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Conservation Biology — Facts, Fallacies

A NESTING WHIP-POOR-WILL

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and
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It had long been the hope of the authors to find a Whip-poor-will nest, particularly for one of us who clearly remembers having been on a family picnic a good many years ago which was highlighted by the broken-wing performance of a nesting Whip-poor-will.

During the past summer the hope of finding a nest was realized in the Iowa River valley near the picturesque Amana villages where large areas of woodland still exist. As one drives through the woodland areas at night in spring and early summer, the timber resounds with the calling of Whip-poor-wills. Many times they may be seen in the auto light calling from the roadway itself.

On such a drive through the Amana timber on the evening of May 21, 1958, several pairs of singing Whip-poor-wills were heard. One pair particularly was calling from a small triangle of woodland cut off from the main woods by a curve of the road, and a mental note was made to revisit the area at a later time actually to search for the birds.

Such an opportunity presented itself on June 22 when one of us visited the area and had the good fortune to flush two Whip-poor-wills from the triangle of woods. An hour's search revealed no nest, but a return trip three days later brought full success, when the female was flushed from her nest and one egg was disclosed. We had come upon the very beginning of a nest.

Another trip was made June 29. A stealthy, quiet approach showed the bird to be incubating, though almost indistinguishable from its surroundings because of its protective coloration and its eyes nearly closed. At times when looking at it through binoculars,

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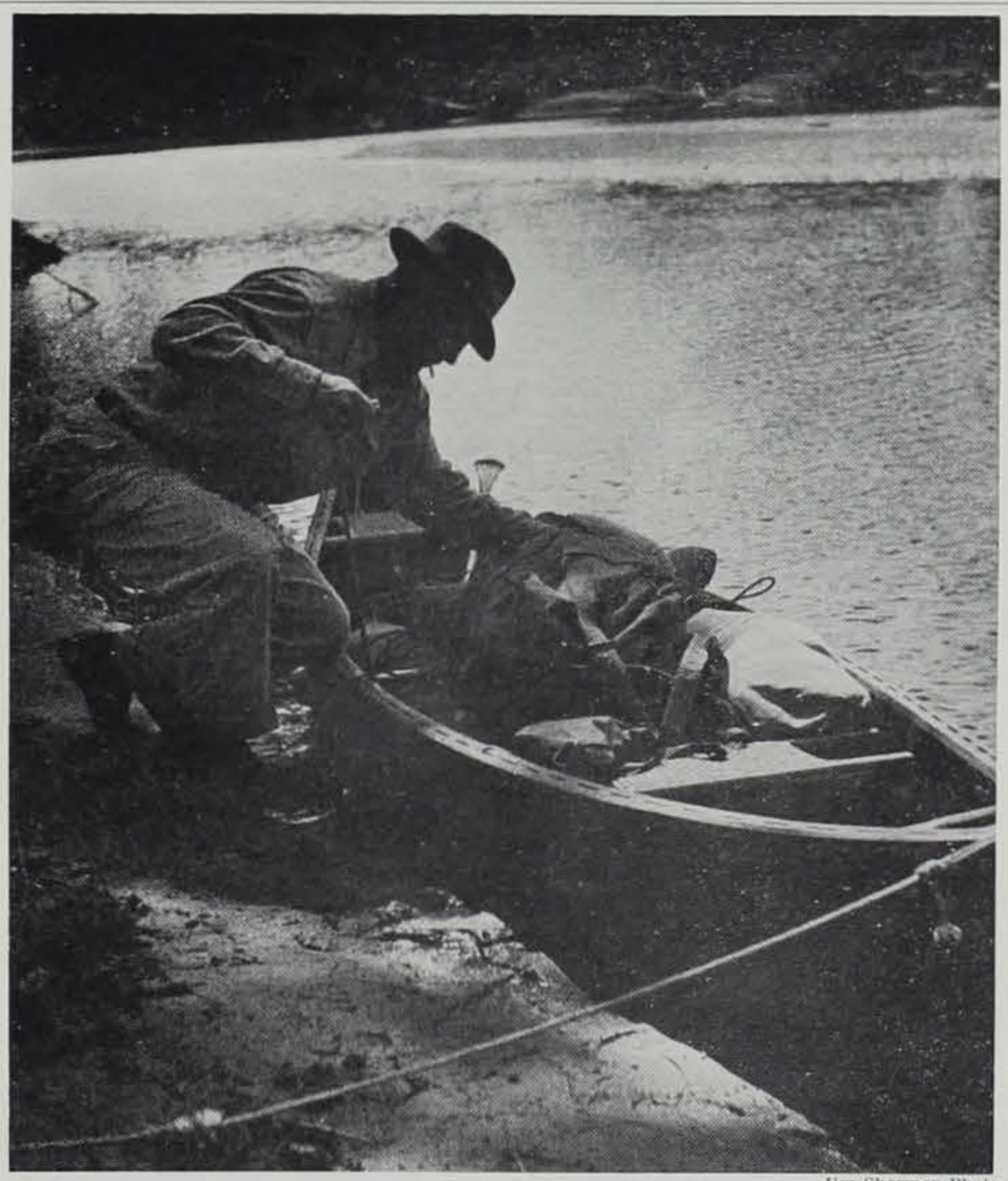

Jim Sherman Photo.

A small boat which can easily be carried on top of a car will make it possible to explore hundreds of miles of Iowa streams.

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Small Boats Mean Fun

George E. Tovey
Photographer

Usually when we buy an item we buy it to fit our needs. One rarely finds a grand piano in a small apartment, yet when it comes to boats we are apt to go a bit overboard. Perhaps it is because we tend to think of boats in terms of the automobile—size, speed and power. Large and powerful boats usually belong on large bodies of water.

Many of us here in Iowa are not located near large bodies of water, yet there is no need foregoing the primary reason for boat ownership —pleasure. A small boat of shallow draft which can be easily carried on top of the car and a light motor which can be lifted with one hand, will make you ready to explore the many hundreds of miles of Iowa streams.

Many miles of streams haven't seen a boat since the last Indian birchbark glided past, yet they are perfectly navigable to any light craft. The only difference in piloting a large steamboat up the lower Mississippi and a light boat up an Iowa stream is the difference in size. It can be just as much fun. One can learn to read the channel; this ripple meaning that

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Conservation: some biologists have suggested that the word itself should be scrapped because it has come to imply "locking up" our natural resources. This unfortunately popular connotation of conservation emphasizes the conflict between popular and scientific thinking about the efficient management of our natural wealth.

In 1907, the late Gifford Pinchot told in his book, *Breaking New Ground*, of the birth of a concept new to government, that of the close relationship of such renewable resources as forests, ranges, waters and wildlife, and the need for unifying their management into one land-use program.

With his colleagues in the recently established Forest Service, he pursued the idea and devised a more specific meaning for a word already in the dictionary: Henceforth there would be a new government policy called "Conservation," and W. J. McGee defined it as "use of the natural resources for the greatest number for the longest time." President Roosevelt immediately saw its good logic and made it the watchword of his administration.

This should be the answer to a frequent assertion that conservation is difficult to define and means different things to different people. These things are true only if we make them true by departing from the original meaning. But since this is done frequently the responsible citizen must have responsible terms of reference and be his own judge as to what constitutes the ultimate benefit of the people.

Science and the Public

This kind of understanding is a practical necessity in a democracy where we do not go far in public programs without public support. Yet it is a large order, since the realistic handling of "renewable" resources must be based on a highly technical realm of

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TROUT TAGGING PROGRAM

The Conservation Commission tagged 900 trout to begin a check on the trout stocking program in Iowa.

The trout were tagged at the state fish hatchery in Backbone Park and were among 1,500 trout stocked in late April in various northeast Iowa trout streams.

Bob Cleary, fisheries biologist, said it is the first time trout have been tagged by the Conservation Commission in recent years.

The program's success, of course, depends directly upon the man who stands to benefit most from the work—the angler who works the streams, who catches the trout, and who wants the fishing to remain good or to become even better.

He is the man who must spot the tag in the upper left jaw of the fish and report the catch to the biology section of the State Conservation Commission. Signs posted along trout streams remind the angler to look for the little metal tag (it's about a quarter of an inch long) and to report specific information about the catch.

The trout tagging has a threefold purpose, Cleary explained:

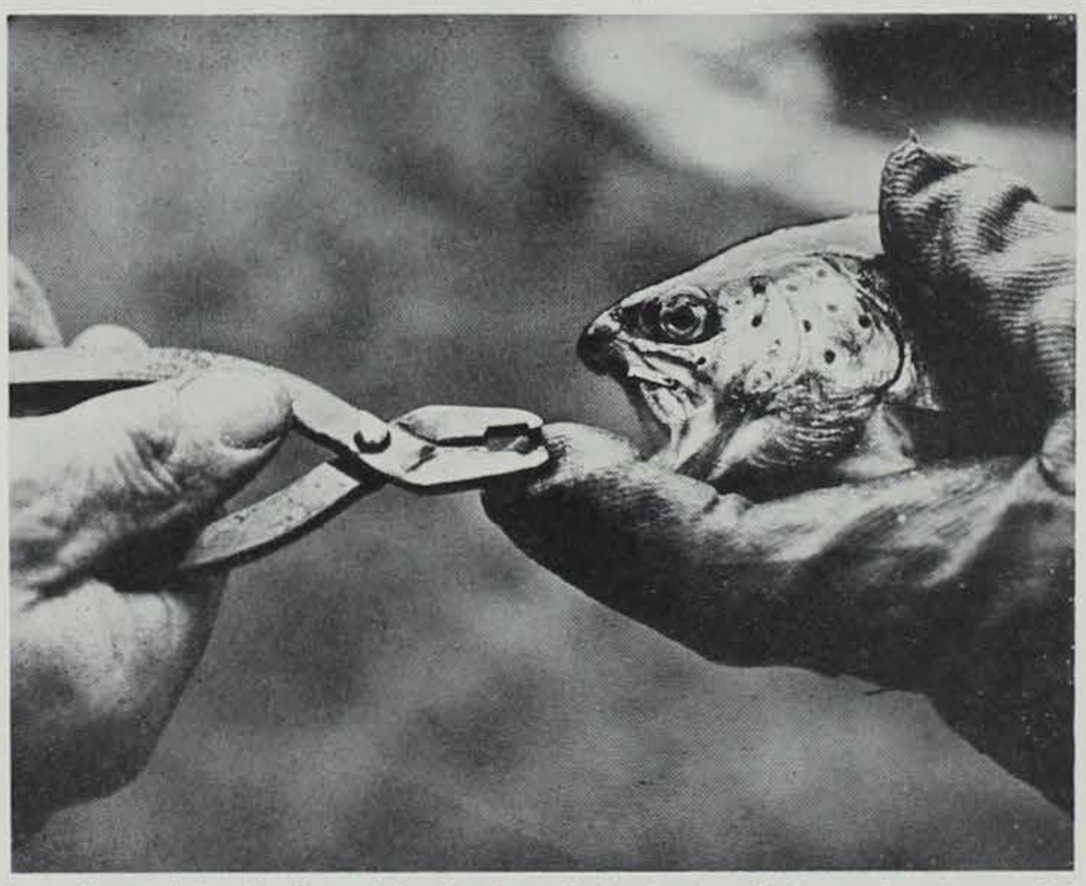
First, to evaluate angler utilization of the fish that are stocked.

Second, to evaluate which seasonal stocking of the streams produces the best results for the angler. The tagged trout will be stocked in the spring, mid-summer and early fall. The Conservation Commission wants to discover if one time is better than another from the point of view of the number of trout caught. While the stocking continues more or less constantly from the time the roads are passable in the spring until winter sets in, the tagged fish will be stocked only at the three times.

Third, to evaluate the importance of stream size, condition and habitat on the trout catch. This amounts to an evaluation of suitability of the trout streams.

Jim Sherman Photos

Trout are weighed and measured by fish biologists before they are hauled out of Backbone Park Hatchery to Iowa trout streams.



A small metal tag is clamped to the jaw of the trout and the number is recorded. When a trout is caught the numbered tag should be returned to the Iowa Conservation Commission.

Trout tagged and stocked were all adult fish. Each truckload included 300 tagged fish—200 rainbows and 100 browns—and 200 trout which were not tagged.

Chlorotone is used to sedate the trout so that they can be handled easily while the metal tag is being clamped to the jaw. Every fifth trout was weighed and measured, and the "vital statistics" recorded by linking the fish with a number on the tag attached to it.

The trout ranged in length up to 15 inches and in weight up to 1¼ pounds—a size that would do credit to anyone's creel.

Cleary said the state has for three years maintained a program of tagging walleyes and saugers on the Mississippi River at Guttenberg. The only other fish tagging project in eastern Iowa was conducted with adult transfers of game species stocked in the river at Waterloo.—*Manchester Press.*

WILDLIFE FALLACIES

Many years ago, when birds disappeared from an area in the fall, local residents had no idea what happened to them. Their reappearance in the spring also was an amazing phenomenon. Then, some noted observers saw the silhouettes of waterfowl against the moon as they traveled through the night. The logical conclusion—the birds flew to the moon each fall and returned in the spring.

Modern day scientific bird banding programs have dispelled this old theory. The banding of migratory birds and the recovery of bands has shown that many species merely travel to different portions of the world in order to continue feeding on their preferred food supplies during winter months. When spring comes, they follow the climatic changes back to the old haunts.

In a few portions of our country some people still believe there to be such creatures as "hoop snakes" that take their tail in their mouth and roll down hill after their prey, and elsewhere some people have not been convinced that porcupines do not "shoot" their quills.

Most of the wildlife fallacies, accepted as fact not long ago, have been proved incorrect by scientific wildlife investigations. However, several still persist. Apparently it will be many years yet before we convince the general sporting public that male pheasants do not help care for the young so the hen can raise a second brood, or that payment of bounties is not the answer in predator control work.

Wildlife belongs to the people of the state—the sportsmen and landowners. The license buying sportsman supports wildlife management and landowners provide the necessary space for this work. Both groups hire specialists to manage this wildlife for them—State Game and Fish Departments. —*North Dakota Outdoors.*

Nine hundred tagged trout were hauled by fisheries trucks to northeastern Iowa trout streams to provide a check on Iowa's stocking program.

F. W. Kent Photos.

Female whip-poor-will—"she would alight on a branch of the brushpile. . . . (A telescope photograph at about 30 feet).

Bird on the nest, incubating two eggs, almost indistinguishable with its protective coloration and its eyes nearly closed.

WHIP-POOR-WILL—

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we could hardly believe it was a bird at all. Nevertheless it did flush to disclose two eggs present when we approached to within eight feet.

Our trips to the nest now began in earnest. In all, at least 18 were made to the nesting area, lasting three to four hours, and observations ranged from 8 a.m. to 11 p.m.

The Area

As mentioned, the nest was found in the Amana woods, specifically the northeast corner of the main body of woods on the Iowa-Johnson County line. A small triangle of woods (30 x 100 yards) had been cut off from the main woods by a curve of the road. The area, essentially an oak ridge, is at the edge of the Iowa River floodplain with open fields to the north and the river with a border of timber three-quarters of a mile away. Mixed hardwoods, mostly white oak, predominated in this ungrazed triangle of woodland with some down timber, brush and a mixed understory.

The Nest

The nest was in a semi-open glade at the edge of the woods and at the top of a 20-foot slope facing south to the road. Fallen logs were to one side of the nest and brush on the other. The nest itself was about a foot from the base of a small oak sapling (5 feet), on a patch of dry oak leaves with some very sparse grass growth around. The two eggs were located in only a very slight depression in the leaves. The area above the nest was clear, apparently for incoming flight as the birds always came directly into the nest and settled from above. Later, when the young had been moved, the second and third locations were very similar.

Behavior During Incubation

The behavior pattern seemed rather constant. Incubation during the daylight hours was always done, in our observation, by the female. Upon our approach to the nest she seemed completely motionless, eyes half closed, sitting on the eggs. On closer approach to 8 or 10 feet she would flush, springing into the air without a sound like a large brown moth. As incubation went on, the distance became less and less, as did the time required for her return to the nest. During our first visits she flew into a distant portion of the triangle of woods and required more than 45 minutes to return. As time went on, her period for return dropped to five or six minutes and she simply flushed to a brushpile to one side and back of the nest.

Her short, rounded wings would lift her directly off the nest. With a turn or two she would alight on a branch of the brushpile, crosswise on occasion with wings drooping, eyes directly on us. Then she would turn on her small pink feet lengthwise on the limb, now and then uttering a low gutteral "cluck" accompanied by a raising of the head and a body jerk. While perched in this manner she would allow close approach, and movies were taken from as near as 12 feet. Flash pictures taken at 3 feet while the bird was on the nest, from a previously placed camera, did not bother her at all.

For night-time behavior we quote from Vane's notes. The evening of July 12 a Whip-poor-will from south of the road flew noiselessly across to flutter down into the nest area. Then a Whip-poor-will flew back across the road to the south side. Had they changed places on the eggs? Indeed they had, and the change was made by intermittent calling and clucking.

We proceeded up to the nest using both red searchlight and ordinary flashlight. How the bird's eyes shone! As we approached it this first time the male bird flushed from the nest, hovering over our heads, and in the twilight we could plainly see the white tail feathers of the male. It first perched in a cluster of oak leaves

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Newly hatched young—"just a tiny ball of fluff complete with egg tooth, tiny pink feet and with eyes still closed." July 16.

Young whip-poor-will in the hand, July 27.

WHIP-POOR-WILL—

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over our heads clucking, then soon flew to a dead branch over the nesting area alighting lengthwise. Again we shone its eyes with the flashlight and red filter. Again it flew and we retired to the road.

After a few minutes we returned to the nest, this time with the strong spotlight, jacklighting the bird as it incubated the eggs. Fred crept up to within 3 feet of the bird and shot several flash pictures. We then retired without flushing it.

Aside from low flights over the road, night-feeding patterns were never seen.

Behavior With Young

On our afternoon visit to the nest on July 16 the female was first flushed from about 10 feet. She was reluctant to leave and flew only to a nearby branch (10 feet) in the brushpile. There she put on a broken-wing act, drooping both wings, perching crosswise on the limb and clucking about every 10 seconds. As we approached her she fluttered farther away to a dark tangle about 50 feet from the nest. There, perched on a limb lengthwise, she would wait for us to leave.

The reason for her concern on this date was the presence of a cinnamon brown Whip-poor-will chick—not an exact match for the oak leaves by any means, just a downy fluff complete with egg tooth, tiny pink feet and with eyes still closed. The incubation period seemed to be 20-21 days, the same as mentioned in the literature.

The parent bird put on a broken-wing act when first flushed but at subsequent times flew only to the nearby brushpile and waited for us to retire, clucking from time to time. She returned to the nest about 5, 7 or 10 minutes after we left the area. We could tell when she was about to return as she would turn at right angles to the branch before taking off. The return was directly to the nest, quickly and silently.

Subsequent visits showed a similar pattern of behavior with two young being present on July 20.

July 23 we arrived just before sunset and placed a ladder near the nest so that I could sit up rather high to watch developments. Surprisingly enough, the two chicks had been moved and the female bird flushed from the two young which were now on the other side of the oak sapling about 4 feet from the original site.

It had been reported that a red light would not bother birds at night and we wanted to try it in hope of seeing a feeding procedure, but to no avail. At 7:50 a few calls came from across the road; a few answering 'clucks' came from the female which had not returned to the nest and within moments the male came flying in close to the ladder. With a few low "whups" he called together the chicks which had dispersed as we had taken pictures of them on Fred's arrival. The young were very active and would jump out of the nest area, and in fact were now showing small quill feathers on their wings.

The little chicks answered the male's call note with soft notes which sounded like whispered "will, wills." Then in order to see what was going on in the gathering dusk, I turned on the flashlight which immediately flushed the male.

At once a beautiful display began. The adult male flew toward me on the ladder, approaching within 5 feet. Then he hovered in mid-air in a vertical position, wings rapidly beating, the expanded white tail showing up vividly in the dim light, acting for all the world like a giant hummingbird.

He would then retire to a branch in the adjacent brushpile, perching crosswise with drooping wings and spread tail. In addition to his "whip" or "whup" note the male sometimes uttered a completely different note, "Churr, churr" rolling the "r." Then in a moment he would be up again to repeat the performance.

Calling to Fred, he came on the scene to take "strobe" shots of the bird poised in the air. Meanwhile the female remained in the background, only occasionally moving moth-like about but in no sense going through the hovering display of the male. She could always be found by "eye shine" when we scoured the woods with flashlights.

Meanwhile Fred was out of film; so he went back to the car to reload. The male, which had not yet returned to brood the young, went through his aggressive display. He hovered, spread his tail and wings and again we shone his eyes with both red and white lights. Ultimately the birds retreated farther from the nest area, the female perching high on a dead branch, the male retreating across the road where we could hear him calling "Whip-poor-will" and also "whup-whup-whup" in the light of the half moon.

It was now 10:30. Presumably the parent birds were out feeding to gather food for the young. How did they feed them? This was a question which we could not answer. But we did learn that the male bird both incubated the eggs and brooded the young, taking his place soon after sundown.

And so a pattern of behavior emerged, and as we drove home we knew we would long remember our vivid night visit to the Whip-poor-will nest.

Moving of Young

On July 27 we saw the young for the last time. They were now at least seven and eleven days old and not to be found anywhere near the hatching area. To find the young, we started a systematic search of the area and Pete Laude finally flushed the female, along with hordes of mosquitoes, some 40 feet from the original nest site. Careful search disclosed the young on a patch of dry leaves in a small opening of knee-high vegetation.

The young, now nearly half grown, showed a well defined pattern of spots and markings which blended so well with the leaves that they were almost invisible. Side by side but facing opposite directions they remained completely immobile while we took pictures. But when we stooped to pick one up, it scrambled away with half-open wings and disappeared right before our eyes into the vegetation. We posed it on a small log for more pictures and also saw it open its mouth several times—an enormous cavern. During all this time the female remained on top of a 20-foot stump some distance away without moving or clucking. When we left the area the young birds were huddled together where we had found them.

A week later the woods was revisited, and though we searched thoroughly, it yielded no young Whip-poor-wills—nothing but hungry mosquitos.

Three other trips were made at dusk during August evenings. On August 4, two birds were seen flying back and forth along the edge of the woods, with several calling from either side of the road. It was almost certain that four birds were located in the area.

On August 21, calls were heard in the area but only four or five at a time, and on August 28 a few calls were heard coming from the deep woods at dusk.

Our summer experiences with the Whip-poor-wills were now over, but as mentioned before, we knew we would long remember the pleasant field trips and the vivid night visits to the nest of this interesting bird.

WILDFLOWER OF THE MONTH

WILD ROSE

Common Name: Wild Rose.

Other Name: Prairie Wild Rose.

Importance: State flower of Iowa.

Family: The Wild Rose is a member of the rose family, *Rosaceae*. Other members of this family are the spireas, ninebarks, blackberries, and the cinquefoils.

Description: Once the Wild Rose blossoms we may consider that spring is over. It is sometimes considered as the "May Queen" of the summer flowers. The flowers will vary in color from a deep rose to white, this variation often depending upon the age of the flower and its exposure. The flower has five petals, attached around the top or inside of a bowl-shaped swelling which later becomes the scarlet "rose-hip." The golden yellow centers have many stamens. The leaves are pinnately divided with toothed leaflets.

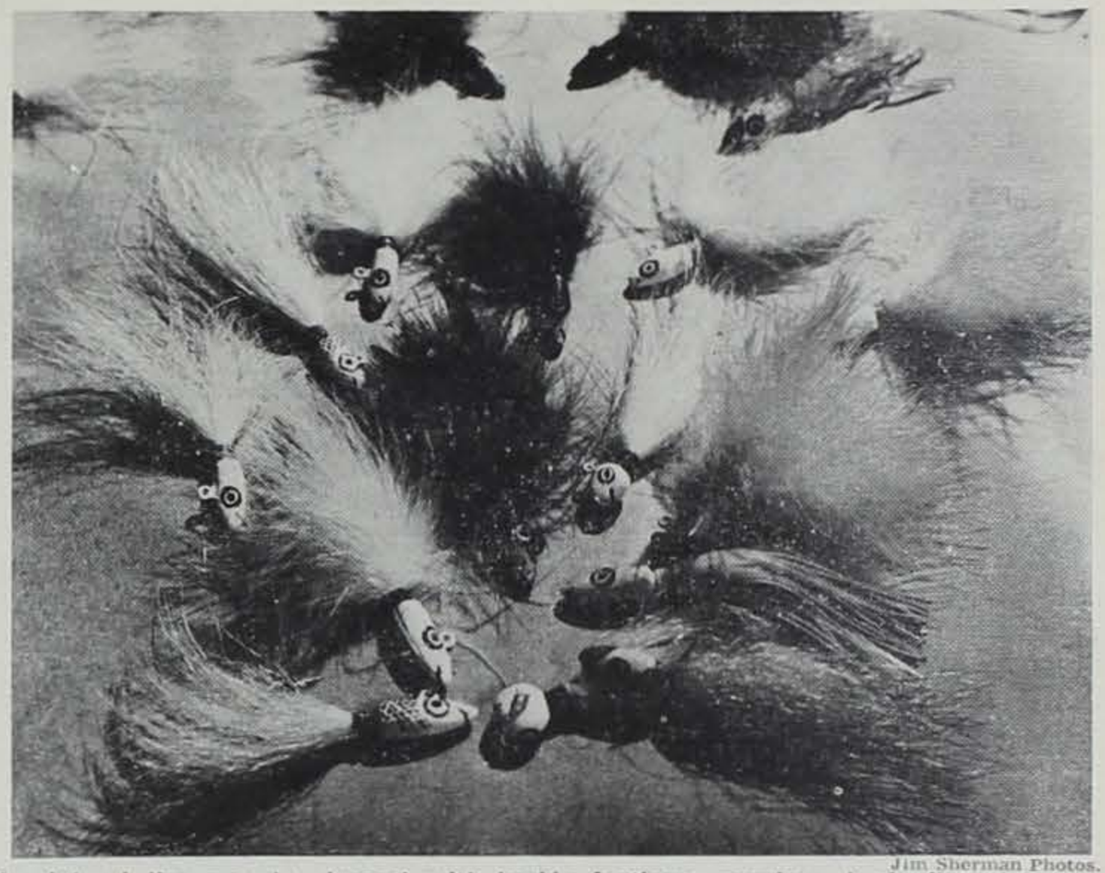
Where to Look: The Wild Rose with its sharp prickles on the stem and leaf stalks lines our paths and roads throughout the state. It begins to blossom around the latter part of May.—*(Descriptive material was obtained from "Wild Flowers of Missouri" by Theresa C. Rickett).*

A pretty young stewardess, farm-reared, asked the pilot of her first flight over the Grand Canyon: "Could this have been prevented by contour farming?"—*Marshalltown Times-Republican.*

Ducks have a transparent membrane which the bird can pull over its eyes while in flight.

Heat the mold to the same temperature as the molten metal.

Lead heads are brought to final shape by filing excess metal.

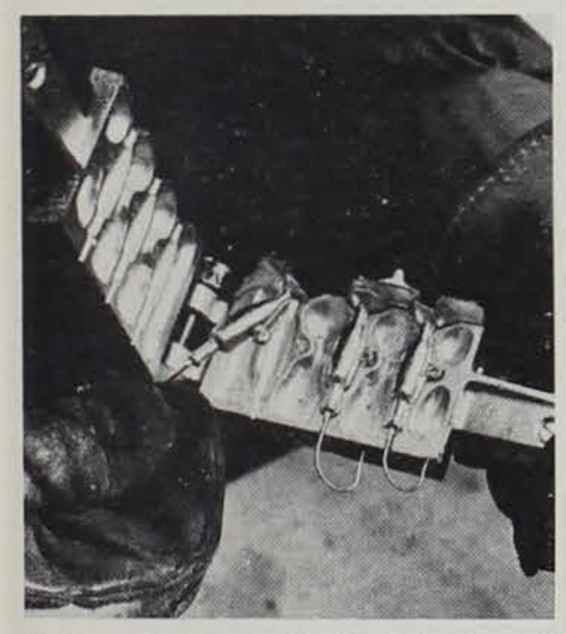


Jim Sherman Photos.

Lead head jigs may be dressed with hackle feathers, marabou, bucktail, polar bear hair, rubber and plastic skirts in any color.

Keep pouring for a short time after the mold is full.

Quick-dry model airplane paint is best for dipping the jig.



If the mold is properly filled, the jigs will be true shape.

Fly-head cement may be applied to windings with a toothpick.

Pouring dimples can be removed with cutting pliers or side cutters.

Marabou feathers are a very popular dressing for these lures.

HOW TO MAKE A JIG

Frank A. Heidelbauer
Special Law Enforcement Officer

Iowa's anglers have taken a good thing and made it even better.

The "lead head" in one shape or another has been known to salt water fishermen for generations. The first to appear in this country were crude, leaden replicas of small, salt water squids cast over a sizeable hook with only the hook eye, bend and barb protruding. Early, East Coast surf anglers attached these heavy lures (weights to one-fourth pound were not uncommon) to their tarred hand lines, and after mighty windups, sailed them far out over the breakers. Huge rockfish and red drum fell victim to their rapid but erratic hand over hand retrieve.

From the old leaden or block tin squid evolved the common salt water jig with its bullet-like head and tail of clustered rooster neck hackle-feathers. Its practical design and fish taking qualities made it a universal favorite of both sport and commercial salt water fishermen throughout the world. With such a lure, huge Pacific tuna are still levered over strong backs to eventually end up on the shelf of your "Super-market."

When the great TVA impoundments were completed in the deep South, "tidewater anglers," with both fresh and salt water tackle in their boxes, pondered over the deep, fast and turbulent tail waters of these dams.

Game fishes were in great evidence in these cold, clear and heavily oxygenated waters, but the extreme turbulence made the use of conventional fresh-water lures impossible. "Johnny Reb" is no fool and he quickly snapped on the "lead head jig" he carried for catching "weakfish" in the Gulf.

Born in the wild, turbid surfs of New England, the "lead head" had at last come to fresh-water—tailor-made for these fast tail-race waters; it provided southern "pole and liners" with such fresh-water fishing as they had never known.

Our Iowa anglers know a good thing when they see it. Iowans on southern vacations were quick to grasp the lures' potential and summarily brought tackle boxes full of them back to the "Tall Corn" state and put them to work.

Our amateur and professional flytiers, who rank among the nation's finest, were quick to apply their ingenuity. The old "lead head" principle of "hook eye and barb riding up" began to appear in new shapes, sizes, and variations of dressing.

Flytiers of our Iowa Great Lakes region were first to adapt standard streamer fly body and dressing patterns to the "lead heads" and their fame as game fish lures is still radiating from that area.

BLUEGILL CHOWDER

Fishing successes needn't be on the grandiose level for this excellent chowder made with bluegills! Six of the little fellows of about hand-size will furnish all the meat needed.

Scale and clean the fish, then split. Remove backbone, trim out rib cages, and cut each of the little fillets into three pieces.

Cut two slices bacon into narrow strips and fry out in a deep kettle. Add one small onion finely chopped and saute three minutes. Pour in one pint water and bring to a boil. Add the bluegill pieces, two medium potatoes sliced, one cup tomatoes (drained and cut fine), one-half cup of tomato liquid, one teaspoon salt, one-quarter teaspoon pepper, one-eighth teaspoon thyme, one-quarter teaspoon sweet basil and one sprig minced parsley. Cover and simmer until fish and potatoes are done, fifteen to twenty minutes.—Eddie Meier, *Webster City Freeman-Journal.*

MT. AYR — WALNUT CREEK MARSH

F. A. Heidelbauer Photo.

A new slough in the Mt. Ayr upland game area now includes about 65 acres of water. Built primarily for a duck marsh, it will be stocked with fish this summer. It was completed last fall and was completely full of water for the first time this spring.

The new slough can be reached by going four miles west and one mile south of Mt. Ayr.

BIOLOGY—

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biological knowledge. This is ecology, the "science of relationships," a field that draws from every other scientific discipline.

Ecology is directly concerned with environments, biotic communities, and life processes, which is to say with the resources themselves—plants, animals, soil, and water. But in addition it involves an understanding of the dynamics and living standard of the human population being served. In the first of these aspects we are well behind. The second has hardly been recognized as a part of resource policy-making.

There are three essential phases to a conservation program as applied to our renewable natural resources: (1) *Research* is the fact-gathering through which the biology of plant and animal communities must be understood. It is the small-scale experimentation by which workable methods are developed at reasonable cost. (2) *Information* programs are essential to keep responsible segments of public opinion up to date on new concepts and new trends in management. Without this conditioning, progress will be opposed and stalled indefinitely. (3) *Management* is the pay-off. It secures our natural wealth against waste and makes it productive of public benefits. By definition it has the long view.

The key deficiency in our conservation effort is in public information, since even adequate fact-finding can not be carried out unless the citizen-beneficiaries see the need for it. This has been especially evident in game and fish programs. Here the applications of science have the same tremendous possibilities as in other human endeavors; yet it is a curious space-age phenomenon that this proposition must be constantly re-sold to the public.

Obviously it is a job for professional educators working closely with research and management personnel. But after thirty years of scientific work in fish and wildlife management, some states have hardly made a start in bringing facts to their public. Others have excellent information programs, but it probably is true that none has actually risen to this challenge. In the Federal Bureau of Sport Fisheries and Wildlife, work is of the highest quality, but its scope is far too limited—a result of totally inadequate financing.

This situation produces the incongruous spectacle of technical personnel, paid by fish and game license money, pulling in one direction while the license-buyers themselves pull in another. It creates areas of controversy that persist year after year, and even decade after decade, because technically sound concepts never get through to enough people.

Disagreement and wasted effort are particularly common in three types of activity: (1) The artificial stocking of game and fish; (2) Predator control and the bounty system; and (3) Hunting and fishing regulations. These are fields of constructive policy-making on the part of conservation commissions. Yet it frequently happens that after policy is made on technical grounds, the Legislature takes a hand and reverses the trend in deference to purely political pressure.

Specifically, this maneuver has ear-marked funds for game and fish stocking that was of little or no public benefit. It has kept bounties on the books that had no usefulness other than as a trapper subsidy. It has prevented many states from taking more than half the available crop of deer—allowing thousands of animals to go to waste, while permitting over-numerous herds to destroy food supplies.

These are excellent fields for an examination of both public attitudes and technical facts, since the logic involved has strong implications in the entire resource picture. A basic difficulty is that ecological thinking does not seem to "come naturally" to anyone. The average person thinks in plus-and-minus terms, and customarily looks to assembly lines for the amenities of life. As he conceives it, any problem can be handled by applying enough money and expanding "production." If we need more game and fish, raise it by efficient modern methods and turn it loose. If we want less predators, kill them off. If we want good deer hunting, save the does to raise more fawns.

Unfortunately, this logic has major short-comings when applied to animals in their natural environment. In wild communities, numbers shift constantly and the total environment alters steadily with the cycle of the seasons. There are compensations for every change and the ecologist learns to think in terms of trends and influences.

Habitat and Population Principles

Fundamental to every judgment of the biologist is the characteristic of habitat that he calls "carrying capacity." It means that at a given time a unit of range can support only so many animals of a particular species. Some habitats are favorable year after year and have high carrying capacities. Others are consistently less favorable and support few animals and poor hunting. Carrying capacity is commonly high during the summer breeding period and lower in winter when the growing season is over and food and cover are declining. There is always a seasonal factor at some time during the year that is less favorable than all the rest and which determines the annual productivity of the area. Frequently this is the place to begin in habitat improvement programs, the aim of which is to increase carrying capacity.

The carrying capacity phenomenon is a re-statement of the principle that we can not get something for nothing. It asserts that two rabbits do not occupy the same space at one time. In the less complex management of domestic animals in artificial ranges, every farmer recognizes these realities.

For fish, carrying capacity can be expressed in pounds per acre, and it is largely determined by food supply. In these terms, assuming similar food habits, 50 fish weighing 1/10 pound each are equivalent to 5 fish weighing one pound each. When a large population of small fish utilizes its supply of nutrients to full capacity, the fish stop growing. If half of them were killed, the remainder could then double their weight. Since many species of fish lay thousands of eggs, it follows that a huge mortality of young must take place if fish of catchable size are to be produced. In a Michigan lake it was found that for every million bluegills hatched only 416 lived to maturity. In this 15 acres of water annual production of black bass fry was about 860,000, of which about 714 lived to spawn.

Before the advent of quantitative work on fish, it was widely assumed that small size classes needed to be protected and the wild population fortified by releases of hatchery-reared fry and fingerlings. Each small fish was regarded as an individual that could "grow up and be caught." It is now evident that the bulk of a new generation of pan and game fish is a food supply that will be expended in feeding relatively few larger fish to catchable size. In fact the multitudes of young fish must be thinned out drastically if some of them are to grow and become useful to the angler.

This is the realism behind the widespread removal of size, catch, and season limitations on warm-water fishing. It is why biologists do not subscribe to the outmoded practice of indiscriminately stocking lakes and streams with hatchery-reared fry and fingerlings. Nevertheless, both fishing restrictions and stocking may be part of a sound management plan. The difference lies in tailoring methods to fit specific biological needs. This is impossible in politically inspired programs.

This drastic "annual turnover" that takes place in all fish populations occurs similarly in small game species like the quail, pheasant and rabbit. Obviously this is a biological side of management that commonly escapes the amateur conservationist. And without this picture he can make no real evaluation of such practices as stocking and predator killing, nor can he judge the effects of the sportsman's harvest.

All common animals achieve a relatively large "over-production" during the breeding season. A population "surplus" is created which maintains a fairly high level of stocking the rest of the year as numbers are whittled down to fit seasonal "bottle-necks." As would be expected, there is a lag in adjustments to carrying capacity.

Most game birds probably lay about two eggs for every one hatched. Of the chicks produced, only about half or less are likely to survive until hunting season. An average female cottontail bears about three litters aggregating 15 young during the summer season. Losses commonly are heavy in all such animals, yet a breeding stock of birds or rabbits usually will increase about threefold from spring to fall.

An even better view of the annual turnover is gained by considering what happens to the fall

peak of numbers. This represents the population of "grown" animals for the year. When we look into the hunter's game bag and "age" his kill in statistically significant numbers, we find about 75 to 80 per cent of such species as rabbits or quail are *young of the year.* Since this occurs every year, it means that from one October to another, about 8 out of 10 animals are being lost from the population and replaced during the breeding season.

Although larger animals reproduce more slowly, they also have a substantial annual turnover. Starting with nearly any pre-hunting deer herd, we can expect the death and replacement rate to be 35 to 40 per cent during the next twelve months.

Obviously, the annual cycle of numbers for an animal population is a regime of decimation and restoration, and takes place on practically the same scale whether a species is protected from the gun or heavily hunted. It is largely unaffected by such activities as stocking and predator control. There is a compensatory relationship among mortality factors. If one thing does not "get them," something else will. This is the key principle in game management which impresses the biologist by virtue of his quantitative work. But the sportsman has no background for such thinking.

Density Factors

An animal population is dynamic, tending always to expand. There is competition for living space and the resources on which animals live, creating "population pressure" which causes the species to spread into all available range.

In an environment stocked beyond capacity nearly all trends are in the direction of reproduction. Sometimes only a change in weather will trigger a collapse. This is a common origin for declines in game species.

Quite the opposite is true when the numbers of a species are reduced below habitat carrying capacity. In this case living immediately becomes easier for surviving animals. The security of the individual improves as all mortality rates go down. Under favorable range conditions a thinned-out breeding stock commonly shows a marked rise in its percentage of increase. All trends in a reduced population are toward the rapid restoration of numbers to carrying capacity level.

These relationships are another source of misunderstanding between amateur and professional conservationists. Any build-up of animal numbers beyond the usual range is looked upon by hunters as "prosperity," and it becomes a new norm against which lesser densities are measured. The biologist regards such a concentration of numbers as unstable and temporary because of the internal controls it inevitably develops.

These controls are closely interrelated, and the most basic of all probably is expressed in the individual animal as an increase in physiologic stress, a condition resulting from the intensification of social contact and competition. Among wild animals this stress reaction evidently involves the adreno-pituitary syndrome in much the same manner as among human beings. It has a fundamental predisposing influence on other welfare factors.

For this and other reasons, high densities of animals are especially vulnerable to disease and parasitism. They have high losses from predation, "accidents," and other causes. As numbers increase, there is a reduction of both the birth rate and the survival of the young. Percentage-wise the productivity of an abundant breeding stock is low.

The key condition is a favorable environment — one that provides life necessities for a greater number of animals than are present.

Management Applications

It must be evident that natural processes involve mass production and reduction, and can achieve mass benefits. Our best stocking efforts are small-scale, and can only be considered an inconsequential addition to the annual population surplus.

Artificial stocking is an expensive way to produce a small portion of our public hunting and accomplishes nothing of a permanent nature. Quail and rabbit stocking have been abandoned by most states, and there has been some reduction of pheasant releases. But the costly practice hangs on largely as a result of a poorly informed public.

A cropping problem that has been almost a classic concerns the deer. Every state has deer, and the annual harvest is around 800,000. Where hunting is done year after year under bucks-only regulations, the kill is consistently less than 10 per cent of the herd. But since the average annual turnover is near 40 per cent, the hunter is getting much less than his available crop. The progressive trend is toward the regulated hunting of "any deer," and some states are killing more than 20 per cent of their herds each year. A properly distributed kill undoubtedly can be at least 25 per cent of pre-hunting numbers.

The failure to crop deer adequately has far-reaching effects. It sends too many animals into lowland wintering areas and depletes the food supply. This occasions large losses in severe winters and reduces carrying capacity for years to come. Actually, some states never had a buck law, and others dropped the regulation some years ago. In these, intensive cropping programs have been outstandingly successful. Yet the facts fail to impress certain segments of public opinion, and because of this several of the nation's largest state herds yield less than half of the sport they could provide under good management.

For game in general it is clear we should hunt in fall when the population is at its height. At that time the hunter gets his best sport, and the biological effects of a fall thinning are of utmost significance. Each time an animal is killed, the status of the survivors is changed.

High game populations automatically attract heavy hunting, and low numbers discourage it. As the shooting season advances game numbers are reduced and remaining animals become more wary. This means a steady reduction in the rate of kill. Hunters become discouraged and the effort tapers off. Because of these trends, hunting is to a great extent self-regulatory, and overshooting of resident (as opposed to migratory) game is not nearly so frequent as commonly assumed.

When we shoot heavily in the fall, we take animals that otherwise would have succumbed to natural mortality—our kill is part of that annual surplus. Thus we minimize natural losses in the winter to follow. We actually take game away from the predators. A major reduction of game populations in the fall is our most economical and practical kind of "predator control." It is simply that the hunter gets there first.

Just as hunting for sport does not ordinarily reduce the quail or rabbit on a year-to-year basis, so bounty hunting does not reduce the fox. Repeated and widespread studies show that (1) predators seldom exert a controlling influence on game and (2) bounties do not control predators. They merely pay for the scalps of animals that would have been eliminated anyway in the annual turnover of the population — which in foxes is about 75 per cent.

The question of habitat quality pervades nearly all our problems in game and fish management. To the technical observer it long ago became evident that given proper conditions *we can hardly fail* to have good production. And almost irrespective of what is done, it is impossible to achieve intensive management at a reasonable price on poor range. Thereby we get the great emphasis on habitat improvement in the plans of wildlife scientists.

It has been said there is a 20-year lag in the public understanding of these questions. For some issues that is conservative. Unless the need for adequate public information is met, the dedication to artificial methods and the oversimplified, plus-and-minus thinking could persist indefinitely.—Reprint from *Bulletin for Medical Research.*

BOATS—

(Continued from page 137)

a sandbar is forming just beneath the surface, and over by the bank where the current seems so slow there is safe deep water.

If time is a factor and you want to make sure of a return to your starting point, try going upstream until a little better than half the allotted time is up. The trip downstream is always accomplished more quickly.

These quiet untraveled highways have much to offer. An observer of the shoreline will often find it tells an interesting story. In the banks the nature of the soil stands revealed, the secret of how the tree sends out its roots is exposed, and signs of the presence of wildlife are not lacking.

Picture taking, picnicking, camping, and fishing can be carried on with a boat. And much might be said for the opportunity for outright, downright loafing; an occupation, which, if judiciously pursued by those who have neglected the art, can be beneficial to health.

By choosing our boats to fit our streams, we have recreation at our very doorstep.

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WHAT GOOD ARE TREES?