett State Historic Site. The three-dimensional model pictured above is part of the diorama portraying pre-Civil War transportation. Other parts of the exhibit depict history of the fort as well as the fort community after the military left until the turn of the century.

EXHIBIT AREA COMPLETED AT FORT MCKAVETT

The color and drama of life in a frontier fort is captured in an interpretive exhibit recently completed at Fort McKavett State Historic Site in Menard County.

The fort, located at the headwaters of the San Saba River, was one of a line of military posts across West Texas established to protect settlers from Indians. This frontier line of forts also included Forts Richardson, Griffin, Concho and Clark.

Fort McKavett was an active infantry post from 1852 to 1883, except during the Civil War, and during its peak activity was manned by some 300 people.

The interpretive exhibits are located in the fort's original hospital ward room, and feature a general history of the fort in pho-

tos, illustrations, dioramas and approximately 200 artifacts. The exhibits also deal with the history of the fort community after the military moved out until the turn of the century.

Restored stone buildings at the fort include the hospital, barracks, headquarters, bakery and school. Restoration is currently underway on seven sets of officers' quarters.

The fort is located about 60 miles southeast of San Angelo and 22 miles west of Menard, between U.S. Highway 190 (formerly U.S. 29) and U.S. 290.

There are no overnight facilities at the park, but a picnic area is available. The headquarters telephone number is 915-396-2358.

DECLINE SEEN IN BOAT REGISTRATIONS

Soaring fuel costs, high interest rates and decreasing loan availability apparently are pushing the state's boat industry into stormy waters.

FRESHWATER TROTLINES STILL MUST BE TAGGED

After September 1, freshwater trotline fishermen in Texas will benefit from somewhat liberalized trotline regulations, but they can expect some tighter enforcement as well, according to the Texas Parks and Wildlife Department.

A new regulation adopted recently by the Parks and Wildlife Commission retains the former 100-hook limit, but specifies that a person may use more than two trotlines to make up the total. Current law limits trotliners to only two lines, totaling 100 hooks.

David Palmer, field operations supervisor, reminded fishermen they still must mark their lines with legible tags bearing the angler's name, address and the date the line was placed in the water. "The line must be redated every 90 days to keep it current," Palmer said.

Abandoned, outdated or un-

HUNTING LICENSE SALES INCREASE

Sales of resident hunting and fishing licenses are ahead of last year's pace, Texas Parks and Wildlife Department officials said.

During the first six months of the 1979-80 fiscal year which began September 1, 1979, the department posted gains in hunting, fishing and combination hunting/fishing licenses over the first half of 1978-79.

Department officials were encouraged by the rise in resident hunting license sales, which had declined somewhat in 1978-79. The 313,977 hunting licenses sold represented a gain of 1,048 over the same period in 1978-79.

Resident combination hunting/fishing licenses for the six-

month period gained by 41,803, which amounts to a revenue increase of \$355,694 over the first six months of 1978-79.

Resident fishing license sales, which set a new revenue record in 1978-79, continued to increase, with 449,152 bringing in \$1,800,289 revenue. This represents an increase of more than 11,000 licenses and \$46,000 revenue over the first half of 1978-79.

Archery stamp sales also showed a significant increase of 2,879 stamps and \$8,804 revenue over 1978-79.

Officials attributed the rise in hunting license sales to generally favorable weather conditions early in 1979 which boosted production of quail, turkey and deer for the 1979-80 hunting seasons.

marked lines are subject to being confiscated by game wardens, Palmer pointed out. "This regulation is designed to help keep the state's public waters open to all fishermen, as abandoned trotlines are a nuisance and can be hazardous."

Palmer also said state law prohibits setting any trotlines in the vicinity of public boat docks, swimming beaches or any public place commonly used as a swimming area.

"Trotline fishermen should check with a local game warden, or the department's hunting and fishing guide which comes out in late summer, to be aware of any special lake restrictions," Palmer said. He said some lakes such as power plant cooling ponds have their own restrictions on trotlines. An example is the Fayette Power Project Lake near LaGrange, where trotlines are prohibited.

Tagging a trotline is easy, Palmer said. Most fishermen use all or sections of plastic milk jugs and write the required information on them with indelible ink.

owners are "downsizing" to rigs less expensive to operate and which do not require large towing vehicles.

Ebell speculated that much of the shift has been from fiberglass hulls to lighter aluminum models. These boats generally can get by with smaller outboard motors, and most can be towed behind a compact car, he added.

Examples of the decline can be seen at public boat ramps. At

ties may be reserved for any date during the current calendar year. Reservations made in person will be confirmed in writing, and telephone or mail requests received three days or more in advance of occupancy also will be confirmed in writing.

All reservations must be claimed by 8 p.m. on the first day of occupancy. In case of a delay, late arrival privileges will be granted if the visitor calls the park on the arrival date before 8 p.m.

TIME TO RESERVE STATE PARK CAMPSITES

Specific campsites or shelters cannot be reserved, but if a specific location is desired on arrival it will be honored if it is not occupied and if it will accommodate the visitor's equipment.

For specific information on facilities available in the state park system, write the Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744, or call toll-free 1-800-252-9327 for a free Texas State Park Information brochure.

With summer vacation season here, many Texans will be planning to spend time in state parks. Prospective overnight park visitors who want to be assured of accommodations should be aware that cabins, campsites and group shelters are operated on a reservation basis in parks with these facilities.

To make a reservation, it is necessary to call, write or apply in person to the individual park. Reservations are not mandatory, but advisable to be assured of a campsite upon arrival.

No reservation fees are charged; however, a user fee is charged based on the type of facility occupied. Reservations cannot be made more than 90 days in advance for cabins or campsites, and requests will be accepted as late as 5 p.m. for occupancy by 8 p.m. Group facili-

NEW PARKS DIRECTOR HIRED BY TP&WD

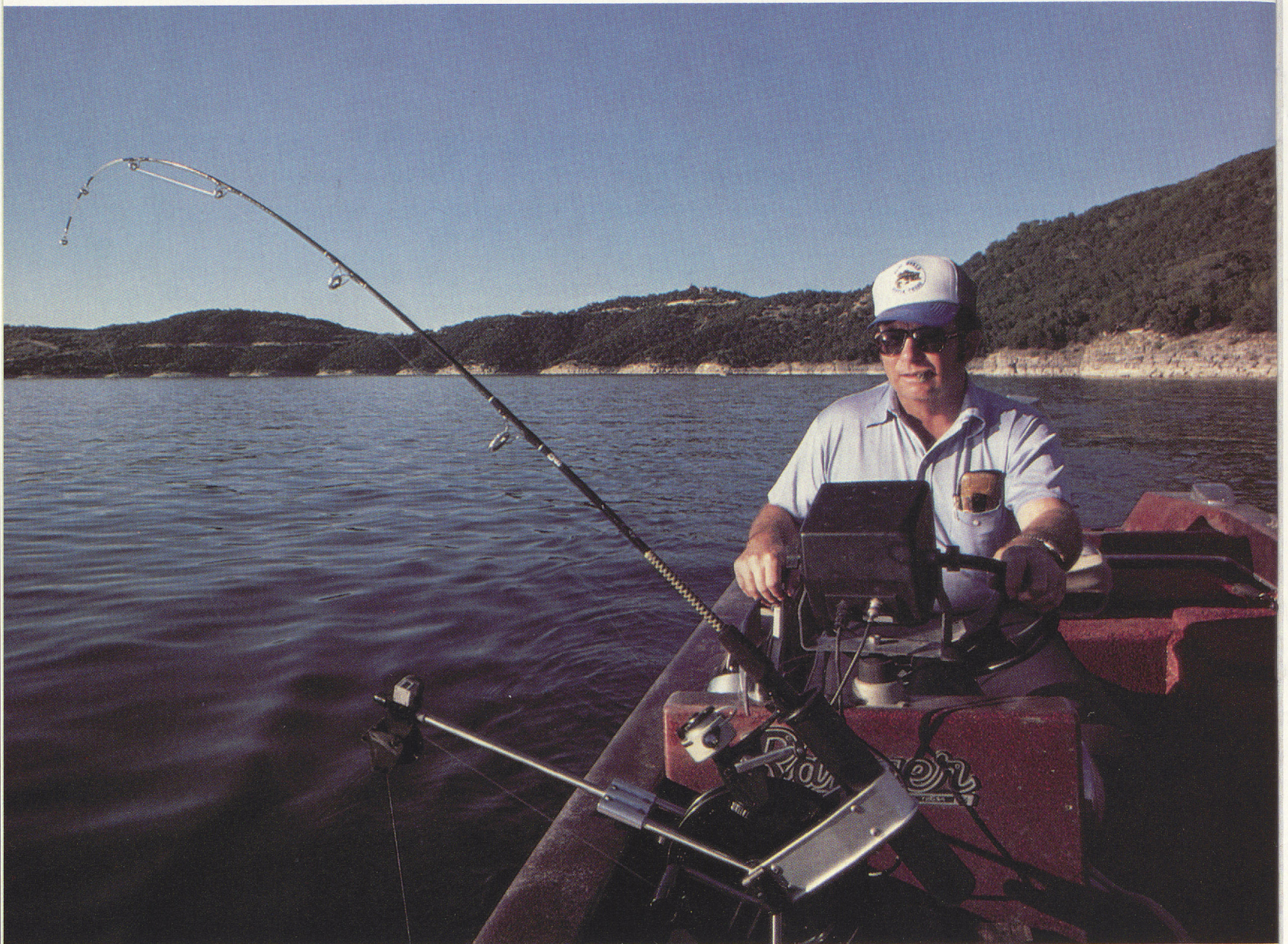
James D. Bell, a Texas native who has spent the past two years as director of the Allegheny County Department of Parks, Recreation and Conservation in Pennsylvania, has been named director of the Texas Parks and Wildlife Department's Parks Division.

As director of the Pennsylvania agency, Bell administered 11 parks comprising 12,000 acres in the Pittsburgh metropolitan area.

From 1973-77, Bell operated a parks and recreation planning and consulting firm in McLean, Virginia. Prior to that he was director of the Fairfax County Park Authority in Virginia, which administered six types of parks in the metropolitan area of Washington, D.C.

Born in Fort Stockton, Bell graduated from Odessa High School in 1954 and received a bachelor of science degree in park administration from Texas Tech University in Lubbock in 1960.

Bell said one of his major objectives with the department will be to increase the identity of the Texas state park system both nationally and locally. "Texas already has a number of very remarkable facilities in its state park system, and more are in the planning stage," Bell said. "I think there's a lot we can do to promote public awareness of these outstanding resources."



Downriggers Come to Texas

Article by Jim Cox Photos by Glen Mills

True innovations in fishing are few and far between.

Every so often a new wrinkle appears—crankbaits that rattle, baits that buzz and plastic worms that smell like a snow cone or grape soda. But in spite of the marketing hoopla, most freshwater fishing techniques have remained basically the same through the years.

Trolling is one of these methods. It has been around as long as the outboard motor, and it consists mainly of dragging a diving lure behind a slow-running boat in hopes of placing the bait in front of a fish before it snags on a submerged tree or the bottom of the lake. However, trolling is held in low esteem by many anglers. They consider it appropriate only for those too dull-witted or clumsy to use other techniques.

From the shores of the Great Lakes, and from the salmon waters of Puget Sound comes a new trolling gadget—the downrigger. It has caught the eye of a number of perceptive Texas anglers who see virtue in this winchlike device and have decided it is not as crude and unsportsmanlike as it appears. In short, they have mounted downriggers on their boats, and have found that putting a trolled lure in front of a fish can be accomplished almost as precisely as casting a top-water lure next to a submerged tree stump.

What's so different about downriggers?

Downrigger manufacturers stress the phrase "controlled depth" when describing their product. With the simple turn of a crank, the angler can place a trolled lure of any size or weight at the exact depth desired, whether 10 feet or 100. Even the most sophisticated standard trolling rigs, utilizing oversized deep-diving lures or lead weights, cannot do that. In fact, getting a lure deeper than 15 or 20 feet by dragging it behind a boat is difficult, and requires heavy equipment. Estimating how deep the trolled lure is running also involves considerable guesswork.

The other main advantage of downriggers is that depth is achieved by the downrigger's weight, not the lure. When a fish strikes, the line pops free from the weight, allowing the angler to use ultralight tackle for playing the fish if he so chooses.

Marketers correctly point out that a downrigger can place small lures into the lower strata of deepwater lakes where perhaps the fish never have seen an artificial lure.

Of course, downriggers are not new. Saltwater anglers have used them for years in pursuit of large, deep-running fish such as salmon, but articles in fishing publications indicate a growing trend toward downriggers among Great Lakes fishermen.

The emergence of the striped bass fishery in Texas and other states has stimulated the move to freshwater downrigger applications. These fish spend much of

Although saltwater anglers have used them for years, Texas fishermen have just recently begun mounting downriggers on their boats. This winchlike device lets the angler place a trolled lure of any size or weight at the exact depth desired, something standard trolling rigs cannot do.

their time in submerged river channels at depths beyond the reach of traditional trolling rigs. The prevailing method for catching deepwater Texas stripers has been to drop a slab-type spoon or live sunfish to the correct depth, preferably after locating the fish with a depth finder or chart recorder. Playing hide-and-seek with the mobile schools of stripers can be made easier with a downrigger.

Downriggers are showing up on Lake Texoma, one of the state's better striped bass producers. An informal survey of tackle shops in the Dallas area revealed that several now stock at least one line of downriggers, and some offer several models ranging in cost from \$35 to \$300 or more.

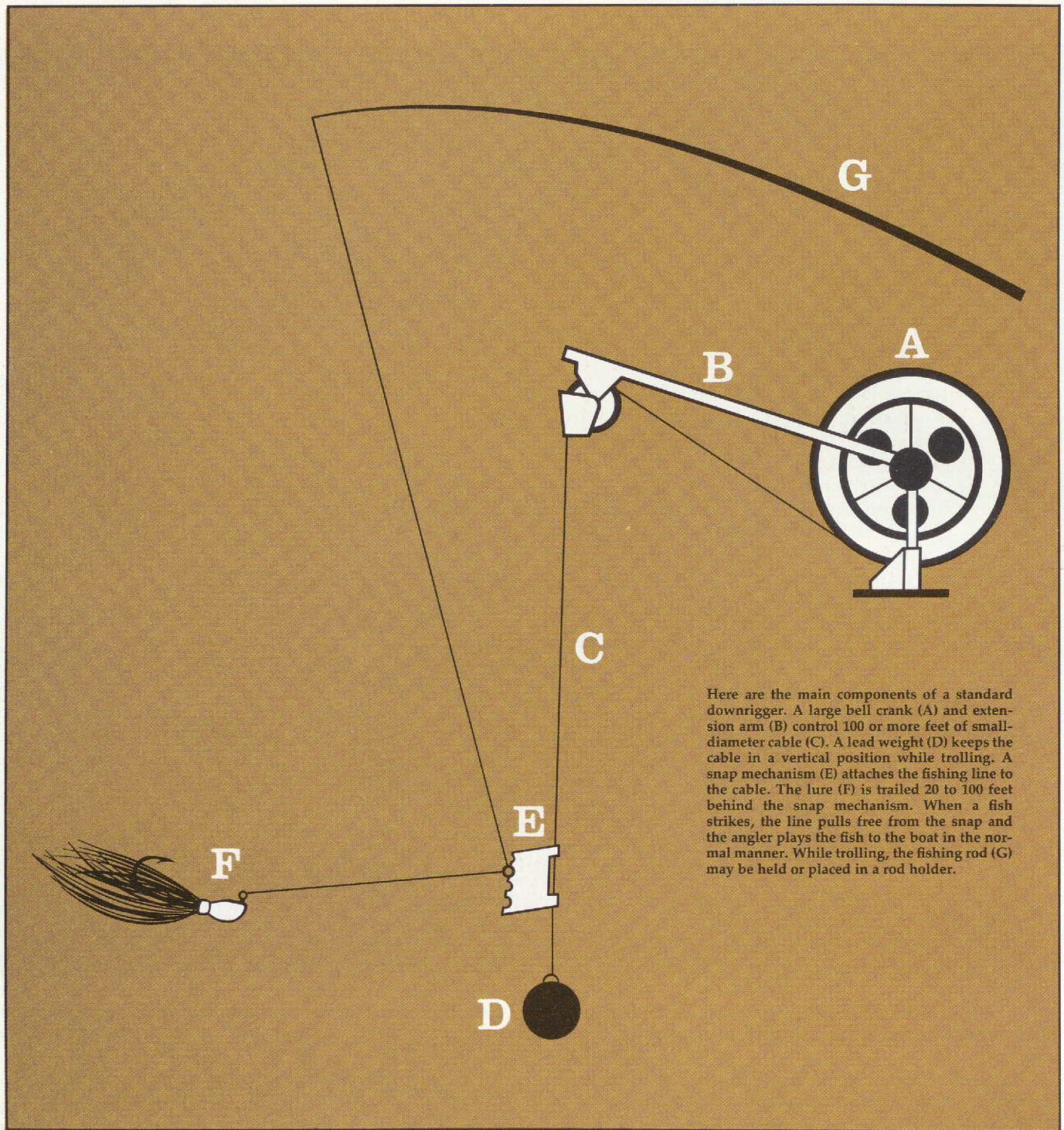
Any swimming-type lure can be used with downriggers and it doesn't need a lip to make it dive deeper. In fact, a lure which trails obediently along behind the weight is preferred, since the downrigger operator uses the depth of the weight to determine the fishing depth. Spinners or spoons, which tend to twist the line, should be avoided. Jigs are perhaps the most popular lure for downrigger use, and they come in enough different sizes and colors for any situation.

If fishing with downriggers has a peak time in Texas, it probably would be summer when striped bass in the state's reservoirs cruise submerged river channels. They usually are found at 40 to 60 feet, but depending on factors such as thermoclines, they may be as deep as 100 feet. (A thermocline is an area in the water of extreme temperature change.) Night trolling along deep river channels and underwater ridges can be highly productive for stripers in the summer.

Checking with local fishermen or department biologists to determine if a thermocline exists would be advisable. In the hottest periods, a thermocline usually forms in 20 to 30 feet of water. The cooler water trapped below the thermocline often is deficient in oxygen and useless for fish; however, in deeper lakes, a second level of oxygen-rich water may be found below the thermocline. This condition may be caused by water releases from a dam; an influx of fresh, cold water from the watershed; or both. At any rate, summertime downrigger anglers should experiment at varying depths to find the most favorable oxygen levels.

Of course, every fishing method has its drawbacks. Downriggers obviously are useful only for those who have access to a boat. Almost any powerboat can be adapted to downrigger fishing, but it must have a motor that runs well at low trolling speeds. Fast trolling is effective in open water for striped bass when using lures manufactured for that application, but slower speeds are needed when going for walleyes, smallmouth or largemouth bass.

Another piece of equipment, which is valuable if not indispensable to the use of downriggers, is a sonar depth finder. A simple flasher unit will indicate lake bottom features important to finding fish, and it also can help avoid snagging the downrigger weight or lure



Here are the main components of a standard downrigger. A large bell crank (A) and extension arm (B) control 100 or more feet of small-diameter cable (C). A lead weight (D) keeps the cable in a vertical position while trolling. A snap mechanism (E) attaches the fishing line to the cable. The lure (F) is trailed 20 to 100 feet behind the snap mechanism. When a fish strikes, the line pulls free from the snap and the angler plays the fish to the boat in the normal manner. While trolling, the fishing rod (G) may be held or placed in a rod holder.

A wide variety of terminal tackle is seen on the various brands of downriggers. The model pictured in the top photo (opposite page), has four precision-cut notches which serve the same purpose as snap mechanisms on other rigs. The fishing line is threaded through a doughnut-shaped ring before the lure is tied on. The amount of line to be trailed behind the keel is controlled by making several twists in the line with the ring at that point, then wedging the ring in one of the four slots. The slots are sized to give varying degrees of holding power to compensate for trolling speeds or lure weight. The middle photo shows the position of the keel in relation to the weight. The bottom photo shows an extension-arm model downrigger mounted atop a live well box in an aluminum boat.

on the bottom. A flasher or more expensive chart recorder also can be used to locate individual fish or schools of fish. Finding the depth at which sport fish or their forage species are cruising represents half the battle in hooking the quarry. Once the fish are located, adjusting the downrigger to reach the productive zone is a simple matter.

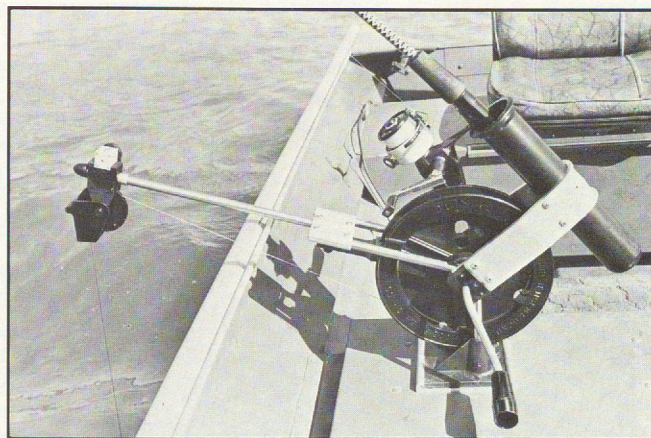
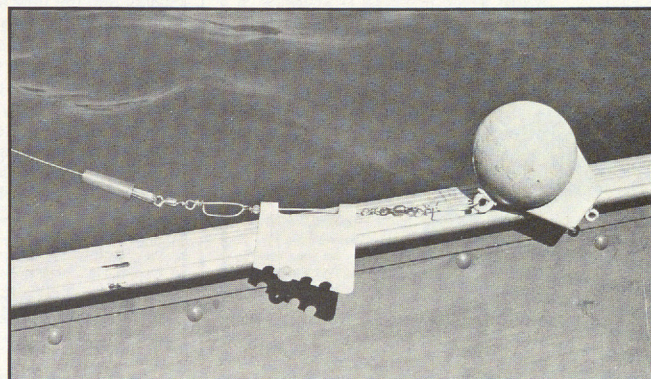
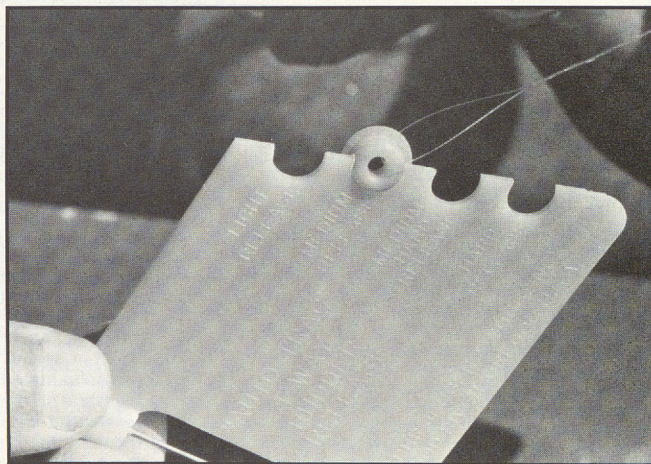
All but the most inexpensive downrigger units are equipped with mechanical counters, calibrated in feet, which indicate the fishing depth. As the price increases, more optional features are available. These may include a drag system which can save the loss of cable or weight if snagged, a swiveling extension arm to reduce wear and binding on the cable, rod holders and even an electric-powered winding device to retrieve the cable automatically when a fish strikes. The latter feature is designed not to winch the fish up, but to get the cable out of the way while the angler is playing the fish to the boat.

Most downrigger anglers feel an electric winder is a luxury. Since the lure normally is trolled at least 20 to 30 feet behind the cable, there usually is plenty of time to get the weight out of the way and little effort is required to crank up the weight.

Mounting a downrigger on some boats presents a problem. Fiberglass boats with narrow gunwales or metal rails on the gunwales make mounting difficult. Most extension-arm downriggers have mounting plates which must be attached to a flat surface with bolts, and many fiberglass bass boats have no applicable surface. Also, many bass boats equipped with large motors often don't have enough free transom space to handle a stern-mounted downrigger. The ideal arrangement places the downrigger within easy reach of the boat's controls, although this is not essential if more than one person is along. Some of the larger trolling boats used in salt water and the Great Lakes have as many as four downriggers mounted at strategic locations around the deck.

Downriggers basically are simple in design, and one could be made at home. However, it is doubtful that a home-built rig would match the commercial units for lightness and convenience features.

Whether downriggers will become a significant piece of equipment for fishing Texas reservoirs remains to be seen. As efficient as they are, downriggers still require patience and skill for finding the right depth and lure. Another question is whether the method can be adapted for game fish species other than striped bass. Deepwater fish such as the introduced walleye could be a good target for downriggers, since most of their life cycle is spent in depths below 30 feet. Also, in many lakes largemouth bass are found at surprising depths, particularly in midwinter and summer. According to reports from California, trophy-sized Florida-strain largemouth bass frequently are caught by trollers using lead-core lines at depths down to 80 feet. Scuba divers in Texas reservoirs also have reported seeing significant numbers of largemouths around submerged ridges and ledges 50 feet down. This is contrary to the popular notion that largemouths are

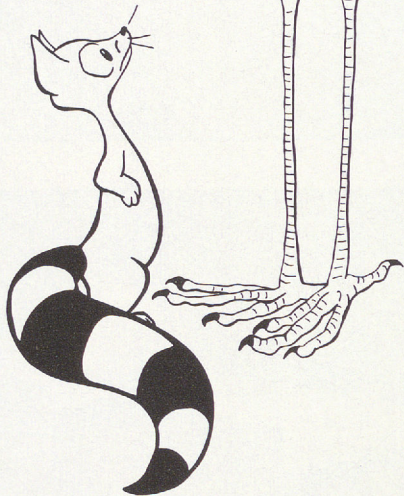


strictly a shallow-water species. Through careful manipulation of a downrigger, and by keeping a watchful eye on the depth finder, a lure could be maneuvered close to these deep bass hideouts.

The trolling stigma could remain in force, but if enough downrigger success stories are circulated through the Texas angling grapevine, some staunch antitrollers may take another look at this new method of fishing. **

Editor's note: The downrigger photographed in this story was loaned to us by Angler's Crossing Tackle Shop of Austin; we appreciate it.

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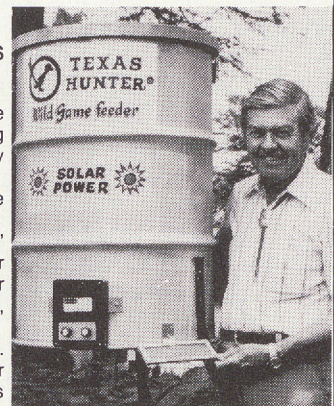
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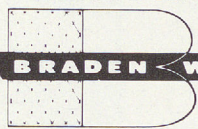
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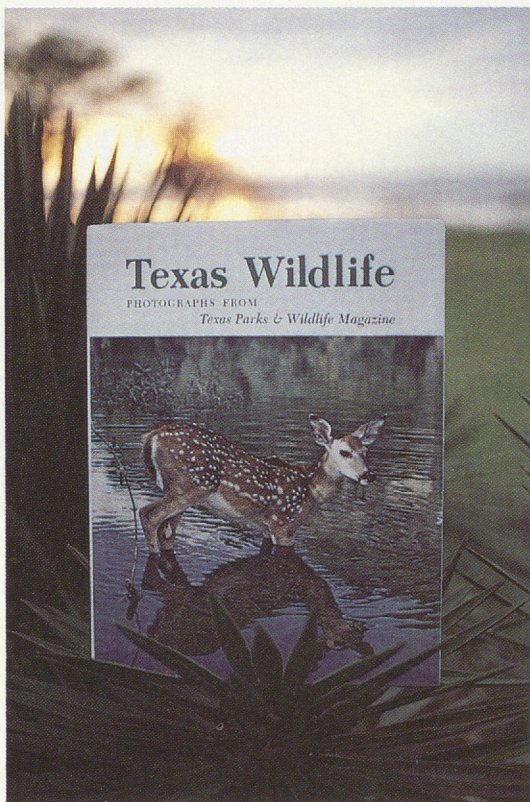
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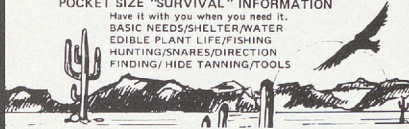
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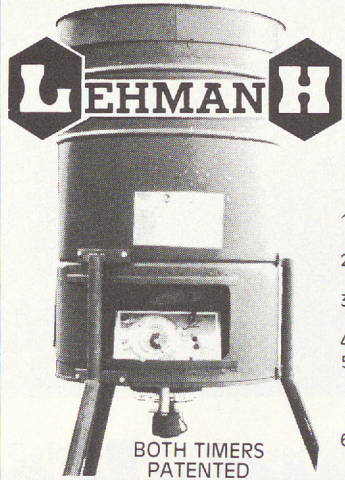
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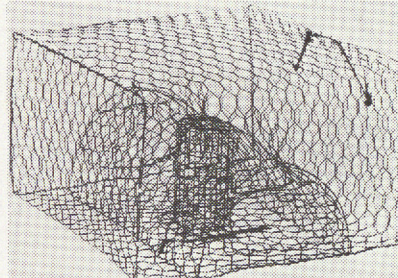
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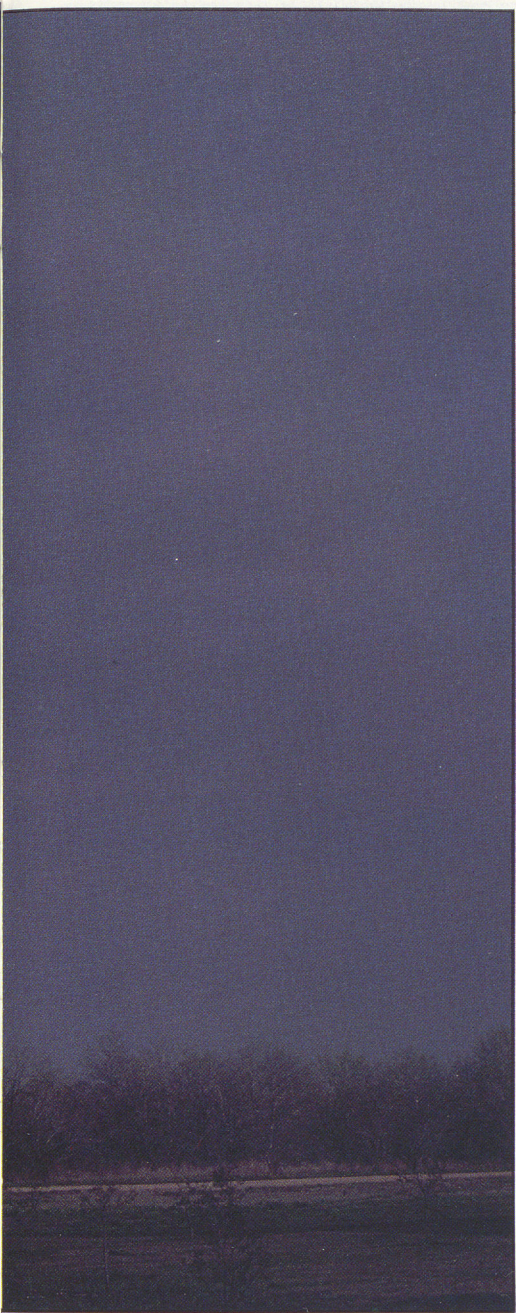
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Young Naturalist **RAINBOWS**

by Ilo Hiller



Although rainbows are surrounded by folklore, superstition and religious beliefs, they have a very common reason for existing. They result when sunlight is refracted and reflected by raindrops. In the primary rainbow, red lies on the outer edge of the arch and violet on the inner edge. A fainter, secondary rainbow sometimes can be seen outside the primary one. The light rays in the secondary rainbow strike the raindrops at a higher angle than those in the primary one, and are reflected twice. This makes the resulting rainbow's colors fainter and reverses the order. Red lies on the inner edge and violet on the outer edge of the secondary rainbow.

ing creature that the earth never again will be destroyed by flood.

Superstitious beliefs also relate to the rainbow. One tribe in South America believed a rainbow over the sea was a good sign, but when it appeared over land, it was the sign of an evil spirit looking for a victim. In Eastern Europe it was believed that an angel put gold at the ends of the rainbow, but only a nude man could find it. An old Romanian folktale claimed that when the end of a rainbow stood in a river, anyone creeping in on hands and knees for a drink of the rainbow-touched water would be changed instantly to the opposite sex. A similar tale claimed that anyone passing beneath a rainbow's arch would be changed into the opposite sex.

Rainbow colors also have had their significance in folklore. Some people believed that when red was the most brilliant, or noticeable, it meant war; green meant abundance; and yellow meant death.

Such superstitious beliefs seem foolish to us today, but these earlier cultures, with their limited scientific knowledge, had no way of knowing the colorful bands of light were produced by sunlight being refracted (bent) and reflected (turned back) by raindrops.

In order to understand how this happens, we must learn a little about light. Sunlight is a mixture of color rays, and these rays travel in wavy lines. The distance between the tops of the waves, which varies in different rays from 14- to 28-millionths of an inch, is called the wave length. Each different wave length produces a different color. Red and yellow

wave lengths are longer than those which produce blue and violet light, and the combination of all colors produces white light.

You can separate the colors contained in sunlight by using a simple prism, which is a triangular bar of glass. As light waves enter the prism, they are refracted. Since each color has a slightly different wave length, each is bent at a slightly different angle. This separates them, and they emerge from the prism in bands of colors—red, orange, yellow, green, blue, indigo and violet. These seven bands of color are called the solar spectrum.

When sunlight passes through air filled with water droplets, each of the raindrops acts as a tiny prism to bend and separate the light into its many colors. But instead of allowing the light to pass through as it does with a prism, the inner surface of the raindrop reflects the color. Upon leaving the raindrop the color is bent again. The result of this refraction and reflection is a rainbow.

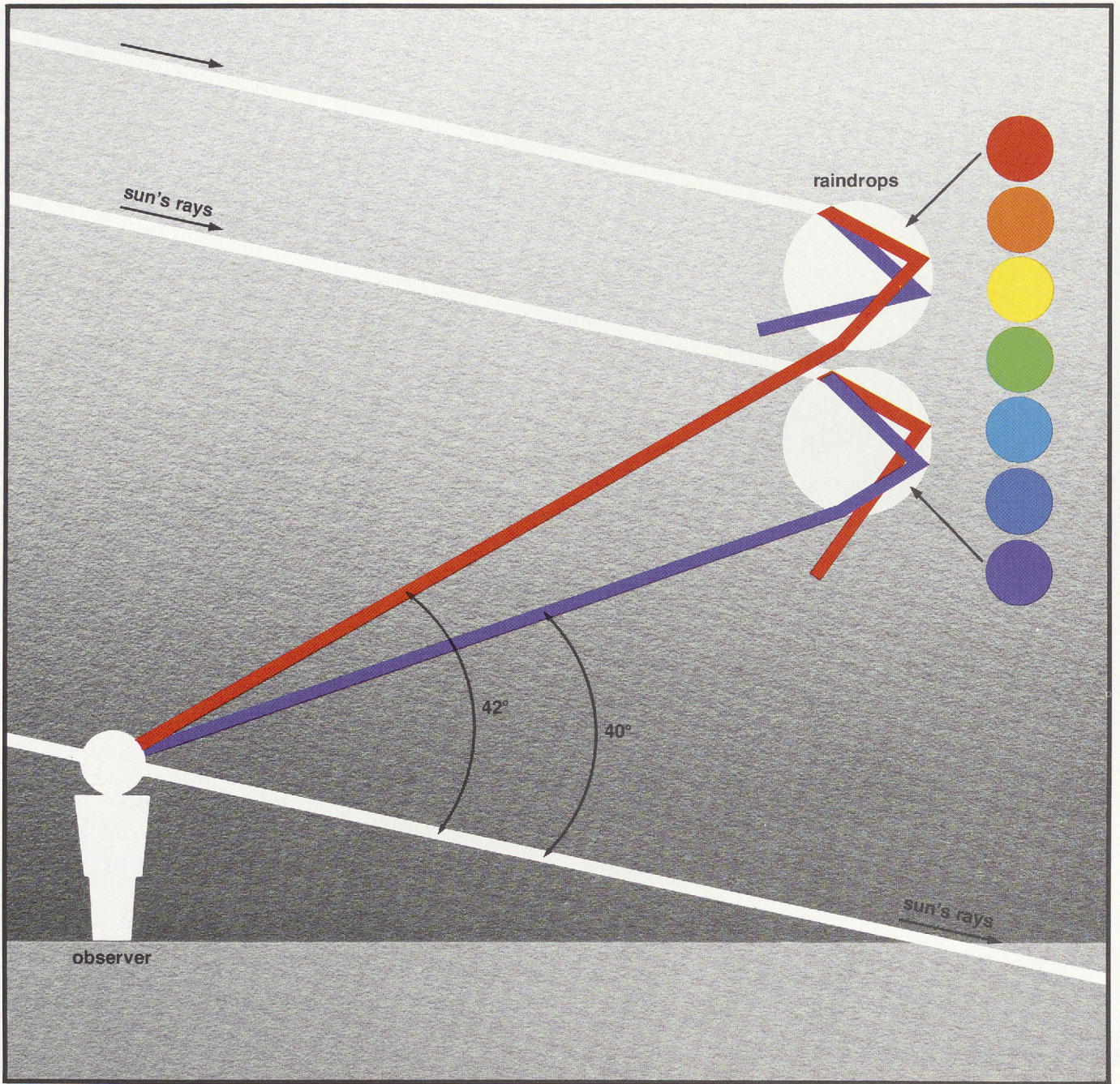
All of the colors of the solar spectrum are present in a rainbow, but since they blend or overlap somewhat, you rarely see more than four or five colors clearly. The color on the outer edge of the arch is red, and violet lies on the inner edge. The width of the color bands depends upon the size of the raindrops forming the rainbow.

Certain conditions must exist before a rainbow can be seen. The sun must be behind you and low enough on the horizon for its rays to be reflected at the proper angle to reach your eyes. The rain must be somewhere in front of you. Since sunshine and rain showers appear together most frequently in the summer, more rainbows are seen during this season.

At this point, you may be wondering how a rainbow remains the same while the raindrops are falling. Each drop contributes to the color for only a second, but since each falling drop is quickly replaced by another, the reflected rays give the appearance of never changing. We do not see all of the rays reflected by the many raindrops present in a shower. Those reflected at 40- to 42-degree angles form the primary rainbow. Violet rays arrive at our eyes at a 40-degree an-

Before the scientific secrets of rainbows were discovered, these colorful bands of light were wrapped in mystery and folklore. Every culture had its own theory for the rainbow's purpose, and many times it had religious significance.

Rainbows have been called such things as the tongue of the sun, road of the dead, bride of the rain, hem of the sun-god's coat, road of the thunder god, bridge between heaven and earth, window to heaven and bow of God. Biblical accounts establish the rainbow as a covenant, or promise, between God and every liv-



Raindrops act as tiny prisms and mirrors that bend and separate sunlight into the seven colors of the spectrum and reflect these color rays back to our eyes as a rainbow. Each raindrop produces the entire spectrum, but we see only those color rays that reach our eyes at certain angles. In the primary rainbow, violet arrives at a 40-degree angle, red at 42 degrees and the remaining five colors at degrees between the two. Since the colors blend and overlap somewhat, we rarely see more than four or five colors clearly. The width of the color bands depends upon the size of the raindrops forming the rainbow.

gle, red at 42 degrees and the remaining five colors at degrees between these two.

A secondary rainbow, located a short distance outside the primary one, sometimes can be seen. Its rays reach the eye at 50- to 54-degree angles. This secondary rainbow, which some people incorrectly think is a reflection of the primary one, has a full spectrum of colors; however, the colors always are fainter and the order reversed. Red lies on the inner edge of the secondary rainbow and violet on the outer edge. The light rays forming the secondary rainbow strike the raindrops from a higher angle and are reflected twice before leaving the raindrop. This double reflection accounts for the fainter appearance and the reversed order of color.

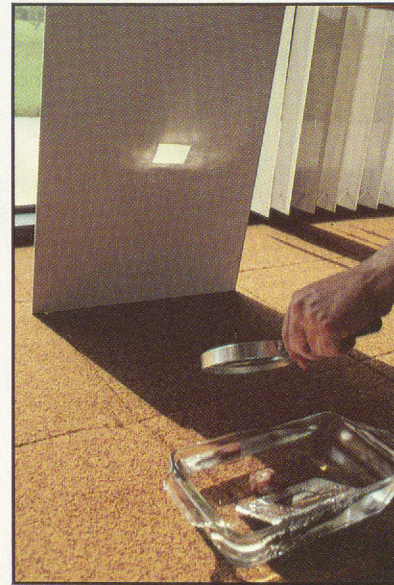
You may think you have seen the complete rainbow as it arches from one point on the horizon to another, but you really haven't. Rainbows can form a full circle. If you were standing on a high mountain and the sun appeared low enough on the horizon to create a rainbow, you might see a round one. Passengers in airplanes occasionally do when conditions are right.

With the help of a garden hose, you can make your own rainbow. During the early morning or late afternoon, put the sun at your back and spray a fine mist of water into the air in front of you. A circular rainbow should be reflected by the water droplets. Increase the size of the water droplets and notice whether the width of the bands of color changes. Mist from a plunging waterfall will produce a similar rainbow on a sunny day.

Up to now, all of the rainbows mentioned have been caused by reflected sunlight, but a study of rainbows would not be complete without mentioning that moonlight occasionally is responsible for rainbows. The feebleness of moonlight results in very faint colors, making a lunar rainbow very difficult to see; however, the lunar rainbow differs from those made by the sun only in the intensity of its color.

All rainbows, whether produced by sunlight or moonlight, are a result of light being refracted and reflected in moisture. **

Experimenting with a Solar Spectrum



Photos by Leroy Williamson

Proving the scientific theory that sunlight is a combination of colors can be a fascinating experience. Perhaps you already have had a chance to experiment with a simple prism in your science class and have separated sunlight into its various colors, but have you ever produced the solar spectrum with a water prism?

A water prism is easy to make. All you need is an oblong, glass dish at least two inches deep; a small mirror; a piece of foil large enough to wrap around the mirror; a rock; and a large, white card.

Fill the dish with water and set it in the sunlight. Cut a window one-inch tall by one-half inch wide in the middle of the piece of foil. Center the window on the mirror and wrap the foil around the edges to hold the window in place. Put the foil-covered mirror in the water with the window facing the sun. The top, back edge of the mirror should be leaning against the side of the dish. Adjust the angle of the mirror until a color spectrum is reflected on a nearby wall. Use the rock to keep the mirror from slipping once you have it at the proper angle. Insert the white card between the dish and the wall image and the spectrum should appear on the card. The water refracts the light, separating it into its colors, and the mirror reflects these colors onto the card.

To bring the colors back together, place a magnifying glass in the path of the reflected light, holding it several inches from the card and facing the mirror. A rectangle of white light the shape of the foil window should now be projected on the white card instead of a color spectrum. By adjusting the angle of the magnifying glass, you should get a sharp outline of the window. The curved lens of the magnifying glass has brought the color rays back together, producing white light, but you have proved with your water prism that sunlight is a combination of colors.

LETTERS TO THE EDITOR

Dewberry Specials

I was so disappointed that your excellent article on dewberries (May issue) didn't include a couple of tips on using this plentiful Texas fruit. Any Texas Extension Service specialist can furnish recipes for dewberry jelly, cobblers and freezing techniques, but the recipe for dewberry cream pie is one that usually is passed around by word of mouth. I am including it for your other readers.

Dewberry Cream Pie

1 unbaked 9-inch pie shell
Dewberries to fill level with top of shell
2 well-beaten eggs
1½ cups sugar
½ cup flour
½ cup heavy cream
pinch of salt
Mix eggs, sugar and flour. Add cream and salt. Pour mixture over berries in pie shell and allow mixture to settle to bottom.
Topping:
8 tablespoons flour
8 tablespoons sugar
4 tablespoons butter

Mix flour, sugar and butter. Spread this crumbly mixture over top of pie and then bake the pie at 325 degrees for 45 minutes, or until brown.

To freeze dewberries, select fully ripe, sound berries. Handle as little as possible. Wash, cap and drain well. Add three-fourths cup of sugar for each quart of berries or cover the berries with cold sugar, a mixture of three cups of sugar to four cups of water.

Hazel Briscoe
Rosenberg

Who's To Blame?

After controlling the rage I felt, all that was left was a sick, helpless feeling.

We found a pile of birds, including an Inca dove, western tanager, chickadee, titmouse and several cardinals, that had been killed by local boys with BB guns and slingshots. They also had killed some squirrels that obviously were nursing litters. The boys had pulled the feathers from the tails and wings of the birds, and said they were going to sell

the squirrel skins. This incident took place in a small city designated as a wildlife preserve by the residents.

Where does the blame lie? These were the sons of "sportsmen." If the hunters and sportsmen of this state want to retain the rights they are so vocal about and the respect of people who believe wildlife is more than a "toy" for their children to practice on until they are old enough to use bigger guns on bigger game, they should consider the consequences of giving seven- and eight-year-olds guns to go out and play with. I definitely feel the law holding parents responsible for the actions of their children should be applicable here.

It is everyone's responsibility—sportsman and naturalist alike—to educate his children in the preservation of the natural world and life, however small. I am not condemning guns or hunting. I am condemning the irresponsible use of either.

Cynthia North
Grey Forest

New Lake Planned

Please send me some information about the new lake that is going to be built near Hillsboro. I understand it is to be bigger than Lake Whitney.

Jo Ellen Mitchell
Irving

■ The U.S. Corps of Engineers is planning a reservoir at Aquilla, which is near Hillsboro. Construction is not scheduled to begin for about two years, and we do not have any details as yet. For additional information, contact the Corps of Engineers office in Fort Worth.

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BACK COVERS

Inside: Originally from South America, the nine-banded armadillo is the only species of the order Xenarthra that ranges into the United States. Armadillos are toothless and have long, sticky tongues to capture insects. Their heavy claws allow them to tear apart ant and termite nests, and their bony shield makes them unique among mammals. Photo by Karen Dickey Johnson.

Outside: Skinks are smooth, shiny lizards that are difficult to catch and hold. When caught, they may try to bite and their tails break off easily. This four-lined skink, *Eumeces tetragrammus tetragrammus*, is five to seven inches long and is found in the Lower Rio Grande Valley. Photo by Bill Reaves.

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