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Burying a Dead River

Earlier this year, an interesting case came into the Gray County District Court. A corporation of western Kansas farmers petitioned the court for title to a stretch of the Arkansas River that ran through several sections of their property. The farmers had already cleared tracts of dying timber along the river banks and installed center pivot irrigation systems that reached almost into the stream bed itself. With this sizeable investment already made, they were understandably interested in securing their claim to the developed acreage.

The problem is that the Ark River is legally classified as a navigable stream, one of only three in Kansas. The classification is a hold-over from the last century when the river showed potential as a method of transportation. Anyone who has seen the western reaches of the Ark in the last decade knows how pathetic this classification is for the modern river. Demands for irrigation water in eastern Colorado and western Kansas have sucked the Ark dry and threaten to deplete aquifers under the river as well. Still, the state owns the riverbed and controls whatever water might be there until the court rules differently.

The farmers argue that, without surface water, a river can't be navigable. In their view, if it doesn't flow, it may as well be farmed.

Environmental interests, on the other hand, see the cultivation of the riverbed as the final notice that the loss of the Ark and its riverside wildlife habitat is irrevocable.

Whatever the district court's ruling, there will be appeals, and the ultimate ruling may be a long time coming. The fact that there has to be a ruling at all is a sad indication that, in three hundred years of settling this continent, our attitude toward the land hasn't changed very much.

We started out in North America with the understandable impression that we had stumbled on more natural richness than we could possibly use up. The challenge at hand was to tame a corner of it so that a few people could make their livings without fear. It took a hundred years or so for the developers among us to realize that an enterprising man could do much better than a hand-to-mouth living. That attitude worked its way west in the early nineteenth century, cleared the plains of its bison in less than a decade before 1880,

cleared away the lion's share of its waterfowl, deer, and upland game birds twenty years later, and cleared it of much of its topsoil thirty years after that.

As the supply of virgin ground has been depleted, the developer's justification has changed; his activities haven't. In the 1800's, there was too much wild country to use up; now, there's not enough to bother with. In either case, the only economical thing to do is turn a profit on what's available.

The scraps of wild land left on the plains aren't generally the best of what was or even a representative sample. They're mostly places that were too poor to attract much attention in the decades of our real land wealth. That isn't to say they're unworthy of notice. We're not as land rich as we once were, not poor by any means, but no longer wealthy enough to turn up our noses at the remnants of wildness along a river we've pumped dry. It may not look like much, but in southwest Kansas, it's a large share of what we have left.





Navigation in the bird world—

Pathfinders

Bob Mathews

“Here is a rule of order, a design of habit. Free as the winds to fly when, where, and how they might choose, wildfowl hold almost as closely to lanes of passage as do earthbound mammals.”—A. H. Hochbaum

There probably is no phenomenon of animal life that enthralls humans more than the unerring accuracy with which migratory birds travel to and from their birthplaces. The theorizing that seeks to shed some light on the mysteries of the seasonal movements of birds has continued for centuries.

Biblical references to bird migrations appear in the book of Job (39:26) where the question is asked: “Doth the hawk fly by Thy wisdom and stretch her wings toward the south?” The author of Jeremiah (8:7) observes: “The stork in the heavens knoweth her appointed time; and the turtledove, and the crane, and the swallow, observe the time of their coming.”

While the speculations of the earliest recorded observers may seem incredibly naive to us now, there still are enough unsolved riddles to busy bird researchers for years to come. Aristotle advanced the theory that the winter disappearance of birds was the result of

Gene Brehm

their wholesale hibernation; that they passed the winter in a torpid state in hollow trees, caves, or under the mud of marshes. Another writer, in 1703, contended that migratory birds wintered on the moon. Others accepted as fact the notion that birds huddled together and passed the season underwater.

Nineteenth-century ornithologists, who set up coordinated teams of bird watchers, were the first to base their theories on personal observation rather than accept unfounded speculation. The introduction of bird banding in the 1900's laid a solid foundation for establishing routes and patterns of bird travel. Since World War II, radar has enabled investigators to follow the movement of flocks of migrants, and even individual birds, on their journeys. Development of miniature radio transmitters, which can be mounted on birds and transmit signals to receivers on the ground, further increased the capabilities of bird studiers.

With these new tools, investigators in the past thirty years have turned to a more complex aspect of migration: How do they do it? How can the arctic tern navigate the 25,000-mile round trip that stretches nearly from pole to pole? How do ocean-going gannets, albatrosses, and shearwaters find their way across thousands of miles of seemingly trackless water to the same islands where they nested or wintered the year before? How does the pintail hen return year after year to the same meadow to lay a new clutch of eggs?

Many questions still remain but a fair amount of research has helped substantiate theories on the potential environmental cues which help guide a migratory bird's seasonal journey. While some species seem to possess more sophisticated navigational equipment than others, it is assumed all birds that migrate use a combination of environmental guidance devices.

The fundamental cues available to birds are landscape features. Numerous studies indicate the passage of migratory birds generally seems to obey topographic features such as lakes, marshes, and river courses. Even ocean travelers have a rich source of visual cues, such as wave direction, reefs, atolls, currents, clouds over islands, and fog belts. Almost all birds are well-equipped to make the most efficient use of landmarks. Some species possess visual acuity eight times greater than that of a man, and the area encompassed by the horizon at 2,000 feet is nearly twenty times greater than the circle of vision at the average eye level of a walking man.

For a long time, understandably, it was believed that birds relied entirely on landscape features to chart their courses. If a bird became lost, it was presumed, it merely flew a random search pattern until a familiar landmark was sighted. But that theory, couched in terms of human perception of the environment instead of objective research to learn how birds perceive their environment, failed to answer a lot of questions.

If landscape features were the sole guidance system for birds, then birds released many miles from their home range should become hopelessly lost. Experimentation revealed some surprising results.

British scientists R. M. Lockley and David Lack in 1937 collected Manx shearwaters, ocean-going birds known for their homing abilities, from their nesting grounds on Skokholm Island in the British Isles. They transported the birds to various distant points from their nests and released them. Most of the birds quickly returned to Skokholm Island. Some were even observed immediately setting a direct course for home upon their release. Another Britisher, Geoffrey Matthews, also released shearwaters from many different points of displacement. They again showed an uncanny ability to return home. Other tests with Laysan albatrosses, cliff swallows, and purple martins yielded similar results.

It was extremely unlikely that the unfamiliar landmarks available to the birds at their points of release served any useful function in guiding them back home.

The speed with which they returned negated the possibility that the birds had time to wander until they located familiar territory. Apparently they were putting other environmental cues to work. While movements in familiar territory may have been attributed to the birds' consultation with familiar landmarks, their ability to home from foreign surroundings provided evidence that more was involved.

Subsequent experimentation indicated that birds are capable of determining a fixed direction by considering the position of sun or stars overhead. A researcher named Kramer studied the activity of caged starlings during migration season and found that their movement inside the cage showed a strong bias in one direction, depending on the location of the sun. When Kramer manipulated the position of the sun with mirrors, the starlings adjusted their position accordingly. When the sun was obscured by overcast, the birds showed no directional preference. Further, the starlings apparently modified their position to compensate for the sun's movement across the sky, adjusting the angle between their heading and the sun. That indicated that starlings possess a mental clock, equivalent to a ship navigator's chronometer, which allows them to adjust their position to the sun's progress in its arc across the sky.

Other investigators provided evidence that nocturnal migrants are able to determine direction using the position of stars. Drs. Franz and Eleonore Sauer, a German husband-and-wife team, found that warblers placed in a cage with a glass top oriented in the right direction as long as they could see the starry sky. When the Sauer's moved the caged birds into a planetarium, and projected different star patterns on the ceiling, the birds invariably showed a preference corresponding to



Chris Madson

the seasonal configuration of stars: when the projected sky simulated a spring sky, the birds pointed northeast; when an autumn sky was reproduced, the birds oriented to the southwest. An unfamiliar star pattern evoked confusion and disorientation.

The results recorded by these and other investigators added valuable information to the study of bird navigation but even tougher questions surfaced as new answers were found to the old questions. To travel from nesting grounds to winter quarters, it would seem, requires more than an ability to maintain a given compass bearing. If a migrating bird is blown several miles off its course, for example, how does it adjust its course to compensate for that variable? To continue in the same direction would keep the bird on a course parallel to its original course, but off target.

A human navigator on the ocean can find his bearings with a sextant and calculate his position in terms

of latitude and longitude, then plot the position on a map and relate it to his destination. Do birds have equivalent equipment in their heads?

Some studies have shown that birds are capable of detecting the movement of the sun across the sky. By comparison, that feat is similar to a human witnessing the actual movement of the hour hand of a clock. The ability of predatory birds, such as falcons, to intercept fleeing prey also demonstrates their built-in ability to accurately measure angles.

Matthews theorized that birds are able to compute in their heads their present position and compare it to their memory of the sun's angle in their wintering quarters. It's called bicoordinate navigation. The displacement experiments, in which birds are transported from their home range to distant points and released, provide circumstantial evidence that birds are able to perform true navigation.



Still, scientists are reluctant to accept the results of those experiments as proof that bicoordinate navigation capability exists in birds. It is not known what other environmental cues birds perceive and extremely difficult to isolate a particular environmental cue so that it is the only one available to experimental birds. Human perception may indicate that all other environmental factors, except that for which a bird is being tested, have been excluded by careful structuring of the experimental method. But there may be environmental cues available to birds that are beyond the realm of human perception.

In one carefully controlled experiment, homing pigeons showed good homing when released in foreign surroundings under overcast skies. The birds were unable to use landscape features or the sun for their return. With those cues unavailable, investigators contended, the best potential source of navigational infor-

mation lay in the earth's magnetic field. Within the past twenty years, some experimenters have focused their attention on possible use by birds of an innate ability to detect the minute differences in the earth's magnetic field. Some experimenters attempted to alter the magnetic field around a bird by affixing magnets to their necks or wings. No resulting effects were noticed, however. Neither were any results noticed in tests in which flying birds were exposed to artificially-produced magnetic fields. In a few cases, there have been unexplained reactions of bird flights when high-powered radar beams were aimed at them.

In a separate study, German scientists studying reactions of caged robins found that the robins continued to flutter against the southwest wall of their cage after nightfall and after their view of the sky was obscured by drawn blinds. When the same birds were placed in a steel box they showed no directional pref-



One of the longest lived of all migratory birds, geese develop strong attachments to their traditional routes and stopping places. Photo by Gene Brehm.

the wind direction and speed at similar altitudes. The birds observed on radar appeared to select wind characteristics which were favorable to their migration and led Bellrose to postulate that winds were an additional source of directional guidance.

Wind direction may have something to do with aiding navigation of waterfowl crossing the United States. A. H. Hochbaum, who has spent nearly two decades in research at the Delta Waterfowl Research Station in Manitoba, has reported that the heaviest passage of birds to the south in the autumn is nearly always characterized by a rising barometer, a falling temperature, a drop in relative humidity, and a wind from the northwest. Perhaps a tailwind is to a duck as much a means of guidance as it is an aid to propulsion.

The lifestyle of the birds themselves also must be considered in relation to their means of navigation.

Geese, for example, are among the very few species of birds in which the family stays together beyond the end of the breeding season. Parents and young stay together for nearly a year. With that social arrangement, in which veteran travelers pass their knowledge to their offspring, the feat of navigation seems somewhat less complex.

Ducks, on the other hand, don't possess such a stable family relationship. In most species, the father has parted company with his mate before the young are hatched. In mallards and most other dabbling ducks, the hen usually stays with her ducklings until they begin to fly. The hen of many species of diving ducks abandons her offspring several weeks before they are ready to fly. The young are on their own early and building their own travel experience in their summer wanderings. The return of ducks to nesting range each spring is based on a background of experience in travel, the previous year's juveniles having completed their first migration.

But, for most birds, the initial journey to winter quarters is accomplished without the guidance of parents. That doesn't preclude the transfer of navigational know-how from one generation to the next, however, since juvenile ducks may travel in company with other more experienced birds of their own species.

Much has been learned in recent years about the means by which birds navigate. But with each new bit of information added to our store of knowledge on how birds do it, it seems another, more complex question arises to take its place. For some unquenchable inquisitors, the challenge of unraveling these brain-bending mysteries is enough to dedicate years of study to. Others of us are content with simpler endeavors . . . like our awestruck witnessing of their purposeful passage overhead every year . . . no matter how they do it. □

erence and fluttered about at random. When the steel door of the box was opened, they resumed their southwest orientation. The effect of the steel box was to reduce the earth's magnetic field.

Research is continuing to determine birds' potential use of magnetic fields but the evidence is so far inconclusive.

The ability of birds to migrate at night when astral cues are hidden by cloud cover and landmarks are indistinct also points to another possible cue—wind patterns. Indirect evidence of use of wind cues is implied in the migration of the slender-billed shearwater from Tasmania through the North Pacific. Its route of travel follows the prevailing oceanic wind patterns in that part of the world.

Waterfowl authority Frank Bellrose studied the response of migrating birds to a variety of wind directions and speeds, comparing their flight patterns with



Kansas Beaver: A Profile

Rod Baughman

Photo by Len Rue, Jr.

Only two mammals are capable of developing water projects. One is man, whose bulldozers and concrete can change the course of a river. The other is the beaver, who performs the same task equipped with only a tenacious spirit and a strong set of teeth. A native of Kansas, the beaver played a major role in the state's early history. The luxuriant fur has periodically commanded a good price, and today some Kansans eager for a little extra income and a lot of exercise run traplines during the beaver season in January and February.



Two-hundred years ago, beaver trapping was more than an engaging pastime; it was the national passion. The burgeoning European market for beaver fur accelerated the opening of the West in the 1700s, including the territory that is now Kansas. Powerful firms like the Hudson's Bay Company and the American Fur Company vied for the nation's fur resource. French and English fur traders were among the first white men to explore the Plains. They traversed the streams, trapping beaver and trading whisky, guns, and other goods to the Indians for beaver pelts.

Robert Henderson describes the impact of the fur trade on the Kansas territory: "Frontiersmen like Daniel Boone, George Morgan, and Davy Crockett pressed across Kansas and into the mountains where new supplies of beavers were discovered. The rivers of Kansas soon became trails to the far west. In 1786, Auguste and Pierre Chouteau established trading posts along the major rivers of Kansas. Explorations of Lewis and Clark, Pike, Long, Fremont and Becknell encouraged the exploration of the fur resources of the West" (*Beaver in Kansas*).

Even though the beaver's construction skills are mainly instinctive, the finished works are still remarkable. Medieval man undoubtedly modeled the moated castle after the beaver lodge, for water is an effective defense against enemies. By building a dam across a flowing stream, beaver create the calm, deep water necessary for a homesite. An underwater tunnel is the only entranceway to a beaver lodge, and once inside the beaver are safe from terrestrial predators. The tunnel opens in deep water so that after freeze-up they can still make trips to their food cache, a mass of freshly cut branches shoved into the mud of the bottom and sometimes anchored with stones. This food supply must be available throughout the winter if the colony is to survive. For this reason, the colder the climate the higher the dam must be. In northern areas where ice cover may get several feet thick, beaver create ponds as deep as ten feet to ensure open water below. The ice layer gives enemies like the coyote access to the lodge, but usually to no avail—once mud used in the lodge freezes, it becomes nearly impregnable to digging assaults.

Although the lodge dwelling is predominant across much of the beaver's range, most prairie streams are ill suited to this type of habitation. In Kansas, beaver generally build bank dens, and dams seldom exceed three or four feet in height. This is in response to the milder climate and the nature of the streams themselves. Most Kansas streams small enough to be impounded like normal beaver habitat tend to flow only

intermittently. Beaver prefer rivers that maintain year-round water flow, and since these permanent watercourses are typically wide and carry considerable water, dams are generally long and low. The bank den may range from a simple burrow in the bank of a river or lake to a lodge-like structure of sticks and mud. Food caches also vary according to water depth and amount of winter ice. On some Kansas streams beaver maintain normal caches, while on others winter food is stored in the burrow or lodge.

The most visible sign of beaver activity is the dam. By gradually piling up sticks and branches across a stream, being careful to fill in places where water flow is greatest, beaver raise the structure uniformly. Initially it holds back little water, but as mud is added the leaks begin to fill up. The current speeds the sealing process by forcing mud and vegetation deep into the dam. Once the flow of water slows, silt settles out and further improves the seal. The beaver succeeds at dam building more by dogged effort than engineering skill. Often a colony will spend weeks erecting a dam on a difficult stretch of water when a more manageable site exists close by. And the beaver's compulsion to build is not daunted by encounters with human edifices. Wildlife photographer Leonard Rue recalls an instance in which beaver inhabiting a manmade pond couldn't resist improving the existing concrete dam. For appearance's sake they tried to cover the structure with mud and sticks.

Because of its remarkable feats of engineering, the beaver has been mythologized by man throughout the centuries. Many American Indian tribes, including Plains dwellers like the Osage and Pawnee, invested the rodent with supernatural powers. Some possessed the beaver bundle, a magic charm that was considered to be big medicine. The beaver figures in the creation story of the Cherokee. According to the legend, giant beaver helped the Great Spirit make the world by excavating mud from the oceans and fashioning it into continents.

The pioneer trappers who earned their livelihoods from the beaver concocted the most fanciful tales of recent history. As described by these mountain men, a typical beaver colony would rival the Army Corps of Engineers for complex efficiency. The author of an 1835 volume on natural history records one such example of the fabled beaver work organization: "They are superintended in their labors by an overseer, who gives notice to his workmen when to be at their posts by flapping with his tail upon the water, divides them into parties for each several kinds of work, distributes their employments, assigns their stations, and super-

intends the execution of his commands.”

Other early accounts portrayed beaver hauling soil on their backs and tails like miniature dump trucks, troweling mud on dams and lodges with the adroitness of stonemasons, and even hammering huge stakes into the ground with their tails.

When researchers began observing beaver behavior firsthand, most of these stories lost credence. But one myth that persists is that of the beaver as expert lumberjack, a furry Paul Bunyan who deftly drops sprawling cottonwoods and aspens with precision cuts for use in engineering projects. In fact, beaver approach timber falling haphazardly; that trees often fall where they want them is the result of environmental factors rather than logging skill. For convenience and to avoid predation, beaver generally cut trees standing close to streams. Because the open area of a watercourse admits more sunlight than the forest, limbs grow thicker and heavier on the stream side of trees on the bank causing them to fall toward the water. The lower elevation of a stream also increases the chances a tree will fall in that direction. The beaver themselves harbor no great confidence in their timber-falling ability. When a tree is about to fall, they feel the vibrations through their teeth and scurry for cover. Some don't make it. Occasionally beaver are found squashed by their own handiwork.

The beaver is physically well adapted to its aquatic lifestyle. Large, webbed hind feet propel the bulky animal through the water at speeds up to six miles per hour. The flat tail serves as a stabilizer and scull in rapid swimming and as a rudder to keep the beaver on course when it is hauling sticks through the water. Valves in the ears and nose automatically close when the beaver submerges, and oversized lungs and liver retain enough oxygen in the blood for underwater jaunts of up to fifteen minutes. Some naturalists claim the beaver is able to swim half a mile without coming up for air. Loose flaps of skin around the mouth close behind the large incisor teeth, allowing the animal to grasp objects and even gnaw wood when submerged without taking in water.

Beaver are able to spend long periods of time in icy water because of their unique fur. A dense underfur keeps out cold, and long guard hairs keep this insulative layer dry. To retain water repellency the beaver secretes an oily substance from its castor glands and oil glands called castoreum, which it periodically combs into its fur. Castoreum was highly valued in former years for its supposed medicinal properties. It was purported to cure everything from colic to arthritis. Perfume makers use castoreum as a fixative for fra-

grances, though the main market for it today is as a base for lures and scents used in trapping.

Beaver in Kansas favor willow and cottonwood bark for food, though they will also cut and eat the bark of green ash, hackberry, maple, elm, mulberry, sycamore, and box elder. They occasionally cut other trees including oak, cedar, and fruit trees. Woody plants are the diet staple during fall and winter; in spring, summer, and early fall, beaver feed mostly on green succulent vegetation. In corn country it is not unusual for beaver to eat ear corn and use the stalks as building material in their dams.

A typical beaver colony in the fall comprises a pair of adults three or more years old, a pair of yearlings about to turn two years old, and two or three kits from last spring's litter. Beaver breed during the winter months, and at this time the yearlings are driven out of the colony. These two-year-olds travel along the stream or head out cross-country until they find a suitable place to live. A few will acquire mates and raise a litter of kits, but most will not breed until the following winter.

Beaver reach adult size at three years of age but continue to grow throughout their lives. In Kansas, adult beaver generally weigh between thirty and fifty pounds, but occasionally an old-timer will tip the scales further, like the ninety-seven pounder found dead on Salt Creek in northcentral Kansas several decades ago. In the wild, beaver can live as long as twelve years; beaver raised in captivity sometimes live to be fifteen or older.

In altering the environment for its own habitat needs, the beaver has a powerful impact on other wildlife. The water backed up by beaver dams creates wetland areas that are attractive and beneficial to deer, waterfowl, water birds, and furbearers such as mink, muskrat, raccoon, and opossum. Timber flooded by a beaver dam eventually dies, providing homes for a diversity of bird species that set up housekeeping in the hollows of the decaying snags. By impounding water the beaver helps stabilize flow downstream, creating better water conditions for fish and other aquatic life.

In an agricultural state like Kansas, the beaver's works sometimes conflict with human interests. Pasture and cropland flooding can become a problem when beaver take up residence in the wrong place, and the scarcity of timber across much of the state often sets the ambitious rodents at odds with landowners. It is usually a losing proposition to take out a beaver dam, for what man removes during the day the beaver will put back at night. This leaves two alternatives: construct drain tubes in the dam or remove the beaver.



Intense, year-round trapping in the last century drastically reduced the beaver population in Kansas. In 1911, the state legislature closed the beaver season for ten years. The moratorium was later extended; it wasn't until 1929 that the Fish and Game Commission again

allowed harvest of beaver, this time on a limited basis, with permits issued only to landowners who registered damage complaints. Over the years the Commission has gradually liberalized controlled harvest of beaver as the statewide population has increased. Today, the



Leonard Lee Rue

A remarkable underwater machine, this beaver swims to his underwater lodge entrance with stick in mouth. Like many other semi-aquatic mammals, the beaver is specially adapted to holding its breath for extended periods, sometimes as long as fifteen minutes. The classic northeastern U.S. beaver lodge (lower right) is seldom if ever seen in Kansas. Much more common are bank lodges like the one above in which the living platform is dug into the bank and covered with sticks and mud on one side. The sticks farther out in the water are part of the colony's food cache.

Ken Stiephen



Neil Johnson



trapping season runs from January 1 to the end of February. Beaver reproduce at a relatively low rate and are particularly vulnerable to trapping during open water. The season falls during the coldest period of the year when ice is likely in order to ensure pelts will be

at their best and to prevent overtrapping.

In the past five years the value of a quality beaver pelt has stayed around two to fifteen dollars, while prices of other furbearers have risen rapidly. This has resulted in relatively low trapping pressure on the



Gene Brehm


Location of a beaver's dam usually has more to do with a dependable local food supply than the quality of the dam site. Although traditional beaver food consists of the cambium of streamside trees, beavers have developed a taste for corn and other crops, a taste that sometimes causes problems for farmers.

beaver. Through careful management the Commission seeks to maintain a slowly expanding harvest year after year and keep damage complaints to a minimum without causing a severe decline in the state's beaver population. This can only be accomplished if the trapper exercises restraint in his harvest of individual colonies. Since a typical colony includes two adults, two yearlings, and two kits, it follows that taking two adult beaver will stop the reproductive effort of the colony.

As a general rule, one beaver can be taken from a colony every year without threatening the future of the group.

Today beaver can be found throughout their original range in Kansas, thriving on most every permanent stream that has enough timber to supply their building and food needs. A heightened sense of wildness accompanies this hardy critter wherever it takes up residence, whether on remote streams or metropolitan waterways. For this reason the return of healthy beaver populations to Kansas is good news not only to wildlife managers and trappers but to everyone who enjoys the outdoors. □

the YELLOW Pages



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WHERE HAVE ALL THE MALLARDS GONE?

by Marvin Kraft
Waterfowl Biologist

Now that the 1979-80 waterfowl hunting season is history, many hunters have been wondering what happened to the ducks, or blaming season dates for the poor hunting they experienced this past fall and winter.

Many of these sportsmen remember optimistic reports of production on the breeding grounds and a rosy fall flight forecast, only to suffer through one of the poorer waterfowl seasons in recent history. This report is an attempt to explain the poor season experienced by Kansas hunters.

As most waterfowl hunters know, the overall success of hunters in Kansas is determined more by available water than good production on the breeding grounds. Besides an optimistic fall flight forecast, much of Kansas looked as though it was primed for a banner waterfowl year last August, when Fish and Game set the 1979-80 waterfowl season.

In much of the western part of the state, rains had filled many areas which had been dry for years. Over the rest of the state, water conditions were about average, although food plant growth in and around our marshes was in good shape, much improved from the previous year.

From this point on, however, things changed. From August until late October, very little moisture fell in Kansas, while the Dakotas and other northern states received above normal rainfall. The excellent habitat conditions in these areas delayed the migration of waterfowl, and when the early migrating ducks did decide to move they overflowed Kansas and went directly to the Gulf Coast. As a result, the Dakotas, Nebraska, and Iowa, as well as the Gulf Coast states, experienced good hunting of the early ducks such as teal, wigeon, pintail, and gadwall, while Kansas hunters waited.

In late October and early November, moisture finally arrived and the hopes of Kansas waterfowl hunters for a good mallard season rose. But this time good water didn't mean good hunting. Weeks came and went, but the mallard flights didn't arrive. Discussions with biologists in the Dakotas and other northern states revealed what had happened. Most mallards and Canada geese winter as far north as food and open water are available. This year abundant water, very little snowfall, and above normal temperatures persisted well into January in states to the north of us. As a result, the mallards remained in these states, while peak numbers in Kansas during December and January were only 25 to 35 percent of what we normally expect.

† † † †

SPRING PLANTINGS BOOST BOBWHITES' WINTER WELFARE

Keeping winter's frost off the bobwhite's feathers can best be done in spring.

Hunters, landowners, and other Kansas residents concerned about winter's effects on quail can perform a real service to the birds by undertaking some simple habitat improvements during the spring.

The heaviest quail losses during any harsh winter occur in areas where cover is marginal and food supplies insufficient, say wildlife biologists. Hedgerows with sparse ground cover, grazed woodlots, or narrow grass strips become death traps when heavy snows accumulate.

Ideally, bobwhites need three habitat types to meet their needs, explains Roger Wells, wildlife biologist. The planting of a food plot will be of little value to the birds unless adequate nesting, brood-rearing, and wintering areas are nearby.

(continued)

Nesting areas for bobwhites must have some dead vegetation from the previous year's growth for nest-building materials, and should be wide enough to prevent predators from easily finding the nest, Wells said. If possible, the nesting area should be at least 50 feet wide to prevent excessive predation from nest predators such as skunks, raccoons, and coyotes. Native rangeland in good condition is one of the best types of nesting cover, Wells said. Fescue grass is one of the poorest.

Quality brood cover is equally important. Newly-hatched quail must have immediate access to large numbers of insects during their first few weeks. Cover that is full of grasshoppers and beetles and relatively free of ground litter, which impedes the small birds' movement, is ideal. Spring-burned native grass is excellent brooding habitat. Annual weeds growing in areas previously disced are also good, as are any of the legume crops.

Winter cover should contain heavy woody plants, preferably low-growing types such as plum, dogwood, and cedar, associated with grassy or annual weed areas. Grains such as milo or corn may be planted or maintained close to these woody areas for emergency food supplies.

Quail movements in winter are very limited. When the 'fall shuffle' occurs, the birds move into the best wintering areas immediately available. For that reason, it is best when all of the habitat types a bobwhite requires are close to each other. Ideally, Wells said, everything a quail needs should be within a quarter-mile area.

"When all the ingredients are within close proximity of each other, such losses as occurred last winter are less likely to be so severe and there will be more quail around for those who enjoy the company of the whistling bobwhite," Wells concluded.

Landowners and other Kansas residents can obtain more detailed information, and advice tailored to specific needs, from the Fish and Game Commission.

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SNAKE STICKUPS, ATTACK RABBITS HIGHLIGHT 1979 WILDLIFE HEADLINES

When President Carter beat off an attack by a "killer rabbit" with a canoe paddle last April, he put wildlife on page one of the nation's newspapers.

But the President's tilt with an aggressive, aquatic cottontail may not have been the most bizarre incident involving humans and wildlife last year, according to the National Wildlife Federation. 1979

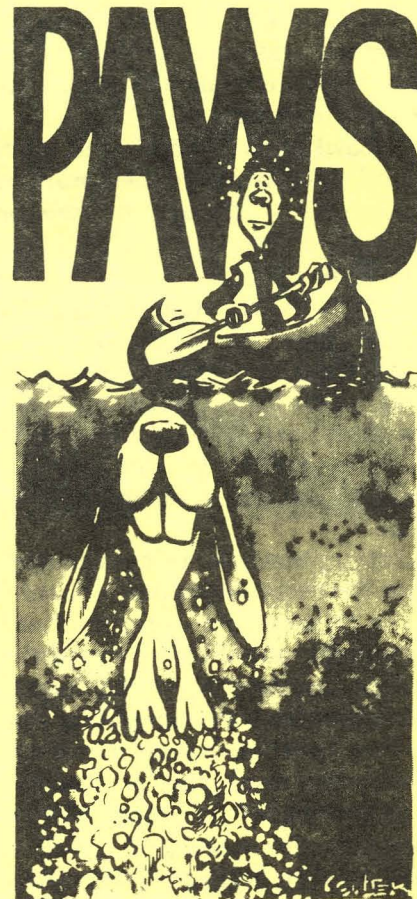
was a wild year for wildlife, the citizens conservation group found in its annual survey of such happenings — a year in which the human and animal kingdoms traded insults, and also exchanged a few favors.

Human vandals assaulted wildlife, for instance, by draining or cutting off the water supply at two fish hatcheries — killing 450,000 trout and salmon near Rochester, N.Y. and 25,000 brown trout at Leetown, W. Va. A school of fish in Lake Huron struck back by clogging a water intake for an Ontario Hydro nuclear reactor, thus shutting down the Canadian power plant for 40 hours.

A Washington, D.C., physician beat a Canada goose to death with a golf club, allegedly after the bird's honking interfered with his putting. But other doctors made up for this lapse by rendering services to wildlife beyond the call of duty.

Soviet surgeons performed a successful cataract operation by inserting an artificial lens in the eye of a seal. When the operation was over the seal performed several tricks for the doctors. Another Russian surgeon, aboard a fishing trawler, successfully treated the wounds of a dolphin that had been attacked by a blue shark, then released the happy marine mammal.

(continued)



Cartoon by William Coulter

For a black-crested night heron whose lower beak had snapped in two, a San Francisco dentist constructed a new beak out of the same pink acrylic that he uses for human dentures. He attached it with tiny wires in a six-hour operation and the heron is again spearing fish.

It was a year in which man discovered new ways to put wild critters to work, the NWF survey found. The West German city of Goppingen put some electricity-emitting goldfish into its municipal water supply to monitor its purity. If the water becomes polluted, the six *Gnathonemus* fish generate less current than usual, which sets off an alarm at the waterwork's headquarters.

In New York City the Museum of Natural History employed thousands of tiny dermestid beetles to dislodge matter from the bodies of tiny mammals without disturbing their delicate skeletal structures. And in Kailua, Hawaii, the U.S. Coast Guard revealed that it is now training eagle-eyed pigeons to search for people lost at sea.

It was again a newsy year for snakes. In Los Angeles, Calif., a man opened his door to a stranger who flashed a knife and a snake and threatened to turn the reptile loose. The thief escaped in the victim's car with \$400 in cash and jewelry.

Italian customs agents seized a boa named Pedro that an American fighter wore into a boxing ring to psych his opponent. Australian customs officers frisked a nervy traveler from Bali and impounded five pythons that he tried to smuggle into their country in his underpants and in pouches strapped to his legs.

It was also a busy year for bees. An estimated 9 million of them swarmed in on Flintstone, Md., after the tractor-trailer in which they were riding overturned. Another swarm of bees attacked hundreds of school girls at a track meet in Vereeniging, South Africa. The bees were apparently attracted by the girls' hairspray.

It was a year in which man devised some new institutions for animals, the NWF survey revealed. Bird lovers in the East German village of Loburg opened a hospital for storks, a threatened species in that country. In Sri Lanka, an orphanage was established for young elephants separated from their parents.

In Newport, Calif., a turtle named "No. 6" won a turtle race and then showed how he felt about one of man's institutions, the racing game, by latching onto the upper lip of his trainer, who sought to give him a congratulatory kiss. It took a dose of valium to unfasten his grip.

A couple of wildlife records were set. In the annual Mayor's Frog Hop at Baltimore, Md., an entry named Cindy jumped to a height of 3 feet 9 inches, outdis-

tancing one Lightfoot Louie. In San Antonio, a male whooping crane named Crip died at 33 — a record for that rare bird in captivity. And Andre, the friendly 220-pound seal who swims each year from his winter home in a Boston aquarium to his summer home at Rockport, Me., set a new record for the 160-mile course — 65 hours. Not breathtaking, to be sure, but 17 hours faster than last year's time.

Finally, it was a year in which a raccoon got caught in a drug bust. After one burglary in which narcotics were taken, a Falls Church, Va., physician trapped an intruder on a return visit to his office and found that it was — that's right — a "masked bandit" with a ringed-tail.

After being lured away from the hard stuff with peanut butter and sardines, the two-time offender was set loose in a woods several miles away for self-rehabilitation.

† † † †

IOWA LAUNCHES HABITAT PROGRAM

The Iowa Conservation Commission is planning to spend about \$100,000 annually for a period of 10 years to establish switchgrass as a warm-season native grass pasture in the state's cow-calf producing region. The effort is expected to improve mid-summer livestock grazing and increase nesting cover for pheasants and songbirds, the Wildlife Management Institute reports.

The program will be funded from proceeds of a \$3 Wildlife Habitat Stamp that all hunters and trappers must purchase. The money will be used as incentive payments to cattlemen for establishing and maintaining switchgrass in their pasture rotations. Landowners may receive up to \$50 per acre under five-year contracts.

Switchgrass is valuable to cattle because it grows well during hot periods of the year when normal cool-season grasses do not. It is valuable to wildlife because it is a natural grass that offers excellent nesting cover. The proposed grazing system involves using cool-season grasses during the early part of the year, turning the cattle into the switchgrass during the hot months (after wildlife nesting is completed), and then reverting to the other pastures in the fall. Research has shown that steers rotated in this manner averaged 74 pounds per animal more weight gain than those grazed on cool-season grasses only.

The program, developed in cooperation with the U.S. Soil Conservation Service, will be available in only seven counties for the 1980 season, but the plan

(continued)

is to include more than forty counties within ten years. The Commission hopes to establish about 1,500 acres of switchgrass annually. By demonstrating to cattlemen the economic benefits of switchgrass along with the wildlife habitat qualities, the Commission hopes to encourage large-scale, unsubsidized use of the native grass.

† † † †

WATER BANK PROGRAM EXPANDED

Congress has approved significant changes in the popular Water Bank Program, according to the Wildlife Management Institute. Established in 1970, that program authorizes the Agriculture Department to contract with and pay private landowners not to drain important wetlands and adjacent wildlife cover. Since enactment, the program has placed 503,000 acres into protective management.

Although aimed primarily at preserving migratory waterfowl nesting areas, the Water Bank serves a broad variety of other wildlife. It also contributes to flood reduction, groundwater recharge, and sediment and pollution control.

The amendments remove restrictions on the types of wetlands that can be protected under the program. They allow the Agriculture Secretary to adjust payments for contracts that have been in force for five years or more to reflect current land and crop values. They also increase the annual authorization for the program from \$10 million to \$30 million and provide that no state may receive more than 15 percent of the \$30 million authorized in any one year.

† † † †

TEACHING YOUNG ANGLERS IS THEME OF "FISHING WEEK"

More than 75 percent of adult who now fish were taught the sport before they were 12 years old, according to a survey conducted by the American Fishing Tackle Manufacturers Association. Most of those were introduced to angling by a parent or other close relative.

Teaching youngsters to fish will be a major part of AFTMA's National Fishing Week observance, May 12-18, this year. With the theme, "Take a Child Fishing," AFTMA plans to emphasize teaching youngsters to fish. Retailers will be urged to stage clinics and



demonstrations on such advanced subjects as bait and fly-casting, fly-tying, and lure-retrieval techniques.

† † † †

CHANUTE STUDENT NAMED ESSAY CONTEST WINNER

Chanute High School student Marty Greer is the winner of the Kansas Bowhunter's Association Essay Contest. Greer was awarded \$100 and a three-year subscription to Kansas Fish & Game for his essay, entitled "The Role of the Hunter in Wildlife Conservation."

Numerous other entries from prep students throughout the state followed similar themes. Second place was awarded to John Taranto, Fontana. Third place went to Richard Walters, Junction City.

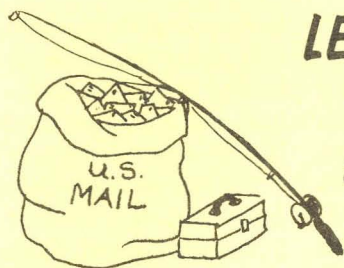
Following are excerpts from Greer's winning entry:

"The role of the hunter in wildlife conservation is to obey all game laws and to obey the rules of the landowner because it is his private property.

"There are many anti-hunters who protest the killing of animals but if a certain amount of game animals are not harvested, they may die of starvation or cause an epidemic of disease. Hunters solve a lot of these problems by harvesting some of the game animals.

"Many hunters have probably witnessed an illegal kill at one time or another. If you see someone poaching while hunting or driving around, use the nearest telephone or, if you have a CB radio, turn to channel five and call for a game warden to report the incident. This not only helps stop the poacher but it will make you feel better knowing that you helped in keeping the hunting laws as they are and in turn will keep hunting much more enjoyable for everybody."

† † † †



LETTERS to the EDITOR

PARK ISSUE IS PRESERVATION

I read the letter you published in the November/December issue titled "Prairie Park Rebuttal" by Jim Hess. I feel the letter would have been more appropriately titled "Personal Vendetta." I am sorry Mr. Hess felt compelled to resort to such abuse when the issue is not really of a personal nature.

The issue at hand is whether there will be preservation of our national prairie heritage. The proposal for the establishment of a Tallgrass Prairie National Reserve introduced into Congress by Rep. Larry Winn does not call for the condemnation or taking away of privately owned land. To the contrary, it provides for the passage of privately owned land from generation to generation and in the event a landowner wants to sell his land the federal government is allowed the first right to buy it at his price. If the proposal called for the taking away by condemnation of privately owned land I could see there being a personal nature to the issue. As a private landowner I would view any effort to take land away from me very personally. On the other hand, should I decide to sell it there would be quite a different feeling.

As a private landowner I am aware of the fact that our current knowledge of land usage does not allow us to economically maintain a natural-occurring situ-

ation or ecosystem. That is, if we are required to produce an income from our land we must change it. Unless a sufficient amount of an ecosystem is preserved we may never have the opportunity to gain the knowledge necessary to prevent us from destroying it.

We all know that if the Flint Hills could have been plowed it would have been . . . many years ago. We also must remember that the plow is not the only way to destroy or change a natural-occurring situation. With modern technology what it is, or what it may be in the future, who knows what may lay ahead for the Flint Hills?

Any one professing a need for the preservation of our prairie heritage as Mr. Hess does should seriously consider the alternatives and not resort to taking "pot shots" at those actively seeking that preservation.

George Gates
Prairie Village

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TOASTY TOES

In your "Staying Warm" story in the January/February issue you mentioned a fisherman having a pair of "bunny boots" and he said they were the warmest pair of boots he'd ever worn. Well, I have a pair of these "bunny boots" and I also think they are the warmest pair of boots I've worn, too. One of my boots has a hole in the sole of it. The boot still

keeps air in it for awhile. When the air leaks out, it still keeps my feet warm. These boots are also the lightest pair I have.

Kerry Gage
Salina

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LIKES LONG SEASON

I want to thank you again for the long bird season extending into January. I have been hunting pheasants in Kansas for over 30 years and have enjoyed them all.

I have become one of those "dyed-in-the-wool" hunters since I got my first bird dog about 15 years ago. Now I keep a kennel with four Brittany spaniels (two retired) and it is always such a joy to see them hunt, pitting their instincts against nature.

Also, there is the great privilege of hunting such as I did the last day of the season in walking about six miles through a six-inch snow and ten-degree temperatures, following two dogs, and finally coming up with four wily pheasants. It was great fun and seems to make a \$600 dog food bill, veterinary bills, insulated clothing, shotgun shells, gas, etc. all worthwhile.

I know that you fellows receive a lot of "flak" about the length of seasons, game bird populations, guns, etc. but hang in there. I do when populations are down and I hunt several hours looking for that one cock pheasant, hoping my dogs are able to handle him and I'm able to shoot when the bird gets up. That's hunting. Also, I have seen plenty of cold weather, deep snows to walk in, stuck in the mud, sick dogs, best dog you ever had poisoned to death by a farmer poisoning coyotes, being chased out of stubble fields by a farmer that doesn't even own the field or farm it, etc. That's hunting, too.

(continued)

Keep up the good work to make hunting one of life's enjoyable experiences. The stories are good for a lifetime.

**Roland Hoffman
Goodland**

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APPRECIATIVE HUNTER- LANDOWNER

It was another great upland game bird season in Kansas. I am both a hunter and a landowner interested in wildlife, and I support the length of the present seasons. I also support, encourage, and practice land management that provides and improves habitat, as many others are now doing.

We often take a lot for granted, but once in a while do pause to say thanks to someone for a well-done job. Thus, I say "thank-you" to the entire body of Fish and Game employees. You continue to make Kansas a better place to live. Your efforts are appreciated.

**Leo C. Bird
Stockton**

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HOMESICK NATIVE

I enclose my check to add three years to my present subscription. Surely this must be one of the best bargains in magazines anywhere, especially to an old Kansan whose roots remain deep even after a nearly 40-year absence. I find the subjects of the articles very appealing and the quality of the writing is most impressive.

You encourage me to come back and explore my home state. Your magazine has brought the realization that even though I lived in Holton and Lawrence for

35 years, I am familiar only with a relatively small part of the state.

It is most heartening to find that Kansas now has a program of wildlife management in the hands of competent personnel after so many years of backwardness. That past "backwardness" could apply to almost any state, with a few exceptions. Probably the most gratifying aspect of the situation is that nationwide we are managing our wildlife resources so much more intelligently than in the past.

I hope that you and all of the people in Kansas will keep up the good work.

**Robert F. Wallace
Pullman, Washington**

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ONE YEAR AT A TIME

I am nearing my eighty-seventh birthday, and am renewing my Kansas Fish and Game subscription for one year. But I may fool you and be around to renew it a few more times.

I am in the mood to reminisce a bit about what it was like before men and their bulldozers started altering nature's original plans. Being born on a farm in Nemaha County, I have always loved water. There was a small stream that ran through the center of our farm. It was just as God made it, winding its way with ripples and holes in every bend. All the other streams then were the same as nature made them.

That is where I learned to love to fish and, after eighty years, somewhere in the corner of my brain is the memory of the first fish I caught. (Now I have trouble remembering where I put something yesterday!)

My equipment consisted of a crooked stick, a cord string, a

bent pin with a worm on it. The fish must have been about five inches long and had scales. I ran home and wanted mother to cook it, but didn't have any luck.

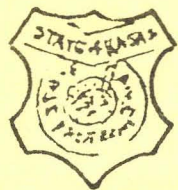
At age ten, my family left the farm and the rest of my years have been spent in Jackson and Shawnee counties. I have been retired for twenty-three years, and have traveled to all corners of the United States. I never cross a bridge that I don't stick my neck out to see if it looks like good fishing.

In my younger days, I used to prefer following the streams and luring a few channel cats with my fly rod. But the creek banks seemed to get steeper and steeper. So now my two buddies and I take our chairs out to the lake and let the fish hunt us!

We do not know how much longer we can do this, but will keep reading your magazine and do a little dreaming.

**Philip R. Long
Topeka**





It's The Law.

Four Wichita men paid a total of \$1,646 in fines and court costs for illegally taking a pair of deer during closed season. The four — Billy Braddy, Jr., Bill Leek, Ronald R. Miller, and Charles Holt — were charged after a lengthy investigation stemming from a witness's telephone call to Fish and Game Director Jerry Conley. The incident occurred in Fall River Wildlife Management Area in Greenwood County.

Greenwood County Magistrate Judge Harriet Shumard also revoked their hunting licenses and assessed suspended jail sentences for the four men.

— In Riley County District Court, Manhattan resident Robert G. Sugg was fined \$300, sentenced to six months in jail, and placed on one year probation for taking a deer without a valid permit.

— Donald D. Garman, Rose Hill, was fined \$500 plus costs and sentenced to 30 days in jail for hunting on private property without permission and failing to wear hunter orange or red while deer hunting. Garman was paroled upon payment of \$100 and costs in Sedgwick County District Court.

— John M. Nodine, Leoti, and Melvin L. Schwindt, Dodge City, paid a total of \$830 in fines and costs for illegally taking two pronghorn antelope. The two men were charged in Wichita County District Court.

— Gregory E. Pate, Esbon, was fined \$200, sentenced to 30 days in jail, and placed on probation for six months on a charge of illegally taking deer. The offense occurred in Jewell County.

— Lawrence P. Jones, Jr., Denver, Colo., paid \$225 and costs for making false representation to secure a Kansas resident hunting license and hunting without a valid license. Jones was charged in Gove County District Court.

— Leon O'Dell, White City, was fined a total of \$550 and sentenced to six months in jail for illegally taking a deer in Dickinson County and using artificial lights to hunt game. The defendant was paroled from the jail sentence for two years on payment of the fine and costs.

FEDERAL PROPOSAL WOULD BOOST FUNDING TO STATES

Funding for Kansas Fish and Game's sport fishing management efforts would be increased 500 percent if proposed federal legislation becomes law.

A proposed amendment to add about \$100 million a year nationwide could provide a tremendous boost for Kansas fishermen, says Cal Groen, chief of Fish and Game's fisheries division. The amendment would expand funding under the Dingell-Johnson Act of 1950 by adding a three percent manufacturer's excise tax on most recreational boats, motors, and trailers. Kayaks, sailboats, hydroplanes, and boats longer than 25 feet would be excluded.

Currently, D-J funds come from a 10 percent tax on sport fishing equipment. The funds are redistributed to states by the federal government on a 75-25 matching basis. Kansas' share in fiscal year 1979 was around \$400,000. The expanded funding would boost Kansas' share of the funds to about \$2 million annually.

"This money is desperately needed to meet future demands," Groen said. "Along with increasing operational costs, there are more and more anglers adding to the fishing pressure in our state."

Groen said the bill would provide needed funds for lake improvements, fisherman access development, fisheries management and research, new lakes, and fish hatchery improvements.

1980 RESERVOIR FISHING FORECAST

While there are many factors affecting fishing success, the chart below provides general prospects for fishing at each of 22 reservoirs in the state. The information is based on predictions made during the past winter from biological sampling of fish populations in the state's reservoirs. During the fishing season, anglers are encouraged to watch local newspapers, radio, and television broadcasts for weekly updates of fishing conditions throughout the state.

NORTHCENTRAL REGION

Reservoir	White Bass	Crappie	Walleye	Channel Cat	Largemouth Bass	Striped Bass	Flathead
Lovewell	Fair	Poor	Good	Good	Poor	None	Fair
Milford	Good	Fair	Good	Excellent	Fair	Fair	Good
Glen Elder	Good	Good	Good	Excellent	Fair	Fair	Poor
Wilson	Good	Poor	Good	Good	Fair	Fair	Poor
Kanopolis	Good	Good	Good	Good	Poor	None	Fair

NORTHEAST REGION

Tuttle Creek	Good	Good	Fair	Good	Poor	Poor	Good
Clinton	Poor	Excellent	Good	Excellent	Excellent	Poor	Poor
Melvorn	Good	Good	Excellent	Good	Excellent	None	Fair
Pomona	Excellent	Good	Good	Good	Fair	None	Fair
Perry	Good	Excellent	Fair	Excellent	Fair	None	Fair

SOUTHCENTRAL REGION

Council Grove	Fair	Good	Good	Good	Poor	None	Good
Marion	Good	Fair	Excellent	Good	Poor	None	Fair
Fall River	Good	Excellent	Poor	Excellent	Poor	None	Fair
Toronto	Fair	Good	Poor	Good	Poor	None	Good
Cheney	Excellent	Poor	Good	Excellent	Poor	Excellent	Poor

SOUTHEAST REGION

LaCygne	None	Excellent	Poor	Excellent	Fair	Poor	Poor
John Redmond	Excellent	Good	Fair	Excellent	Poor	None	Excellent
Elk City	Good	Good	Poor	Good	Fair	None	Excellent

WEST REGION

Kirwin	Fair	Fair	Good	Good	Fair	None	Good
Webster	None	Excellent	Excellent	Good	Good	Good	Excellent
Norton	None	Good	Fair	Good	Excellent	None	None
Cedar Bluff	Good	Fair	Good	Good	Poor	Poor	Good

Waders, beachcombers, prairie nesters, the diverse hoard of stick-legged migrants that are . . .

Kansas' Shorebirds

Marvin Schwilling

Illustrated by Susan Southwick

Shorebirds are a diverse lot. Their variations in food and habitat needs and preferences permit them to fill many wildlife habitat niches in water, marsh and terrestrial habitats. Migration patterns and the timing of migration are also species specific, permitting overlapping habitat usage. They are known by many local common names, some call them “peeps” and “snipes.” Others classify them more carefully—long-legged snipe, short-legged snipe, yellow-legged snipe, long-billed snipe, short-billed snipe, and others. Regardless of common and local names, they're all shorebirds and Kansas is host to tens of thousands of them during the spring and fall migration periods.

Just what is a “shorebird”? For purposes here a shorebird is the American counterpart of the British term “wader”—a group that consists mainly of sandpipers and plovers but also includes woodcock, snipe, curlews, godwits, avocets, stilts and phalaropes. The list runs to forty species in Kansas.

With the possible exception of the killdeer and the common snipe, shorebirds migrate out of the plains for the winter. Some, like the woodcock, go only as far as the Gulf coast; many more push on into Central and northern South America with most of the rest of the continent's migratory birds.

A few make grander pilgrimages. Grassland species like the curlews and upland sandpipers retire to the prairies of Argentina for the winter. The golden plover flies a huge loop from the Argentine, proceeding north

through the North American plains in the spring, then back along the coast of Labrador and New England in the fall. The greater yellowlegs goes as far as the Straits of Magellan to wait for spring.

These annual trips must be hurried to cover so much ground. One researcher banded a lesser yellowlegs and had the band recovered seven days later 1800 miles away, a daily average of 266 miles. A similar record for the turnstone indicated an average daily flight of 460 miles a day. These birds may have covered the distances between banding and recovery much more quickly; no one can know for sure. But even at these average rates, they are doing some hard traveling.

Undoubtedly shorebirds in transition spring and fall plumage—and this is when they most often occur in Kansas—are among the most difficult birds to identify in the field.

Not until Dr. Roger Tory Peterson published his first colorful *Field Guide to the Birds*, which was a new concept for bird identification that pointed out characteristic field marks for individual species and seasonal plumages, was it relatively easy to identify any bird found in the field.

These field guides allow outdoors-people to check individual traits or plumage marks which separate each kind of shorebirds. However, even with the help of these guides, shorebird identification is still not easy in Kansas. We see most of them only during their migration periods when they sing little and are in a

transition or changing plumage that often shows coloration and patterns that differ from what is shown in the guides. Generally speaking, most species of shorebirds are brown or blackish on the backs, mottled and streaked with buff or whitish below.

Most prefer mollusks, crustaceans, and insects for food, found in or on the mud flats or along the moist marsh and wet grassland habitat.

Although a few species nest in trees, and these usually in abandoned nests built by other bird species, most nest on the ground. They lay four pointed and heavily blotched eggs. The eggs blend in well with the background of scantily built nests. The young are precocial, being able to run and feed themselves almost as soon as they have struggled free of the shell.

The forty species known to Kansas are all individually fascinating. Their numbers at the peak of migration often exceed a million birds. Individual flocks exceeding 150,000 birds are normal when habitat conditions are favorable for their use.

During the height of the shorebird migration at the Cheyenne Bottoms Wildlife Area, flocks of as many as 200,000 dowitchers, 75,000 white-rumped sandpipers, 10,000 stilt sandpipers, 25,000 least sandpipers, 100,000 semi-palmated sandpipers, 500 Hudsonian godwits, 20,000 yellowlegs and 1,000 sanderlings are not uncommon, and the list goes on.

Cheyenne Bottoms and Quivira National Wildlife Refuge are probably the most heavily used shorebird habitat in central Kansas because of their shallow water and extensive mud. When water levels are low enough to expose expanses of mud in Kansas reservoirs, they also attract an impressive number of shorebirds.

Ten species are known to nest in Kansas—the killdeer, upland sandpipers, avocet, black-necked stilt, long-billed curlew, Wilson phalarope, snowy plover, spotted sandpiper, mountain plover and woodcock. Only the killdeer and upland sandpiper are considered common nesters.

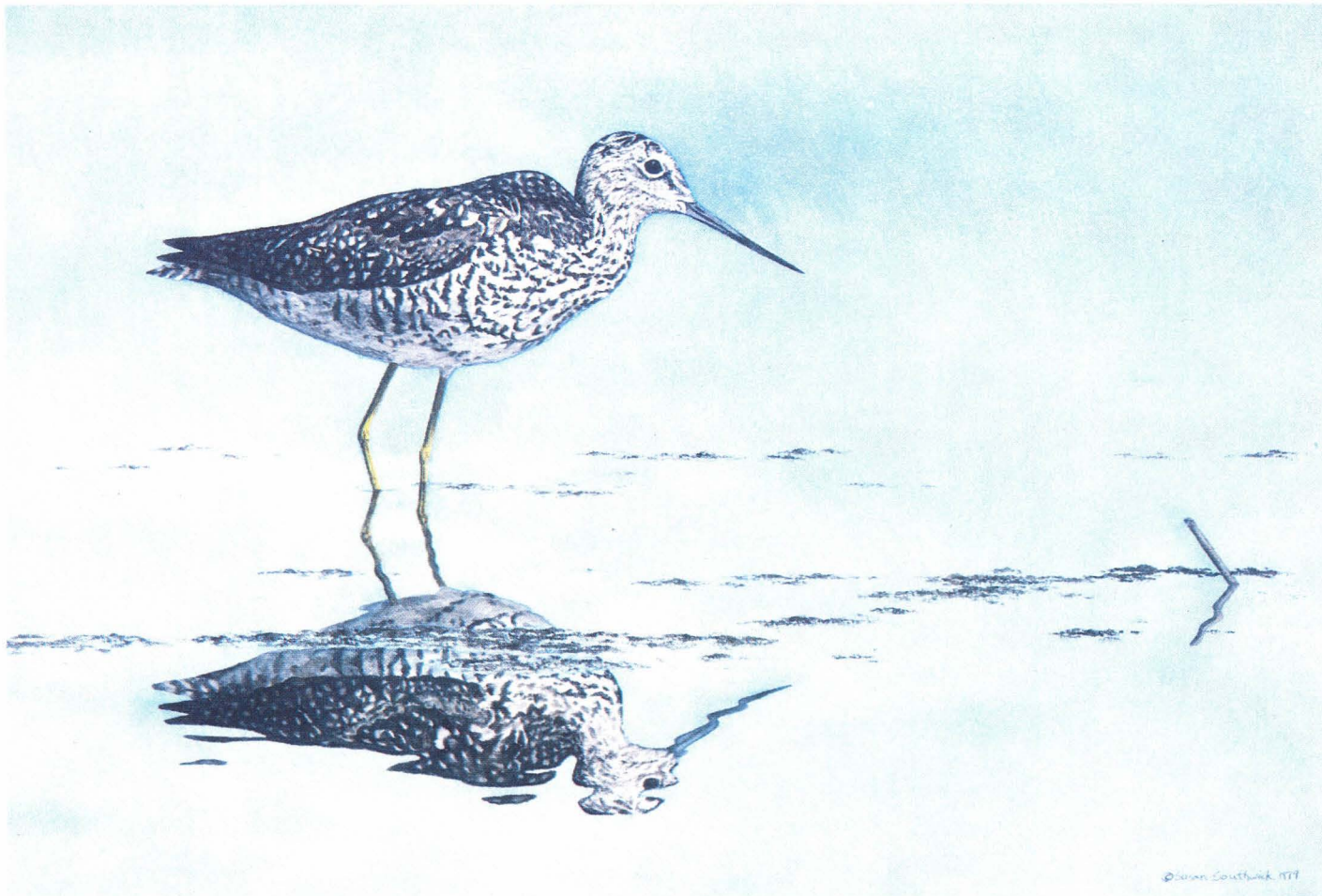
The killdeer, more accurately killdeer plover, is the best known of the Kansas shorebirds and gets its name from its familiar “killdeer” call. It is not a dedicated wader or always a water bird. It may be found in open or plowed fields far from water. Killdeer sometimes nest and rear their young along roadsides or in bare fields.

The nest is a simple scratched-out saucer, in typical shorebird style, often lined with stones, pebbles or short bits of sticks depending on what is handy at the nest site. If the incubating bird is flushed from the nest, she resorts to a convincing crippled-bird-and-broken-wing act, fluttering away dragging a wing while flashing the normally concealed orange brown rump patch, almost rolling over, or stopping to gasp and pant as if totally exhausted. The male soon joins in, circling close, scolding and doing his bit to drive the intruder away from the nest.

Like the killdeer, upland sandpipers are not always







found near water. They are basically grassland pasture birds frequenting water edges consistently only during migration. They are friendly prairie birds well known to the Kansas cowboys as the “wolf-whistle” birds. They are as much a part of the pastures of Kansas as the meadowlark, the prairie chicken or the horned lark, whether in the flint hills or the sandhills. The three-syllable whistle or wolf-whistle call of the upland sandpiper is first heard on the prairie about Easter time each year and continues until late September.

Avocets have long been common migrants through the state. I was privileged to be able to report the first nesting in Kansas. This was near the Pronghorn Lake area north of Garden City in the spring of 1952. Since the time, avocets have become quite common local nesting birds at Cheyenne Bottoms and Quivira. Avocets are colorful chestnut, brown-headed, black-winged and white-bodied birds, with long legs, and upturned long bills that they sweep back and forth while they feed on insect larvae as they wade in shallow water.

Black-necked stilts are rare residents here. They are large, long, red-legged and have a striking white pat-

tern—birds that are seldom overlooked. This species is normally found west of Kansas.

Dr. N. S. Goss in his *Revised Catalog of the Birds of Kansas* (1886) stated that they probably nested in southwestern Kansas. However, the first documented indication that nesting did occur was in 1974 when I observed two adult black-necked stilts with three fledged young on August 10 and 11. In 1976, Ed Martinez of Great Bend reported observing flightless young with adults in Marsh Pool 1 at Cheyenne Bottoms. Larry Veikley reported the first observed nest at the Quivira National Wildlife Refuge also in 1976 but the nest was destroyed before egg laying was complete.

Finally on June 19, 1978, Bob Bartels found a black-necked stilt's nest on Quivira's Big Salt Marsh. On June 28, he observed three pairs of stilts of which two pairs had four young each. This year, the birds have again nested at Quivira; on June 2, I observed two pairs and photographed one nest containing four eggs. Thus it appears that the black-necked stilt has established itself as a regular nesting bird in that area.

The friendly small snowy plover is a migrant and irregular summer resident on suitable available habi-



tat. They are known to nest in Barton, Clark, Comanche, Finney, Meade, and Stafford counties; probably also in Scott, Rooks and Trego. As records accumulate, we will probably find that the snowy plover nest irregularly on most of the salt or bare sand areas in at least the southwest quarter of Kansas. Mark Ports reported a colony of about nine pairs of nesting snowy plovers along the Cimarron River on June 21, 1979, in Meade County. By far the largest nesting population in Kansas is at Quivira's Big Salt Marsh and numbers to several hundred pairs.

Woodcock too have long been known to nest in eastern Kansas. Small young were reported on May 28, 1874 by Dr. N. S. Goss. No further recorded records are known until 1958 when they were believed to have nested in Douglas County. Since about 1970, a considerable number of nest records have accumulated widespread through eastern Kansas including Woodson, Coffey, Lyon and Chase counties. They are very secretive nesters so seem to often be overlooked by outdoors people.

Despite the fact that many other shorebirds are called snipe, the Wilson snipe is the only snipe to be

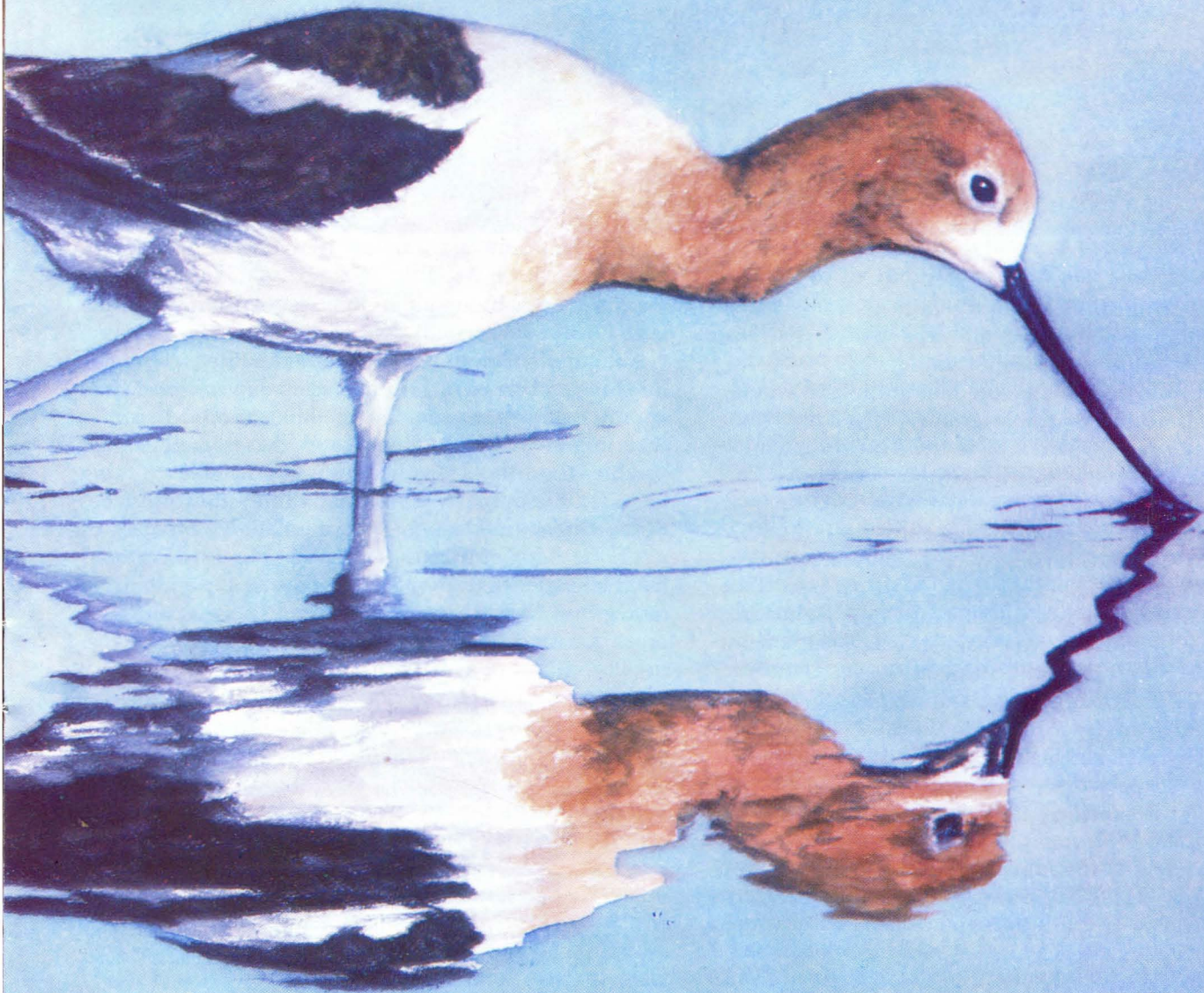
found in all of North America. Snipe and woodcock are the only shorebirds that are still hunted as game birds. Nearly all were hunted during the much publicized "market hunting" days.

Among the most popular were the golden plover, the long-billed and Eskimo curlews, yellowlegs, willet, and upland sandpiper. An observer on a plover hunt in Louisiana in the spring of 1821 estimated that 200 gunners in one field killed 48,000 golden plover in a single day.

Another nineteenth century report from Nebraska had hunters filling wagons with Eskimo curlews and even dumping those wagons to refill them from the seemingly infinite flocks. One shooter bragged of killing twenty-eight birds with a single shot. Many of the shorebirds decoyed as well as ducks and even responded to calls. Some sportsmen took their shooting quite seriously, assembling spreads of mixed decoys. These conservation-minded hunters decried extreme examples of waste, but there was demand for many of the shorebirds in the city markets so the slaughter continued until some species approached the brink of extinction. The Eskimo curlew was probably dealt a



American avocet





fatal blow during this period, a victim of a combination of economic incentive and the belief that no human effort could dent such abundance.

All shorebirds except the common snipe and woodcock were protected by the Migratory Bird Treaty Act in 1918. Later on, the drought of the Thirties affected the snipe so severely that the season was closed for thirteen years beginning in 1941.

The snipe has recovered dramatically from the loss of habitat it suffered during the Dust Bowl. Nimrods who hunt the bird hold him in high esteem. The strangest part of the old snipe-hunting prank is the idea that they can be caught with a bag—taking a snipe with a shotgun is tough enough! Snipe are never found in flocks, usually flushing from short grass or rushes around a marsh edge as singles or doubles. They often flush wild, flying a zig-zag pattern close to the ground, uttering a “scape-scape” sound as they go, almost appearing to be mocking the hunters with the words “e-scape-e-scape.”

Woodcock have habits that are similar in many ways to snipe. They do not flock in migration, flush wild, fly fast and travel an erratic zig-zag pattern. Their unusual speed and flight patterns are probably the major reasons woodcock and Wilson snipe have been able to

maintain their numbers and persist as huntable game species.

Among all shorebirds, the reproductive potential—one brood of three or four per year—is very low when compared to other game birds, thus shorebird species that migrate in large flocks and decoy well cannot produce the annual surplus necessary to offset hunting harvest. By comparison, the bobwhite quail produces three to four times as many young.

This is barely an introduction to shorebirds—books have been written about the group or individuals in this group. Spend some time with them when they cross Kansas. I’m sure you’ll find them fascinating.

Marvin Schwilling, the Fish and Game Commission’s nongame and endangered species biologist, is intimately acquainted with Kansas shorebirds. A past president of the Kansas Ornithological Society, Marvin managed the Cheyenne Bottoms Wildlife Area, one of the state’s richest shorebird areas, for fifteen years during his tenure as waterfowl biologist.

Susan Southwick is a native of southwestern Minnesota. She comes by her interest in the outdoors honestly since her father was a regional wildlife manager for the state of Minnesota. She combines her interest in art with training in biology and experience as a hunter. Many of her watercolors are based on her own photographic studies of wildlife. She has shown her work all over the Midwest and has won many art show awards in her home state.

The Wiper, Best of Two Worlds

Steve Price

Illustrated by Jenny Thayer

In this age of modern technology, almost nothing is impossible. Scientists, through DNA transplants, now have the ability to create totally new living organisms, creatures never before known to exist on earth. Other areas of genetic research have resulted in alterations or modifications of existing species. An immense amount of work is being done to create intermediate organisms—creatures that are characteristic of two or more naturally occurring species. These are the hybrids.

Hybridization is nothing new. It has been going on in the wild since the beginning of time, and men have been studying the process since Gregor Mendel first became involved with the science of genetics in 1865. It is an area that seems to grow in complexity and extent as time progresses and research persists.

The incorporation of hybrid fishes in fishery science is becoming increasingly popular. Hybrid fishes often possess many desirable characteristics. For instance, hybrids tend to be highly adaptable, grow rapidly, and are extremely vigorous and aggressive. These characteristics, among others, make hybrid fishes very appealing for introduction into a wide variety of aquatic situations.

In 1965-66, a new fish was created and later introduced into a number of impoundments across the nation. The new fish was not a product of a natural cross. It was the result of a dream and carefully laid

plans for its creation. This new fish is currently being employed by the Kansas Fish and Game Commission to supplement angler opportunities in three Kansas reservoirs and is known as the wiper. Wipers are the offspring of male white bass and female striped bass. They are intermediate in characteristics of the two parental species, appear to be very aggressive and are capable of attaining trophy size.

Field identification of the wiper is not particularly easy. Anyone who has compared a small striper with a small white bass will know it takes more than a single glance to distinguish the two and the hybrid can easily be mistaken for either parental species. The wiper has the deep, flat body, small head and distinct back-arch of the white bass and the dark bluish-gray and silver body coloration and distinct stripes (frequently broken) of the striped bass. At first observation, it appears that the presence of broken horizontal lines along the length of the hybrid's body could serve as a positive means of identification. However, often times the striped bass, and the white bass also, exhibit this characteristic.

One of the better methods of identification involves the following process of elimination. First examine the teeth on the tongue of the fish. White bass have a single patch of teeth, either rounded or heart shaped, which is not clearly separated. Striped bass and hybrids exhibit

two separate, elongated patches of teeth near the center of the tongue which in larger individuals are usually divided by a space equal to or greater than the width of a single patch of teeth. With larger individuals, general appearance should be sufficient to distinguish the striped bass from the hybrid—the striped bass being long and streamlined and the hybrid showing the distinct hump-back characteristic. However, a body length to body depth ratio can be used when general appearance seems inadequate. First, measure the fork length of the fish (distance from the point at which the tail begins to fork to the tip of the snout) and the body depth (distance from the outermost edge of the back to the outermost edge of the belly running perpendicular to the length and beginning at the forward base of the dorsal fin). If the fork length to body depth ratio is less than four and your measurements are accurate, you probably have a wiper.

The quest for a large predator that would use the abundant gizzard shad and provide the angler with the opportunity to set hooks to fish of trophy size has been the driving force responsible for striped bass and wiper stocking efforts in Kansas reservoirs. Which fish is best suited for achieving the goals? This is a tough question to answer and depends on a number of characteristics of the individual reservoir in question.

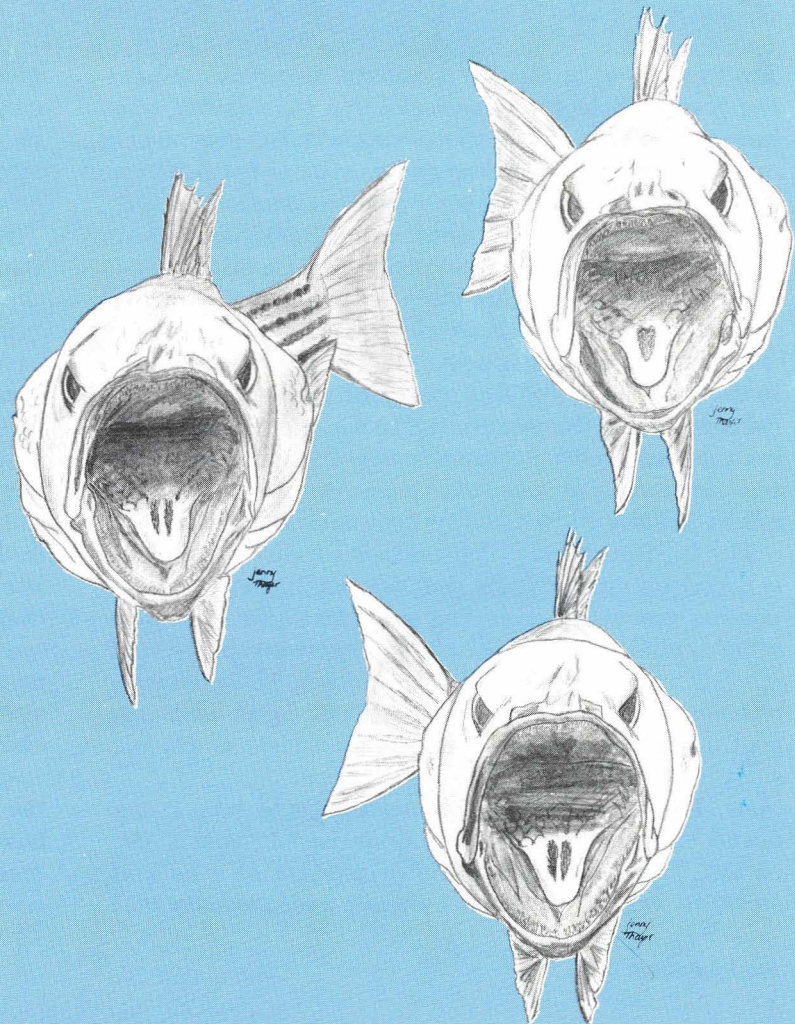
There is evidence that wipers are able to survive in a wider variety of freshwater habitat types than are striped bass. Also, hybrids tend to grow faster than stripers during the early years of life and are easier to catch than stripers, due to their extreme vigor and aggressiveness. Feeding habits of the two are very similar. Both the stripers and the hybrids sustain themselves on a diet of primarily gizzard shad, whenever shad are available. Various invertebrates such as crayfish and aquatic insects are also fairly common food items. Hybrids, however, eat forage fish other than shad. In Florida, juvenile hybrids stocked in an eight-acre bass-bluegill pond without shad reached a size of eight pounds in four years. Another hybrid population was sustained on a diet of carp and goldfish.

A great deal of work has also been done with the reciprocal cross (male striped bass X female white bass). Initial efforts produced undesirable results. The small size of the hybrid at hatching, frequent deformities and lack of available food were problems that since have been conquered through revised culture techniques. To date, this male striper/female white hybrid has not been introduced into Kansas waters. Wipers, however, have been stocked in three impoundments in Kansas and appear to be doing well.

The White Bass At maturity, the white bass is the smallest of the three fish shown here, but size is of little use as a distinguishing characteristic where young stripers and wipers are mixed with whites. The white bass is the only one of the three with a single row of teeth on the tongue. In addition, the white bass is a deep-bodied fish, less streamlined than either of its brethren.

The Striped Bass The striped bass is a saltwater native, more streamlined and much larger than the white. Stripers over thirty pounds aren't uncommon in Kansas, and the national freshwater record is more than seventy pounds. Small stripers can be distinguished from white bass by their torpedo shape, the prominent lateral stripes down the flank, and the two rows of teeth on the tongue.

The Wiper The hybrid wiper shares characteristics of both the striped and white bass. The wiper has two rows of teeth on its tongue, unlike the white. It is usually less streamlined than a striper; the ratio of the wiper's body length to its depth is more than four to one. If the ratio is less than that, the fish is a striper. Experience from other states with wiper programs indicates that this hybrid inherits the striper's ferocious feeding habits.



Lovewell, Marion and Norton Reservoirs all contain wipers. Fish that were stocked in Norton Reservoir in 1977 are currently averaging fifteen to eighteen inches in length. They are capable of attaining trophy size and can reproduce naturally. Whether or not hybrids will be able to reproduce successfully in Kansas reservoirs awaits to be seen. Hybrid spawning runs have been documented in other areas of the United States. In most cases, hybrids migrated upriver during the annual white bass run. To my knowledge, spawning efforts by hybrid bass have resulted in very few offspring. Generally, when natural reproduction by hybrid fishes does occur, offspring tend to revert to the original parental species and thereby lose their hybrid characteristics. It is interesting to note however, that some hybrid fishes can reproduce naturally without reversion. The splake (male lake trout X female brook trout), which has been stocked in the Great Lakes, is an excellent example of this phenomenon. The splake is one hybrid fish that breeds true and therefore is very nearly equivalent to a totally new species of fish. Wipers will probably not breed true and may not reproduce at all in Kansas waters. Most likely, populations of wipers will have to be maintained through Fish and Game Commission stocking efforts.

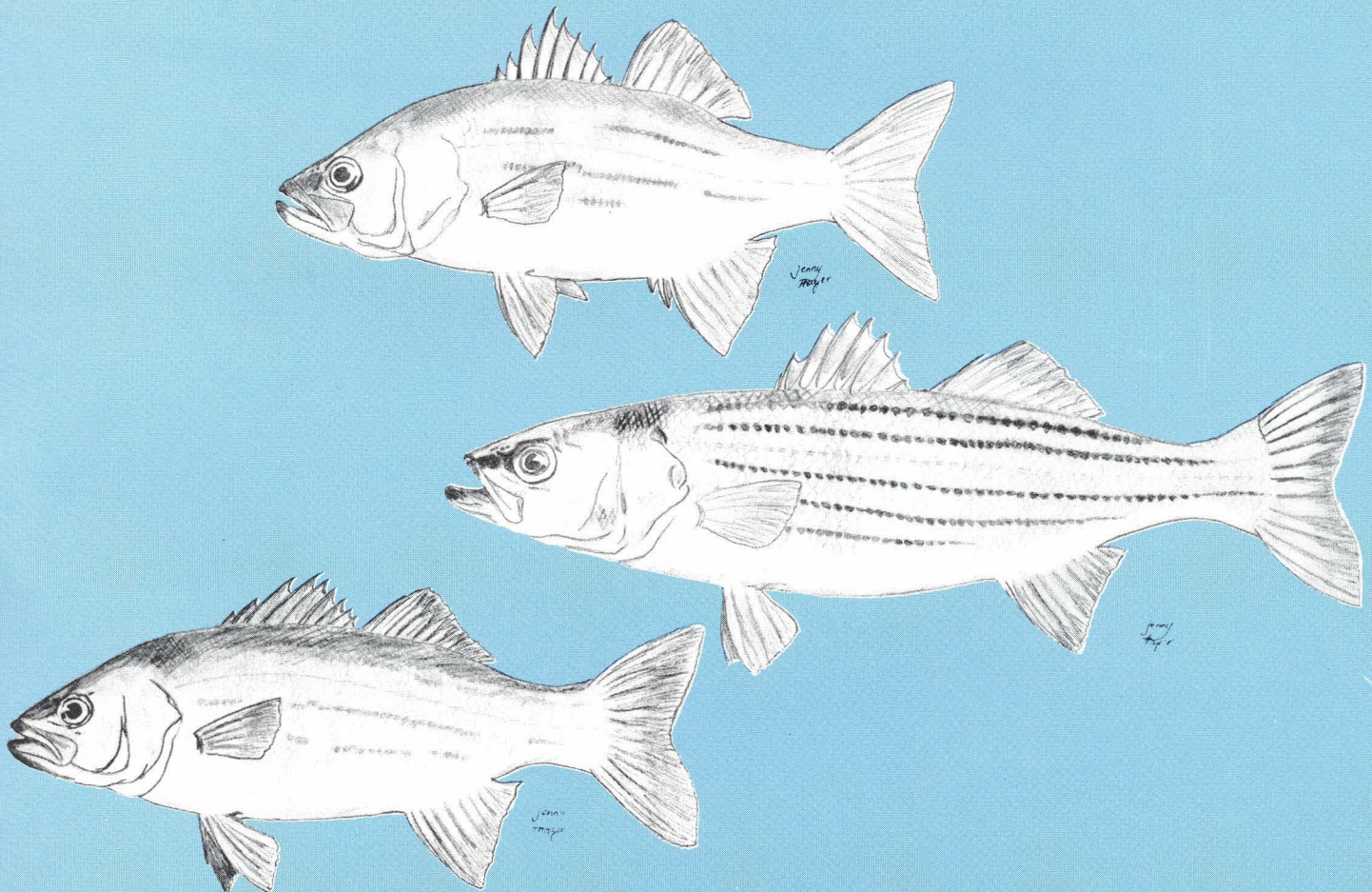
At present there is no size or creel limit on wipers in

Kansas. Fishermen can legally keep every hybrid they catch. However, releasing those small ones now will help to sustain the populations and provide for a trophy fishery in just a few years. When feeding, wipers will readily strike jigs, minnows, various crank baits and shad imitations and put up one heck of a battle. In the spring, they prefer open water areas near rocky shorelines, particularly along the dams of reservoirs. They tend to travel in schools so if you catch one, continue casting to the same area and you're liable to really get into them. During the summer months, try fishing the mudflats with live baits. Worms stillfished on the bottom work best.

Anglers have been known to go to great pains and travel long distances for the opportunity to test their skills against fish foreign to their normal creel. Fishing for an unfamiliar game fish is always an exciting challenge. Kansas anglers have the opportunity of accepting the challenge and do not need an out-of-state fishing license to do it. The challenger is the wiper. Try him; you might be surprised what that ferocious bundle of muscle can do.

Steve Price is the Fish and Game Commission's fisheries biologist in Stockton.

Jenny Thayer is a YACC employee in the Stockton Fish and Game office. She specializes in pencil sketches of a broad range of wildlife species.



Whitefronts: the geese no one knew

Chris Madson



A reasonably experienced waterfowler anywhere in the United States will probably have seen snow geese sometime in his career, and he is likely to have taken a shot at one of a dozen races of Canada goose. But if, in the flow of casual conversation, he mentions the whitefront, he's immediately told you two things about himself: he's a westerner, and he spends a lot of time on the marsh.

For the whitefront is an uncommon goose. He's a bird of the Central and Pacific flyways, seldom found east of the Mississippi and only locally abundant even in the West. While there are 1.4 million lesser snow geese on the plains and west coast every fall and more than half a million Canadas, the continental population of whitefronts is little more than 200,000, and they generally move down to their wintering grounds with the speed of an Arctic cold front. With this combination of blitzkrieg migration and relatively small numbers, the main whitefront flocks can slip past many western waterfowlers in a week or less and be

long gone before the word of their arrival gets out. Only the few hunters who give up job and family for an unbroken November in the cattails are likely to get a crack at them or even recognize them as they pass.

This lack of notoriety may be part of the reason the whitefront was neglected for so many years by biologists. For years, most states' regulations lumped the whitefront with the Canada goose because no one knew anything about the whitefront except that he showed up in small groups among the early flights of honkers, laughing over the lower-voiced Canadas in the flock.

The first extensive whitefront research was spurred by the discovery in the late Fifties that the Central Flyway flock wintering in Texas was declining. The scramble for information focused on the Yukon-Kuskokwim Delta region in southwest Alaska, a piece of real estate half the size of Wisconsin, one of the richest waterfowl production areas on the continent, and one of the few places where large numbers of breeding

whitefronts had been observed.

Banding work on the Yukon Delta and eastward to Hudson Bay have shown that there are two major groups of North American whitefronts. Nearly all the southwest Alaskan birds migrate down the Pacific Flyway to wintering grounds in central California. Central Flyway whitefronts nest in a broad band through Alaska and most of northwestern Canada within a hundred miles or so of the Arctic Ocean.

The Arctic is a surprisingly benign nesting environment in most years. The vegetation that lies dormant for nine months out of the year takes advantage of the brief summer and long days to grow almost non-stop. Insects and other invertebrates in the region also feed and reproduce prodigiously. Waterfowl that breed on the tundra depend on this intense productivity to support the heavy physical demands of egg-laying and molting.

Other geese join the whitefront in the Arctic. Greater and lesser snow geese, the small cackling goose (a subspecies of the Canada), a few larger Canadas, brant, and emperor geese all do most of their breeding in the far north, each species taking advantage of a unique

nest. Mated pairs usually start their clutches in stands of tall sedge or the dwarf willow that grows on higher tundra which, combined with the fact that their population is spread over half the Arctic during breeding season, makes their nests nearly impossible for predators (or researchers) to find. As a result, whitefronts have an unusually high hatching and gosling survival rate. Nesting success for the black brant on the Yukon Delta averages about forty-five percent; for whitefronts, it is nearly eighty-five percent. Brood losses among geese on the Delta averages about eighteen percent of goslings that hatch. Whitefronts generally lose only about twelve percent of their young.

At least one waterfowl biologist also believes that the whitefront's tendency to nest a few miles away from the coast in higher tundra may insulate it from some of the weather fluctuations that can affect other nesting geese in the north country. Harvey Miller of the U.S. Fish and Wildlife Service points out that the ice pack along the shore generates its own adverse weather, smothering the first few miles inland with frequent fog and slowing the spring thaw. In normal years, this phenomenon may not affect goose breeding, but after



Photo by Gene Brehm

parcel of habitat. Brant and snow geese are communal birds, preferring to nest fairly close together in fairly open habitat along the shores of the Bering Sea and Arctic Ocean. Cackling geese and other Canadas aren't quite so social, but they use similar low-lying habitat a little farther inland. On the Yukon Delta, cackling geese and brant often nest on islands, probably to avoid confrontations with arctic foxes and other ground predators which can overpower these smaller birds. Emperor geese and whitefronts, on the other hand, are large enough to face down an arctic fox and aren't threatened into leaving the mainland. Nesting populations of emperors and whitefronts aren't nearly as dense as populations of other geese, partly because they can choose a nesting site from tens of thousands of square miles of available cover, partly because dense nesting groups of waterfowl tend to attract avian predators like glaucous gulls.

The whitefront is particularly secretive when it

late or extremely severe winters, the thaw may be delayed so long that geese cannot nest. In such years, Miller believes that the high tundra away from the coasts and lower river deltas may open up earlier and give the whitefront a chance to bring off a few young when other geese are frozen out of their nesting cover.

The wide distribution of breeding whitefronts also helps protect the population from major breeding failures brought on by locally delayed thaws.

The growth of young geese of any species can almost be seen with the naked eye. Whitefront goslings are no exception, attaining flight before they're two months old. During the growth period of their young, adults go through a flightless period of about twenty-five days while they replace their flight feathers.

By the middle of August, the clan begins to gather for migration. The summer's anti-social territorial behavior is left on the breeding grounds; the birds move south in individual flocks of a hundred birds or less



Whitefronts, showing the characteristic white patch on the forehead, feed in an Alaskan marsh (left). Standing birds also show the barring across the breast which accounts for another of the whitefront's common names, the specklebelly or speck. Whitefronts have broad tastes: they will graze and feed in grain fields like Canada geese and will grub for roots and tubers in wetlands, snow-goose style. Photos by Alaska Dept. of Fish and Game.

strung together in loose waves of several thousand migrants. The whitefront moves early and fast, usually timing its flights with first pushes of northern cold air.

The prairie whitefront population takes two routes to its wintering grounds. The western flock moves down out of Alaska and extreme northwest Canada through Alberta and western Saskatchewan where they make their first major staging stop. They begin trickling into Kansas as early as late August and build to a peak population of about 25,000 sometime in late October or the first half of November. By mid-December, most have pulled stakes and headed for the Gulf. A second flock summers farther east in Alaska and on into Canada as far as the Thelon River, flies through Manitoba and eastern Saskatchewan, and filters down through the eastern Dakotas into Louisiana and eastern Texas.

The distinction between these two flocks is vital to whitefront management. Band returns in the Fifties and Sixties showed that the western flock was being heavily shot by hunters. Alex Dzubin, a Canadian Wildlife Service biologist in Saskatchewan, has estimated that young whitefronts are 2.3 times as likely as adults to work decoys and be killed. By comparison, young Canadas are never more than twice as susceptible as their parents to hunters. Whitefronts in general seem to be vulnerable to the gun in Saskatchewan because they tend to come off their roosts before sunrise, well before other geese. The half-light before dawn covers many hunter mistakes that later-rising Canadas pick out from hundreds of yards away.

The whitefront's trusting nature gets him into trouble all along the flyway. Kansas hunters take about 3,500 annually, mostly at Cheyenne Bottoms and Quivira where hunters after other game get a crack at them.

Waterfowlers in South Dakota, Nebraska, and Oklahoma probably take a similar toll. A major harvest occurs in Texas where hunters with large spreads of snow goose or Canada goose decoys regularly fool whitefronts into range.

Oddly enough, the eastern flock moving down the dividing line between the Central and Mississippi flyways is much less severely dealt with. These birds shift their southern Canadian staging areas frequently, keeping Canadian waterfowlers off balance, and they face only moderate pressure in North Dakota, Louisiana and eastern Texas. The differential hunting mortality between the two flocks seems to be the reason the western flock has declined over the last twenty years while the eastern flock has prospered. The expansion of the eastern contingent has shown up on the breeding grounds where nesting whitefronts have pioneered new country. Whitefronts are commonly nesting today along stretches of the Thelon River where they were absent as late as 1937.

More restrictive regulations have been imposed on whitefront shooting through the Central Flyway in an attempt to help the western flock back. Dzubin thinks that the restrictions may have done the trick. He sees signs of recovery already, not surprising considering the whitefront's ability as a parent. In the early Sixties, the Central Flyway whitefront population was estimated at about 100,000; today, the estimate has risen to 200,000.

Given a chance, many experienced hunters will consistently take whitefronts out of mixed flocks of geese. They're beautiful birds and a novelty to a goose hunter who is used to dealing with more abundant snows and Canadas. Best of all, they're a trophy on the table; waterfowlers across the West rave about the

whitefronts they have eaten. Like most other geese, whitefronts feed mainly on grain during the migration which undoubtedly enhances their table quality. On the wintering grounds, they often work wheat stubble and seem particularly fond of Texas and Louisiana rice fields. Their dispersal on the breeding grounds may be the key to their toothsome, however. Summer congregations of snow geese and Canadas have shown signs of hunger in some years. They seem to prefer staying with the group instead of pioneering new feeding grounds. Meanwhile, the whitefronts are spread thinly over a vast expanse of prime tundra, eating to their hearts' content and maintaining prime physical condition.

Once the migrating flocks make it to the Gulf coast, they disperse again, scattering into small lakes, marshes, and estuaries. Whitefronts seem to like to travel together, but they are no more gregarious in the southlands than during breeding season on the tundra. Many of the small groups in Texas, Louisiana, and Mexico are remnants of the family groups that left the Arctic together a couple of months earlier. Although most whitefronts stay fairly close to the U.S., some continue south as if they were teal. They have been reported on the Yucatan Peninsula and on the Pacific coast of Mexico farther south than any other North American goose ever travels.

The trip ought to earn them a little rest, but like most marathons, it only means they have to start back sooner. They pass December and January in the sun, then feel the urge to challenge the last of winter. In Kansas, whitefronts stack up through early February, reaching a peak of about 40,000 birds that pass on as soon as the first thaw comes. The most accurate whitefront count is taken during the spring push as the birds congregate along the Platte River in Nebraska. This is the only time of year when the majority of Central Flyway whitefronts gather in one place, and even this count is almost certain to be low.

Among other goose species, family ties begin to loosen during the spring passage to be broken abruptly when mated adults arrive on the breeding grounds and establish territories. Whitefront families, though, are more closely knit. The young are often observed around their parents as the older birds set up house-keeping. These teen-aged birds move away from their parents' nest to molt but often show up again after the hatch, hanging around until the current year's goslings get into the air. Then, the three generations may well move south together.

Many of the questions wildlife biologists were asking about the whitefront a decade ago have been answered, a tribute to the efficiency of wildlife research in North America, but there are still some mysteries. There are thousands of square miles of tundra that seem to be top-notch whitefront breeding habitat but support very few nesting whitefronts. Recent expan-

sions in the eastern breeding range of the bird may indicate that these unused areas could be occupied in years to come. There may also be subtle differences in these tracts that exclude whitefronts.

Whitefronts seem to be unusually susceptible to disease during migration. This vulnerability may be due to the species' lack of sociability; since whitefronts are more isolated than other geese during summer and winter, they may not have a chance to develop resistance to the spectrum of disease organisms carried in large flocks of other geese. It's a good enough guess, but no one really knows how accurate it is, and, in any case, it's hard to say how important disease is in limiting whitefront populations.

Perhaps the biggest mystery left to whitefront researchers is the Tule goose, the whitefront's version of the giant Canada goose. Early nineteenth century descriptions of whitefronts in Texas indicate that there might have been Tule geese along the Central Flyway, but if they were ever here, they have long since disappeared. In recent times, the only place the Tule goose shows itself is in central California, a somewhat larger, darker, more trusting component of the Pacific Flyway whitefront flock. A number of biologists even questioned the existence of the subspecies. As Alex Dzubin puts it: "For years, it looked like another one of those giant races of waterfowl made up completely of adult males which are always the largest members of waterfowl species anyway." What was needed was an exact location of an entire breeding population.

In the last year, that breeding group may have been located. A researcher in southcentral Alaska stumbled on 1500 whitefronts of the right size nesting about 300 miles southeast of the Yukon River Delta near the Kenai Peninsula. If these geese turn out to be of the Tule subspecies, they probably represent most of the world's population and could be the rarest waterfowl on the continent.

* * *

While it's good to know that the Tule is still with us, it doesn't take a rare, giant version of the whitefront to impress me. Perhaps that's because I came into whitefront country a little late in life. I cut my teeth on big Canadas in southern Illinois' Union County refuges and watched huge flocks of snows settling into bottomland corn stubble like leaves in the lee of a limestone bluff. My hackles still rise when I hear these eastern geese pass over on a wild December night, but they've been scooped a little by the sound of the unseen flock of whitefronts passing over in the light of the moon a month earlier. Like the first October tang in the autumn air, the whitefront is an announcement that a change is afoot. The laughing talk along the invisible line is touched with a minor note, the shadow of hard times along many miles. The sound of coming winter, greetings from the tundra. □

