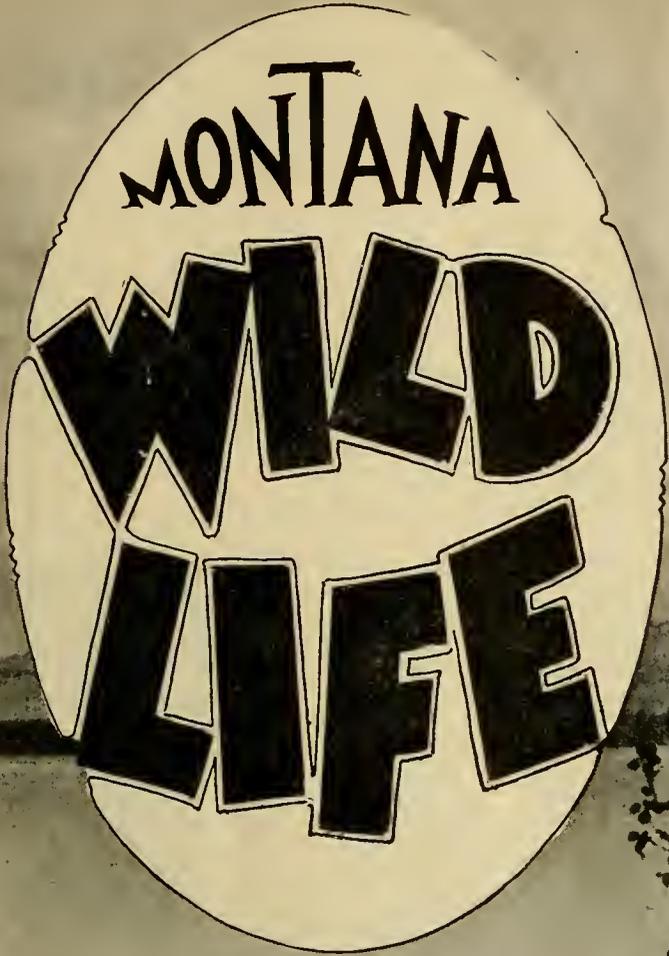


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FLATHEAD LAKE  
BIOLOGICAL  
STATION  
REVIEW

OFFICIAL PUBLICATION OF THE  
**MONTANA STATE FISH AND GAME DEPARTMENT**

# The Sportsman's Salutation

Submitted by George B. Winston, Anaconda.

Judge of the Third Montana Judicial District



*“God of round hills,  
God of great valleys,  
God of clear springs,  
Hear my salutation.*”

*“For where the moose feeds, I have eaten berries,  
where the moose drinks I have drunk deep,  
where the storm crashes through broken heavens,  
and under clear skies, I have known joy.*”

*“God of green trees,  
God of wild grasses,  
God of little flowers,  
Hear my salutation.*”

*“For where the deer crops and the beaver plunges,  
near the river I have pitched my tent,  
where the pine casts aromatic needles on a  
still floor I have known peace.”*



# MONTANA WILD LIFE

The Official Publication of The State Fish and Game Commission

VOL. II

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NO. 1

## Cooperation Between the Commission and Scientists of the State University

By CHANCELLOR MELVIN A. BRANNON



Melvin A. Brannon

**M**ODERN industry makes use of thoroughly trained engineers and scientists in order to secure facts which are basic in developing Twentieth Century industrial arts. Guessing has been superseded by scientific measurements and precision. Superstition and wasteful practices acquired by long and unquestioned precedents have been abandoned with the tal-

low dip of a bygone example of industry age. Tardily the has been followed in government. The results are evidenced by the multiple tests employed in education and by the highly trained engineers and scientists now engaged in governmental work.

The most recent illustration of this modern cooperation between governmental agencies and scientists is found in the pioneer cooperative project set up by the Montana Fish and Game Commission whereby highly trained chemists, physicists and biologists have been associated with the problems of fish and game propagation and conservation in Montana.

This is a pioneer performance and the members of the Montana Fish and Game Commission have won first honors so far as I am acquainted with governmental procedure in the United States relative to adopting and supporting a program of cooperation with the scientists in the university of the state.

However, the fine example set by the members of the Fish and Game Commission of Montana has been followed, I understand, by the members of the Wisconsin Fish and Game Commission who are proceeding along similar lines in Wisconsin.

The State University established a Biological Station under the leadership of Dr. M. J. Elrod in 1899 in order to study the problems of plants and animals living in Flathead Lake. The range of biological studies extended

from the higher types such as birds and fishes to parasitic forms and to microscopic organisms (Plankton) which furnish the ultimate food supply for fishes. This biological station was closed in 1920 because the State University was unable longer to finance the station. In the spring of 1923 it occurred to me that this station and its former work might be utilized by the Fish and Game Commission of Montana. It seemed to me that the leadership of Dr. M. J. Elrod, the organizer and director of the station for twenty years, and his associate, Dr. R. T. Young, zoologist at the State University, and Dr. J. E. Kirkwood, botanist; Dr. J. W. Howard, chemist, and Dr. G. D. Shallenberger, physicist, represented able but latent research power which might well be utilized by the forward-looking Fish and Game Commission of Montana.

Through the courtesy of the Fish and Game Commission I was invited to discuss the proposition relative to the value of having thorough chemical, phy-

sical, botanical and zoological studies of the waters of Flathead Lake made through a series of years by the scientists of the State University in cooperation with and by the advice of the members of the Montana Fish and Game Commission.

The members of the Commission were deeply interested at once in the proposed project and they suggested further conferences which resulted in establishing a program whereby chemical, physical and biological facts vital to fish culture in Flathead Lake might be ascertained.

Moreover, it was believed that similar studies might well be carried on in other lakes and in rivers of the state in order that the Commission might be aided in carrying forward its difficult tasks of propagating and conserving the fish and game life in the waters and on the land areas of Montana.

Questions relative to the biological condition of Montana lakes and rivers, questions relative to plant food for game birds, questions relative to the study and control of parasites and predatory animals which threaten and destroy the fish and game life of the state, questions pertaining to the life cycle of various species of fish and game animals, and the myriad problems which underlie the complex and highly important service of the Fish and Game Commission can be ascertained only through the continuing and intensive work of ably trained scientists in chemistry, physics, botany, and zoology.

Credit for pioneer recognition and utilization of this important research service belongs to the members of the present Fish and Game Commission of Montana.

Sportsmen, agriculturists, and in fact all of the citizens of Montana should be appreciative of this thoroughly modern and up-to-date effort of the Fish and Game Commission to secure precise information in regard to the limiting factors of land and water environment, proper and adequate food supply and control of parasitic and predatory agencies which affect the fish and game of this state. This Montana cooperative project is definitely a pioneer venture. Its importance and significance can not be overestimated.

### GO A FISHIN'

If your liver's out of line,—

Go a fishin';

If your heart ain't keepin' time,

Go a fishin';

Go and sit out in the sun

Git your troubles on the run,

Be a boy and have some fun;

Go a fishin'.

Want to keep from growin' old?

Go a fishin';

Keep your brain from gatherin' mould?

Go a fishin';

Go and wander 'mong the trees,

Makin' friends with birds, and bees,

Take a day off; take your ease;

Go a fishin'.

If your appetite's no good,

Go a fishin';

If you don't enjoy your food,

Go a fishin';

Grab a can of bait, and pole,

Find some nice old bull-head hole,

Let the sunshine in your soul;

Go a fishin'.



# Flathead Lake---Millions of Dewdrops

By C. H. CLAPP, President State University of Montana



C. H. Clapp

**F**LATHEAD Lake is 27 miles in extreme length and 16 miles in extreme width. Its average width is about seven miles. It covers approximately 189 square miles, with a shore line, including all bays and indentations, of 130 to 150 miles. The depth of some 40 square miles is less than 25 feet, of 50 square miles is less than 50 feet, of 70 square miles is less than 75 feet, while the remainder, approximately 110 square miles, is 75 feet deep or deeper. The greatest depth by sounding is 325 feet. It is quite certain that at no place is it deeper than 350 feet.

To determine accurately the character of the shore line is impossible without a detailed examination of each cove, harbor, or inlet. For working purposes the shore may roughly be divided as follows: rocks, projecting more or less abruptly above water, about 50 miles; rocky or pebbly beach, fronting shore not having rock ledges, about 40 miles; shore with mud or sand, or both, about 40 miles.

There are several islands. Wildhorse, in the western arm, is largest, embracing 2,100 acres. Cromwell, west of Wildhorse, is about one-fourth the size

## SHADE

The kindest things God ever made,  
His hand of every healing laid  
Upon a fevered world, is shade.

His glorious company of trees  
Throw out their mantles, and under  
these  
The dust-stained wanderer finds ease.

Green temples, closed against the beat  
Of noontime's blinding glare and heat,  
Open to any pilgrim's feet.

The white road blisters in the sun;  
Now, half the weary journey done,  
Enter and rest, O weary one.

And feel the dew of dawn still wet  
Beneath thy feet, and so forget  
The burning highway's ache and fret.

This is God's hospitality,  
And whoso rests beneath a tree  
Hath cause to thank Him gratefully.

of Wildhorse. The smallest islands cover an acre or less. At the south end of the lake a narrow peninsula projects northward into the lake for about five miles. The small islands are covered with trees and underbrush, but on the large islands the trees and underbrush are confined mainly to the vicinity of the shore.

The country at the northern end of the lake is largely prairie, except along Flathead River. Along the east side of the lake the densely wooded Mission Range rises abruptly from the water. The west side of the lake is likewise mountainous and covered with timber.

However, there are more open and relatively level sections for fruit and other ranches than on the east side. There is a prairie-like area around the big arm which extends westward from the main lake. The southern end of the lake is bordered by a high, woodless, glacial moraine, through which the Flathead River, the outlet of the lake, has recently cut its channel.

The lake is fed by Flathead and Swan (Bigfork) Rivers, and by many small streams from the mountains to the east and west. Flathead River enters the lake at the northern end. It carries annually a large amount of silt into the lake and has filled an area of several square miles to form a delta. Swan River enters the lake at the northeast corner.

The lake has an annual rise and fall of from 9 to 16 feet. The rise is in spring, from late May until July, depending on the melting of the snow in the mountains. Low water stage is again reached in September, when the lake surface remains stationary until the following May or June. The rise is sometimes slow, sometimes rapid. The usual rise is 10 to 13 feet.

The bottom of the main lake, as revealed by the few bottom samples taken at different places, is covered with very fine light-colored mud, in places alternating with a thin dark layer. In this mud there is much decaying material washed in from the woods, including many small twigs and pine needles.



Biological and Research Station on the shore of Flathead Lake operated by the State Fish and Game Commission in cooperation with leaders of the University of Montana in solving problems of disease and propagation of wild life. It is the only station of its kind in the world.

# The Fishes of Flathead Lake

By DR. M. J. ELROD



M. J. Elrod

**T**HE STUDY on the food of the fishes of Flathead Lake was undertaken in the summer of 1916. Most of the work was done in July and August. The State Fish and Game Commission cooperated through the loan of nets, granting permission to take fish, and in many other ways. A total of 449 stomachs were examined. The number for each species is given separately in the report.

During the summer of 1915 Maurice D. Pace, then superintendent of schools at Polson, examined 45 stomachs, the results of which are included in the report. A digest of his report appeared in the special edition of the Flathead Courier the following year, September 14, 1916.

Francis Ross, whose father, David Ross, has been of great assistance in planting, distributing, and propagating fish in the waters adjacent to Kalispell and in Glacier Park, was a student at the Biological Station for several years. In the Daily Missoulian, July 21, 1924, he made a report on some of the fish introduced into Flathead Lake and reference to his report is made in several places under the proper headings.

The notes in parentheses, signed R. T. Y., are observations made by R. T. Young in 1928.



Here's Old Man Sucker himself. The western sportsman knows him. In fact he knows him intimately enough to hit him on the head with a rock and leave him for the maggots and wiggle worms. He abounds in Flathead Lake, according to the scientists who have made a searching investigation, and he's one of the reasons, with his Brother Carp, why the fish food intended for game fish is devoured. These fish are bottom feeders, lazily swimming over the pebbles or mud, sucking material into the mouth from time to time and blowing it out again. From this mass they abstract some food. These fish grow to be fifteen inches long. They are not eaten by the people living near the lake.

## Sucker, *Catostomus macrocheilus*

There are two suckers in the lake. The first *Catostomus macrocheilus*, is the commoner. The second species is almost certainly the long nose sucker,

*Catostomus catostomus*. The first species is abundant, more tenacious of life than any other fish examined. They struggle little when they get in the were raised. As a result, the stomach contents were usually well digested, and for the most part was undeterminable.

During the study of fish food in 1916 the stomachs of 48 were examined. A larger number could have been studied, were it deemed necessary, as many of those taken in the nets were returned to the water.

Three stomachs plainly showed remains of insects; two contained entomostraca; 14 had soft material, with nothing that could be definitely determined; and 14 were empty. As the fish are bottom feeders there was in each case a mass of mud and sand mixed with the stomach contents.

The fish are not used by any of the residents about the lake as food. The largest had a length of 16 inches and weighed a pound and three-quarters. Some of them were eaten by the members of the station staff and were pronounced fairly good. They are without doubt better food than is generally supposed.

They are fairly free from parasites. Only three had tapeworms, and only one had leeches. They are common in the lake, living along shore, and nosing in the mud and among pebbles.

## Squawfish, *Ptychocheilus oregonensis*

This is also called Chappaul and Sacramento pike. It is found in the rivers from Vancouver Island south to San Joaquin. It ascends the tributaries of the Columbia to Flathead Lake and tributary streams, and the Snake River as far as the Great Shoshone Falls. Jordán and Evermann report it common in California streams, where it is used as food. In Flathead Lake it is very abundant, in numbers next to the Columbia Chub.

The stomachs of 119 fish were examined, 23 being empty. Thirty-four of the remaining 96 stomachs, 37 per cent, had fish in them. The food of the other 62 was mainly insects. The stomachs of 32 had insects alone. The identifiable insects were mayfly larvae, caddice fly larvae, and grasshoppers. On August 16 of 1916 the little creek at Yellow Bay was sending grasshoppers into the lake in enormous quantities. They were floating by tens of thousands a mile or more from shore. One of the fish stomachs had 35 grasshoppers, another 25, one 20, one 10, and another had 5. The mayfly and caddice fly larvae were abundant in seven stomachs. Of the 34 stomachs containing fish, only 2 contained identifiable material, which was native whitefish. Twenty-one stomachs had soft material, too far gone for determination. One contained fresh water

shrimp. The squawfish is evidently not particular about its food, and will take whatever is convenient.

The squawfish is tenacious of life, dying slowly in the nets. For this reason the food contents of the stomach



Anglers who have sunk a hook into a fish that struck like a trout, fought like a trout and broke water like a trout, have perhaps called him something like *Ptychocheilus Oregonensis* (Rich)—which means Squawfish—or then, again, they perhaps have called him something else when his yellow belly curled up in the landing net or flipped around on the sandbar. Here's the head of one of those Oregonensis things, taken from Flathead Lake and photographed by Dr. M. J. Elrod.

may be well digested between the time of becoming entangled in the net and being removed for examination.

The stomachs of all squawfish examined contained tapeworms. Some had as many as 20 or 25. In a few cases the stomachs were quite filled with a mass of the parasites. There were leeches on 10 of the fish. These were in the mouth and on the fins. One fish had 10 in the mouth alone. The leeches when expanded were an inch or more in length.

The fish spawns from the middle to the last of July. The largest ones taken were about 18 inches in length and weighed four and a quarter pounds. It seems to serve in part as food for the hull trout. It takes the hook readily, and stays largely in shallow water along shore. None were taken in the nets set in deep water.

The squawfish, so far as the writer knows, is not eaten by the residents near Flathead Lake, nor by people in any other part of the state where the fish occurs. Indeed, it is ridiculed as a food fish. It is not rated at its proper value. Young squawfish have good flavor, though a little bony, since the fish belongs to the minnow family. When heads, fins, and tails were cut off, and the fish cooked with Columbia chub and young trout, those eating could not always decide whether the fish being eaten was of one or the other. It should be better appreciated as a food fish.

**Columbia Chub, *Meilochelilus caurinus***

This is also called locally "pee mouth." It is the most abundant fish



You'd never believe it, but this is a photograph of a pair of *Mylocheilus caurinus* taken from Flathead Lake by the scientists employed by the State Fish and Game Commission. Most folks call them the Columbian chub. The chub, a prize fish for the small boy, is easily taken with a hook, is good tasting, often served as whitefish, frequently called whitefish, because it loses color shortly after it is taken from the water. This is one of the abundant fish of the lake, and is deserving of greater recognition as a food fish. Photo by Elrod.

in the lake. From streams where it has access to the Pacific Ocean it often enters the sea. It frequents the spawning beds of the salmon of the coast rivers, where it devours the salmon eggs.

In 1916 the stomachs of 104 chubs were examined, of which 22 were empty. Of the remaining 82, 57, or 70 per cent, had entomostraca, and 25 contained water insects. They do not seem to take fish as food. They are used as food by squawfish and bull trout.

In 77 of the 104 stomachs tapeworms were found, but not in as great numbers as in either the squawfish or bull trout.

The fish are rather tenacious of life. Large numbers of those taken in the gill nets in 1916 were returned to the water, seemed not to be seriously harmed, and swam away.

The females spawn in late July or early August. Specimens taken at that time were either depositing eggs or were full of eggs. The males were full of milt.

During the breeding season adult males have a red line on each side, bordered with black. When the fish are removed from the water and left in the sun for a time the color disappears so that they are almost white. They are, therefore, erroneously called whitefish by some people, especially by boys. This is the fish boys may readily catch, as the proverbial hooked pin with dough for bait is eagerly taken.

The adult is from 8 to 9 inches long, weighing a little over a quarter of a pound. The largest specimen taken was 15 inches long, weighing a pound. Its flesh is of good flavor, and it deserves more recognition as a food fish.

**Oregon Chub, *Luciiscus gillii***

This handsome, brightly colored little fish, about 4 inches long, goes in large schools. It is probably not numerous enough to be of importance, except as food for some other species of fish. In 1915 a school of these fish was ob-

served at Osprey island, near the peninsula at the lower end of the lake. With a few sweeps of a butterfly net about 150 were captured. The stomachs of a number were examined. The food consisted mainly of entomostraca, with a few insects and one grasshopper.

**Native Trout, Flat Trout, *Salmo clarkii***

This fish also has the names of Black Spotted Trout, Salmon Trout, Flat Trout, Red Throated Trout, American Cutthroat Trout.

This species, named for Clark of the Lewis and Clark expedition, is native to the waters of the Pacific Coast. It is eagerly sought by all fishermen because of its fine edible qualities. During the summer months it is found sparingly in Flathead Lake, but in early spring, and again in early fall, it occurs in large numbers along shore, when it is easily taken with hook and line. On the east side its movement in the fall of the year seems to be from the head of the lake down the lake shore. At places only a few miles distant it appears a day or two earlier at the place farther up the lake.

During the summer of 1916, when the study of the food of fishes was being conducted, a total of about 25,000 feet of net was placed, at different times and in different localities. Only two fish were taken in the nets. They measured about 15 inches. Three others were taken in the previous year. As a result, the stomachs of only five fish have been studied. They contained only insects. One was a collector of beetles, having 12 in its stomach, besides other insects. One had a mass of insect remains, mostly mayflies and grasshoppers. One, taken in 1915, had 50 undigested and hundreds of partly digested insects.

The fish is clean, lives mostly on insect food, has few parasites, is gamey, and is very desirable for food.

(Possibly the reason the net took so few is that it occurs chiefly in the surface waters.—R.T.Y.)

**The Bull Trout, *Salvelinus malma***

This species is variously known in different places at bull trout, Dolly Varden trout, charr, Oregon charr, red-spotted trout, malma, and golet, a vernacular name in Kamchatka. It is distributed in the "streams east and west of the Cascade Range from the Upper Sacramento to Montana, Alaska, and Kamchatka, generally abundant northward, descending to the sea, where it reaches a weight of about 12 pounds. One of the most beautiful and active of the Salmonidae.\*

\*Jordan and Evermann, Fishes of North America, p. 508.

**GIVE AND TAKE**

The sportsman knows and heeds the rules.

He will not stoop to take a mean advantage of his foe, though victory is at stake.

He'll give his rival every chance to beat him if he can.

He'll battle for the goal he seeks, but battle as a man.

This is undoubtedly the largest fish in the lake. James Hyer, in 1916, reported taking one 37 inches in length and 25 inches in girth weighing 25 pounds 10 ounces. It was taken with



Dolly Varden or bull trout, from Flathead Lake. This is one of the large fish of the lake that is destructive to other fish, as shown by examination of their stomachs. It is a very desirable food fish, and is abundant in the lake.

a trolling line. Unauthenticated reports tell of specimens weighing up to 32 pounds.

It is undoubtedly the worst fish in the lake with regard to the destruction of other fish. Of 121 stomachs examined in 1916, 57 were empty and 64 contained fish or fish remains. Dr. R. T. Young mentions a bull trout 19 inches long containing a partly swallowed whitefish 13 inches in length. The majority of the fish found in the stomachs of the bull trout were, however, squawfish, which is not considered desirable.

In 1916, while studying the food of fishes at the Biological Station at Yellow Bay, a gill net of one-inch mesh was set in water about 10 feet deep. It was a daylight catch, in shallow water close to the laboratory. In about 15 feet of the net 196 Columbia chubs were caught, ranging from 7 to 10 inches in length, and 2 bull trout, weighing about 3 pounds each. The stomachs of the two bull trout were empty. No other fish were in the net. The inevitable conclusion is that the bull trout were chasing the school of chubs. In the desperate effort at escape the entire school were caught in the net, as well as the two enemies that were chasing them.

Not only is the bull trout an enemy of any other fish in the lake, but they are afflicted with both external and internal parasites. The external parasites are attached to the gills, fins and tail. They are small, degenerate copepods, and are entirely harmless. Of the large number of stomachs examined, all but three had tapeworms in the stomach and intestine. In some cases the worms were very numerous. They were often too long for either stomach or intestine without looping or folding, and some were bent back and forth several times. One stomach contained several spoonfuls. When the fish are cleaned for cooking these parasites are, of course, removed and destroyed, and are never eaten. But through the offal of the fish the tapeworms are undoubtedly further disseminated.

Bull trout die quickly after being caught in the net. Contrary to general supposition, in nets of small mesh, set for small fish and minnows, they were rarely caught.

(We have taken it down to 275 feet, but it is mostly found in 25-150 feet of water.—R.T.Y.)

### Rocky Mountain Bullhead, *Cottus semiscaber*

This fish is also called Blob, Miller's Thumb, Muffle Jaw, and Springfish. It is only 2 or 3 inches long, and has been taken occasionally among the pebbles along shore. The few specimens taken have been captured by skillful use of the hands or insect net. Many people about the lake have never seen the fish, for its color and habits are protective, and its size insignificant.

### Native Whitefish, *Coregonus williamsoni*

It is also known as Williamson's Whitefish, and Rocky Mountain Whitefish. It is found in the waters on both slopes of the Rocky Mountains.

It does not take bait often when sought with hook and line, but Pace says that when insects are present and whitefish are feeding on them they bite readily. He reports the best bait to be the larvae of stoneflies, abundant on the underside of stones in many places in the lake. This larvae is commonly but erroneously called helgrammite. The true helgrammite is the young of the Dobson fly, an inhabitant of southern Atlantic Coast streams.

During 1916 but 38 native whitefish were taken, 9 of which came from Yellow Bay. Of the 38 stomachs 16 were empty. Entomostraca were in great abundance, appearing in 14 stomachs. In some cases they could be taken out by the spoonful. Four stomachs contained insects, mostly the larvae of tipulid flies, simlium flies, and others that were not determinable. Six stomachs contained shells, one a planorbis, another several physa, and the others shells too mashed to determine. Two stomachs had soft material in which the animal life was indeterminable. One contained sand, bark, and grass. Seven of the 36 had tapeworms, one, two, or more. Compared with other species it is fairly free from these parasites. Pace reports that 6 specimens taken with hook and line at the outlet of Flathead Lake (1915) all had stomachs filled with insect larvae, mostly of the salmon fly. This insect is nearly mature at the time the fish were caught and were ready to leave the water and take wing.

This examination of the food of the native whitefish shows that the species is distinctly free from the charge of capturing fish. It lives on insects and other small water animals and is therefore a species to be encouraged.

While it is taken in various parts of the lake, it is abundant only at times and in certain places. The spawning season is in late fall, about November. In 1915 traps were placed at the mouth

## The Bullhead



When spring freshets come and the fellers who enjoy bringing home the big bacon begin to be active, that's the time that the *Cottus Bairdi Punctualatus* flourishes. To the scientists who have made a thorough investigation of the waters of Flathead Lake, the long-winded name quoted in the preceding sentence is what they call 'em. To the bait fishermen, who propose forming a society to propagate them, they're known as Montana bullheads. They are wee fellows and when a bull trout or a huge loch leven strikes he hasn't a chance to get away. He has swallowed everything up to the second joint of the rod and the meat hunter's job consists only in finding a cozy place to land him. This fellow, however, is known to scientists as a Blob, or Miller's Thumb. They report, after investigation of Flathead Lake, that this small fish is scarce, and of no economic importance except that it is destructive to fish eggs, and perhaps to small fish also. It hides among the rocks and pebbles along shore, is easily overlooked, and is quick in its actions when alarmed.

of Swan River, where it empties into the lake, by the State Fish and Game Commission, to secure eggs. Some 30,000 fish were taken. In 1916 a second attempt was made at the same place, but the number taken was negligible, and no eggs were secured. In 1917 a third attempt was made, but the number of fish taken was small.

The native whitefish is not rated at its true worth as a food fish, perhaps because of its apparent scarcity, perhaps because it does not take the hook readily, perhaps because by many it is confused with the Columbia chub, which is about the same size or smaller, and which becomes white when exposed to the light. It is a good pan fish, with good flesh. It is clean, and has few

bones as compared with the chub. The lake seems well adapted to the fish and the fish to the lake. The reason for their relatively larger numbers than some of the other fish is because they can live on the micro-organisms of the lake.

(It is practically impossible to tell the difference in taste between the native whitefish and the Lake Superior whitefish.

Native whitefish are taken mostly at depths of 25 to 100 feet.

The following data will give some idea of their relative abundance. On October 13, 1928, 1200 feet of net, 6 feet depth, set for 48 hours at a depth of 15 to 75 feet off Chapman Point, caught 52 bull trout, 18 native whitefish, and 2 Lake Superior whitefish. Off Cedar Island, 400 feet of net, in 11 days, raised October 13, 1928, caught 75 bull trout, 16 native whitefish, 4 Lake Superior whitefish, 9 squawfish, 11 suckers, and 4 Columbia chubs. On October 16, location not stated, 1200 feet of net, set 48 hours in 20 to 75 feet of water caught 20 bull trout, 15 native whitefish, 3 Lake Superior whitefish, 12 suckers, and 8 squawfish.—R.T.Y.)

The following species of fish have been introduced into the water of Flathead Lake, or adjacent streams and ponds, whence they may have escaped and entered the lake:

### Mackinaw Trout, *Christivomer namayensh*

Also called Great Lake trout, Longe (Vermont), Togue (Maine), Namaycush, Masamacush. Found in the Great Lakes region and lakes of northern New York, New Hampshire and Maine, headwaters of Columbia and Fraser Rivers, streams of Vancouver Island, and north to the Arctic Circle, Great Bear Lake, and Saskatchewan River.

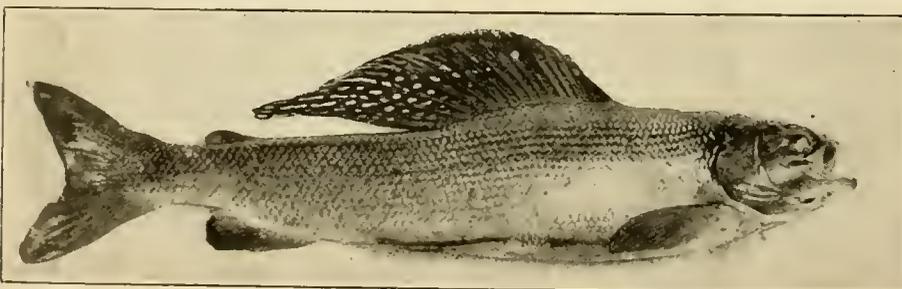
Henshall, in a List of the Fishes of Montana, printed in 1906, reports the Mackinaw trout as having been planted in Flathead Lake.

There seem to be no reports that this fish has been caught in the lake, but it may be confused with the bull trout.

### Black Bass, *Microperus salmoides*

Although there are many large mouth black bass in the lake, they are rarely taken. They are wary of the nets, and are not often caught by hook and line. When they are caught by hook and line, or by trolling, they are very gamey, and put up a good fight. During the study of 1916 the only ones taken were young fish driven into a net, 17 near the Biological Station in Yellow Bay, and 3 in Wood's Bay. Of these 9 had empty stomachs, 10 had remains of fish, and 1 had insects. Robert Oslund reported seeing the fish catching damsel flies on the surface of the water.

During 1916 the black bass was reported in considerable numbers in the shallow water of the lake, and among the grass and rushes at the mouth of Hell Roaring Creek, in the southeastern corner of the lake. At Wood's Bay they were abundant. Mr. Melton reported them common at the fish hatchery. In August (1916) they could be seen by the hundreds every day. In the evening they were swimming about in schools, close to the surface, with the



Montana's Famous Grayling

dorsal fin out of the water, cutting the water like miniature sharks. This was twelve years ago, when they were abundant. None were seen in the open lake, but they were distributed entirely around the lake near shore.

(Several were observed in and around the mouth of Hell Roaring Creek this year (1928) and small specimens were seen elsewhere near shore.—R.T.Y.)

The black bass was first planted in Blaine Lake in Flathead Valley near the Swan Range. By accident they escaped into Flathead River, thence traveling readily to Flathead Lake.

Since it is universally recommended that black bass should not be planted in water containing trout, because of its destructiveness to the eggs and young of the latter, the reduction of the numbers of native and introduced trout may be easily understood. With bull trout, squawfish, and bass taking young trout, the trout are in grave danger of being still further reduced in numbers.

It is true that an insufficient number of stomachs was examined to be certain of conclusions, yet of those examined 50 per cent used fish as food, while only one in 20 had insects in the stomach.

#### Chinook Salmon, *Oncorhynchus tshawytscha*

This is also called Quinnot Salmon, King Salmon, Columbia Salmon, Sacramento Salmon, Tywee Salmon, Sawdwey, and Tsawytscha.

According to Francis Ross these fish have been planted in the lake, and prior to 1912 were caught in Stoner's Bay, at Big Arm, and at the mouth of Flathead River. They may be expected in the lake at the present time.

(Not found this summer.—R.T.Y.)

#### Eastern Brook Trout, *Salvelinus fontinalis*

This fish was planted in the streams whose waters flow into the lake many years ago, and may have migrated to the lake. It goes also by the name Speckled Trout. It belongs to the charrs, of which it is the best known. While it has been largely introduced into western streams, it is not native west of the Mississippi River.

#### Rainbow Trout, *Salmo iridens*

This species was planted in the lake, as reported by Francis Ross, about 30 years ago. Since then they have been reasonably numerous. They are frequently mistaken for the native trout, and are probably caught without being recognized. The species is closely related to the Steelhead (*Salmo gair-*

#### THE NEXT DOOR DOG

Some people say the next door dog  
And mine are just the same.  
They say the only difference is,  
Mine has a different name.  
They say that tail and spots and ears  
And eyes and nose and bark  
Are just the same as my dog  
In the daylight or the dark!  
But for a million dollars down  
And fifty million more,  
I wouldn't trade my dog  
For the dog next door!  
He may look just the same to you,  
And may be just as fine:  
B U T  
The next door dog is the next door  
dog,  
And my dog—is—mine!

dueri), differing chiefly in having larger scales. It is a Pacific Coast species.

(Not found this summer.—R.T.Y.)

#### Sockeye (Saw-qui) Salmon, *Oncorhynchus nerka*

This is variously called "Blue-back Salmon, Redfish, Frazer River Salmon, Saw-qui Salmon, and Krasuaya Salmon. Jordan and Evermann say of it: "The redfish is known to ascend to the small lakes of Alaska, British Columbia, Washington, Oregon, and Idaho, and to spawn in their inlets. This species \* \* \* does not reach the lakes of Idaho until August."

To this must now be added Flathead Lake in Montana.

(Francis Ross reported one, in August, 1928, I believe from Yellow Bay. Mr. Arnet caught a female in early September. Mr. Smith caught a male October 25, which is now in the collection at the State University. These are the only records of Sockeye Salmon caught during 1928 of which I have knowledge.—R.T.Y.)

#### Lake Superior Whitefish, *Coregonus clupeiformis*

This is the common whitefish. Jordan and Evermann state of its distribution, "Great Lakes and neighboring waters, rarely ascending streams; not in Alaska nor Arctic America." However, the whitefish in the streams tributary to Hudson is generally referred to by writers as belonging to this species. J. B. Tyrrell, in his report of his exploration of the country between Churchill River and Lake Athabaska, in 1892, says: "The whitefish (*Coregonus clupeiformis*) is found everywhere throughout the district, but more especially in the shallower lakes." The fish

in Flathead Lake, which were transplanted from St. Mary Lake, a tributary of the Saskatchewan River and of Hudson Bay, are referred to this species.

A planting of some three million fish, secured from the United States Fish Commission, taken from the Great Lakes, placed in the lake several years prior to 1916, seemed to have disappeared. Repeated search failed to produce a single specimen. In 1916, during the months of July and August, 1250 feet of net were placed at various places in the lake, from shallow water to 200 feet in depth. No "Lake Superior" whitefish were taken. As they do not take the hook they had to be sought with nets.

A few years later eggs were secured from fish taken at St. Mary Lake in Glacier National Park. Presumably from these eggs but possibly from the first planting, the fish now taken from the lake have developed, but they are not abundant.

(They are taken in 25-100 feet depth. L. C. Smith notes that they come into the bays to spawn in winter. He has been catching a few for several years.—R.T.Y.)

#### Blnegill Sunfish, *Lepomis pallidus*

Also called Blue Bream, Blue Sunfish, Copper-nosed Bream, and Dollar-dee. This was first introduced in Flathead County in 1910, when 500 were placed in Church's Slough, a tributary of the Flathead River near Kalispell. A few years later they were caught in Lake Basin and Foy's Lake. They escaped into Flathead River, thence to Flathead Lake, and have been taken at Yellow Bay.

#### Crappie, *Pomoxis annularis*

Small Mouth Bass, *Micropterus dolomieu*

#### Bullhead, one of the catfishes

According to Francis Ross these three fish were planted in Church's Slough near Kalispell in 1910. They have easy travel to Flathead River in high water. From there they may enter Flathead Lake, hence they may be found in this water.

(L. C. Smith under date of November 19, 1928, writes that a Mr. Salaman of Polson caught a 22-inch silver salmon recently near Wildhorse Island.—R.T.Y.)

#### FISHING FOR SUCKERS

A man in a hospital for mental cases sat fishing over a flower bed. A visitor, wishing to be affable, remarked:

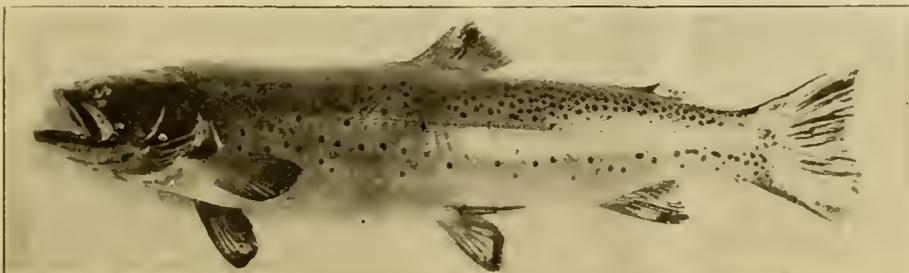
"How many have you caught?"

"You're the ninth," was the surprising reply.

#### BETTER OR WORSE

"Do you take dis heah man to be yo' lawful, wedded husban' fo' better or fo' wuss?" asked the parson of the able-bodied dusky bride.

"Ah'll jes' take him as he is, pahson," she responded. "Effen he gets any bettah, Ah knows de good Lawd's gwine to take him, and effen he gits any wuss, Ah'll tend to him mahse'f."



Another Montana Spotted Beauty

# The Zoology of Flathead Lake

By PROFESSOR R. T. YOUNG



R. T. Young

**W**ORK of the zoologist and field director of the station will cover the following matters: (1) Operation, (2) Methods and equipment, (3) Species of animals, with especial reference to fish and fish food, (4) General discussion and conclusions.

(1) Operations. The work of the station thus far covers the period from June 15 to November 18, inclusive. All of the staff were

present at the station from June 20 to August 4; some of the work (i. e., construction and testing of equipment, detailed chemical analysis, etc.), was carried on to better advantage in the laboratories of the university before and after these dates. After August 4 various members of the staff were present until the opening of the university on September 25, and since that time the field director, with an assistant, visited the station every week except one, until illness suspended his work on November 18.

Prior to June 26 the staff were mainly occupied in collecting equipment, much of which was of a special nature, requiring special designing and construction, in overhauling the station grounds and building, supervising the construction of tent platforms, landing dock, etc., and repairing the water supply line. The station and equipment having been idle for seven years required considerable attention before being fit for use.

Active field work began June 26. The work was two-fold in character, (a) qualitative, and (b) quantitative.

(a) Qualitative work consisted in collecting specimens and their immediate study and identification so far as possible in the laboratory, and their preservation for future examination. This material was collected from the open water of the lake, from reedy bays, from rocky shores and muddy bottoms, by methods to be described below.

(b) Quantitative work consisted in obtaining quantities of water of known amount from certain points in the lake at regular intervals throughout the season, by methods to be described below. These samples were collected in duplicate and preserved for future study.

The purpose of the qualitative work was to determine the kinds of plants and animals inhabiting the lake, while that of the quantitative work was to determine their abundance in different places and at different seasons. These organisms serve either directly or indirectly as food for all fish inhabiting the lake. Determination of their quan-

tity therefore tells us how much food is present. Especially is this determination important in the case of the whitefish, which in large measure feeds directly on the Entomostraca (semi-microscopic animals resembling the common crayfish in their general structure).

The qualitative work was done in practically all parts of the lake; the quantitative at chosen stations whose location and the periods at which they were visited were as follows:

Station 1, 1½ miles west of Yellow Bay on the main lake, depth 300 feet; visited approximately weekly from June 26 to October 27, inclusive.

Station 2, near the shore of Hell Roaring Bay, about 3 miles east of Polson, depth 5 feet; visited bimonthly from June 28 to September 2, inclusive.

Station 3, Somers Bay, about ½ mile east of Somers, depth 5 feet; visited bimonthly from July 2 to August 18, inclusive.

Station 4, mouth of Flathead River, depth 15 feet; visited same as Station 3.

Station 5, the "Narrows," about 6 miles north of Polson, depth 50 feet; visited bimonthly from July 7 to September 2, inclusive.

Station 6, near the mouth of the Big Fork River, depth 5 feet; visited bimonthly from July 8 to August 18, inclusive.

Station 7, Wood's Bay, depth 100 feet; visited on July 8 and August 21.

Station 8, Yellow Bay, depth 75 feet; visited on July 10, August 18 and November 18.

Station 9, Skidoo Bay, depth 40 feet; visited on July 14, August 19 and September 2.

## More Trout in O'Dell



**O**'DELL Creek, one of the feeders of the Madison below Ennis, is a favored fishing ground of Montana anglers. It has been closed by the Commission during the spawning season. Here's a snapshot taken during the spring when the fingerlings are being planted at the old V-F ranch. The picture shows the manner in which the little fish from the hatchery are emptied from the cans into the natural rearing ponds where they are allowed to thrive and grow until large enough to release.

Station 10, head of Big Arm, depth 30 feet; visited on July 24 and September 10.

The above depths are necessarily approximate, varying with the changing level of the lake at different times.

In addition to the collections listed above a special series of collections were made at Station 1 to test the day and night distribution of plankton at various levels, as many of these organisms are very sensitive to light.

All of the collections to date number about 800.

Besides the work on Flathead Lake, the field director visited St. Mary's Lake in Glacier Park and made some collections of fish food for comparison of its abundance in this lake, where there are considerable numbers of whitefish, with the amount in Flathead Lake, where the latter are scarce. This trip occupied four days in the middle of August. In making the collections he was assisted by Mr. J. M. Harbaugh, nature guide at the Sun Chalets. Mr. Harbaugh also collected a number of whitefish stomachs which have been preserved for future analysis of their contents. This assistance is gratefully acknowledged.

Lake Ronan, near Dayton, was also visited and collections of fish food made, for comparison with those from Flathead Lake.

(2) Methods and equipment. The latter may be mentioned first.

Apart from the special equipment used by Dr. Shallenberger in his studies on light penetration, the chief equipment of the station comprised two nets for collecting plankton, both in open water and among rushes near shore; a plankton trap, or device, which can be lowered to any desired depth while open, then automatically closed, employed in collecting samples for quantitative study; a water bottle for collecting samples of water at different depths for chemical analysis and for study of the very small plants and animals which are not caught by the trap; reversible thermometers which are used for obtaining temperatures at any depth; and a dredge, for collecting material from the lake bottom. The last two items were loaned to us by the U. S. Bureau of Fisheries.

A brief description of the method of making a series of collections at Station 1, for example, will illustrate the methods for all the other stations in the lake.

An anchored platform was kept at Station 1 throughout the summer. To this the launch was tied. While one of the party, which was usually four in number, took temperature readings from the surface down to 100 feet at five-foot intervals and at 200 and 300-foot depths, another member took samples of water with the water bottle at 10-foot intervals down to 100 feet and at 200 and 300 feet; while the two other members were operating the

plankton trap at the same depths as the water bottle. A surface towing was then made, and, in some cases, a bottom dredging as well. The time of taking the samples, as well as the condition of wind and weather, was recorded.

(3) Thus far the identification of the animal population has only begun, a total of approximately 100 species having been determined. These represent all the major branches of the animal kingdom excepting those which are exclusively marine. The large majority of these are found in shallow, reedy bays, where the temperature of the water is high and there is better shelter.

Here are found numerous Protozoa; several as yet undetermined species of nematodes, a few flatworms and annelids, numerous rotifers and Entomostraca and several insects and mites.

In the open water of the lake the rotifers and Entomostraca are the chief animals. These, naturally, vary as to kind and abundance, at different seasons. Of the former *Asplanchna priodonta*, *Anuraea cochlearis*, and *Notholca longispina* are probably the most abundant, while the latter are represented chiefly by *Sida crystallina*, *Daphnia longispina*, *Diaptomus ashlandi*, and *Cyclops bicuspidatus*.

In the mud, which covers much of the lake floor, are a few molluscs (snails and mussels), rhizopods (one-celled animals, often bearing shells of great delicacy and beauty), insect larvae, nematodes, and other animals which have not been adequately studied as yet.

It is impossible at present to give any definite information regarding the abundance of plankton or fish food in the lake. Plankton counts must necessarily wait for the identification of material, which is a tedious process, and in many cases will depend on the aid of specialists elsewhere. Up to the present time (January 1, 1929), the time of the zoologist has been occupied largely with the duties of collecting. Furthermore, since the middle of August, when most of the staff left the station, their duties have fallen to him, and in addition he has been handicapped by illness, so that the identification and enumeration of the collections has been necessarily postponed for the present.

Preliminary counts of two series (Station 1, July 12 and 26) have, however, been made. These show (1) that the amount of fish food in Flathead Lake is not large compared with that in many smaller and shallower lakes. Compared with other large and deep lakes in the northwest (Lake Tahoe, Calif.; Crater Lake, Ore., etc.), the plankton is fairly abundant. (2) The largest amount of plankton is found between the 10-foot and 100-foot levels, the different species, of course, differing in their distribution. Probably the two major factors in determining this distribution are light and temperature.

What is the source of the plankton or fish food in Flathead Lake? Part of it develops in the lake itself and part is brought in by tributary streams.

#### PLANT A TREE

Plant a willow by the brook,  
Poplars by the garden wall,  
Apples in some orchard nook,  
Maples for a gorgeous fall.

Set an oak for pasture shade,  
Slender pines to climb a hill,  
Elms, upon a velvet lawn,  
Set a tree with thought and skill.

Breathe a little loving thought  
For all trees this glad spring day.  
Birds and squirrels plant their trees.  
Don't you care as much as they?

What the relative importance of these two sources is can not be said at present.

In the lake the principal source of plankton is probably the shallow, rush-grown bays, where there are large quantities of the larger plants (rushes, pond weeds, etc.). These not only furnish shelter for the plankton, but their decaying remains (similar to humus in a forest) are an important source of nitrogen, one of the all-important elements in plant growth, and thus, in turn, of animals which feed upon plants. One of the reasons why the plankton is apparently so much more abundant in Lake Ronan than in Flathead Lake is the much greater amount of higher plant growth there than in the latter.

(4) General discussion and conclusions. Because of the necessarily incomplete character of the work at present, any conclusions to be made regarding it are tentative and subject to future revision.

The work on Flathead Lake thus far has shown that the lake is very rich in species of both plants and animals, but that these are not very abundant. The question of abundance is, of course, relative. Compared with nearby Lake Ronan, which has a maximum depth of probably 40 or 50 feet, an extensive growth of water plants and very small current, the amount of plankton appears to be small. Compared with a large, deep mountain lake, such as Crater or Tahoe, it is comparatively abundant. Lake Ronan abounds in fish, trout and salmon, while trout are abundant in cold, deep mountain lakes elsewhere. In none of these lakes, however, are Lake Superior whitefish to be found.

The Hudson Bay whitefish, which is identical with, or very closely related to, that of the Great Lakes, is fairly abundant in St. Mary's Lake in Glacier Park, probably because this lake is connected with the Hudson Bay drainage through St. Mary's River and hence the lake can restock itself. The collections from this lake have not, however, been counted yet, so that no comparison between it and Flathead Lake can yet be made.

The only data available to the writer on plankton abundance in lakes where the Great Lakes whitefish is native, is that contained in a brief paper by McKay, published by the University of Toronto in 1924, which gives the results of two summers' work (1922 and 1923) on Lake Nipigon, in northwestern Ontario.

This is a lake of some seven to eight times the area of Flathead Lake and about 60 feet greater depth. From 1916 to 1919, inclusive, 2,511,614 pounds of whitefish were taken here.

McKay's data is not closely comparable with that for Flathead Lake, since his collections were made in shallow bays, while the latter were obtained from the open water. It is to be expected that the shallow bays would contain much more plankton than the open water of the lake.

The following tables, consequently, give only a very approximate comparison of the plankton abundance in the two lakes. In these tables the diatom, *Asterionella*, and the flagellate, *Dinobryon*, are given in colonies, and the other species in individuals per cubic meter.

In Table A the depths of collection were less than one meter (three feet); in Table B, the Flathead Lake data are for the first 20 feet layer, while for Lake Nipigon the depths are not given, but were probably for the first 10 or 15 feet.

Recent collections, April, 1929, indicate a very much greater abundance of diatoms, especially *Asterionella* and *Synedra*, at this season, than during the summer.

TABLE A.

	July 12, 1928	July 12, 1923
<i>Asterionella</i> .....	275,000	349,000
<i>Synedra</i> .....	155,000	653,000
<i>Dinobryon</i> .....	Absent	2,933,000
<i>Ceratium</i> .....	1,000	84,000
<i>Anuraea</i> .....	Absent	6,550
<i>Diaptomus</i> .....	12,000	257
<i>Cyclops</i> .....	1,000	3,490

TABLE B.

	July 26, 1928	August, 1923
<i>Asterionella</i> .....	550,000	6,937,000
<i>Synedra</i> .....	Absent	452,000
<i>Dinobryon</i> .....	850,000	1,419,000
<i>Ceratium</i> .....	31,000	25,000
<i>Anuraea</i> .....	500	18,000
<i>Notholca</i> .....	Absent	2,200
<i>Diaptomus</i> .....	2,500	168
<i>Cyclops</i> .....	5,000	5,000
<i>Daphnia</i> .....	3,000	225

The relatively small amount of fish food present in Flathead Lake is probably largely due to the very great purity of the water, especially to lack of nitrogen-containing compounds, which are the ultimate source of food for all living things. Other factors may enter in, such as size of the lake, character of its shores, depth, clearness, and amount of flow; but the first factor is probably of major importance.

A third factor limiting the number of whitefish and other desirable fish is the abundance of their natural enemies, such as the bull trout, squaw fish, and suckers.

#### Summary

(1) So far as comparisons are available, the amount of fish food in Flathead Lake is greatly diversified in species but small in amount.

(2) The relative scarcity of fish food is probably due primarily to purity of the water, and secondarily to size, depth, flow, and scarcity of shallow, reedy bays.

(3) The scarcity of whitefish is due partly to scarcity of food and partly to natural enemies.

\*Neither sponges nor Bryozoa were found this year. Forbes (Bulletin U. S. F. C., Vol. II), however, has reported them from Flathead Lake.

# The Botany of Flathead Lake

Work Done by the Late DR. J. E. KIRKWOOD—Report by R. T. YOUNG



J. E. Kirkwood

**T**HE SUDDEN death of Dr. Kirkwood on August 15 was a great blow to the work of the station, and a personal loss to each of the staff. Dr. Kirkwood brought to his task a well-trained mind, keen and critical observation and, above all, a boyish enthusiasm, coupled with indomitable patience. Withal he was a kindly, pleasant gentleman who endeared himself to all of us.

He accomplished much during the two months of his work at the station, and yet this is but a beginning of what remains to be done on the botany of the lake. He had identified about 150 species, most of which were recorded by drawings as well as notes, and had made a few counts of their abundance.

The work of botanist and zoologist in a survey of this sort are closely allied to each other; they both use the same equipment and methods, so that the account of this part of the work given in the zoologist's report need not be duplicated here. It remains then to discuss briefly (1) the kinds of plants, (2) their distribution, and (3) their abundance.

(1) The plant life in Flathead Lake may be divided into the following large groups: the higher or flowering plants (Spermatophyta) including rushes, pond weeds, etc., algae (mainly unicellular microscopic plants), which may be subdivided into the blue-green algae (Cyanophyceae), the diatoms, flagellates, stoneworts (Characeae), and the green algae (Chlorophyceae) (including a large number of both unicellular and filamentous forms).

Of the total of 81 genera identified, 35 belong to the green algae, which, in number of species but probably not in number of individuals, constitutes the most important group in the lake. The blue-green algae are represented by 15 genera, diatoms by 13, desmids 9, and flagellates 8.

In number of individuals the diatoms probably are the most important. They are the most numerous species in the plankton of the open water, next in abundance being the flagellates. The other groups, while occasionally represented in the open water are seldom numerous there, being found mostly in the shallow bays.

## MIGRATION

By GENE STURTEVANT

In the springtime dawn,  
When the fog hangs low  
O'er the lake's lead colored breast;  
There's a flash of white  
And a thunder of wings—  
As the flocks from the south find rest.

Dim shadows they seem  
From the misty shore,  
As they circle and splash at play;  
While far on the lake  
Sounds the gull's soft pipe—  
'Neath the shifting curtain of gray.

The sodden ice field,  
With its fringe of white,  
Lazily drifts along—  
With a dash of spray  
And a rush of wings,  
The ducks to the north have gone.

—Outdoor America.

As to distribution the plants of the lake may be divided into (1) shore forms, those growing attached to rocks or other objects in shallow water, (2) plants of shallow bays, and (3) those of the open lake. Naturally these three categories are not mutually exclusive. Thus the forms of the open lake are also found in the shallow bays, while the attached shore forms may become detached and driven by the wind into the open water. Without going into details, the above is a general classification in reference to distribution.

The higher or flowering plants of the lake are found in shallow water in the bays. Hell Roaring Bay is the largest of these. The species mentioned in Dr. Kirkwood's notes are the rush (*Scirpus* sp.), the wire grass (*Eleocharis* sp.), the knotweed (*Polygonum amphibium*), the pondweed (*Potamogeton*, 3 species), the arrow head (*Sagittaria* sp.), the crowfoot (*Batrachium* sp.), and the sweet flag (*Acorus calamus*).

This list is certainly not a complete one. Dr. Kirkwood's attention was centered on the microscopic plants which form an important part, either directly or indirectly, of fish food, and his reference to the higher plants was, therefore, incidental.

Shore forms include *Oedogonium* sp., *Ulothrix* sp., *Bulbochaete mirabilis*, and *Stigeoclonium subuligerum*, and stalked diatoms, the number of species of which is not certain from his notes.

With the plants, as with the animals, the shallow, reedy bays are the richest collecting grounds in the lake. Here may be found practically all of the spe-

cies present in the lake, while the great majority of the shallow water species are found seldom, if ever, in the open water.

In the open water of the lake the most common species are the diatoms, *Asterionella gracillima*, *Tabellaria fenestrata*, *Melosira granulata*, *Fragillaria capucina*, *Synedra* sp., and *Rhizosolenia* sp., the flagellates *Ceratium hirundinella*, *Dinohryon divergens* and *stipitatum* and *Peridinium cinctum*.

From the few counts Dr. Kirkwood made it is impossible to say very much regarding the abundance of the microscopic plants in Flathead Lake. It is difficult to make comparison with other lakes because of the difference in kinds of plants inhabiting different lakes and because the kinds which are similar inhabit different levels. In general the number appears to be somewhat lower than in lakes of similar character elsewhere.

The greater number of these forms appear to occur between the 10 and 100 foot levels, the surface layer being comparatively few, at least during the day.

It is interesting and, at the same time puzzling, to note the differences in vertical distribution of certain species. The following table, which is a partial record of the collections on July 26 at Station 1, will illustrate this. The figures refer to the number of cells per cubic meter (about 35 cubic feet):

It is also interesting to find several species of diatoms at the bottom of the lake at 300 feet depth. On July 5 Dr. Kirkwood reports more organisms present at 300 than at 100 feet. The plankton animals also occur at the bottom of the lake, although in smaller numbers than nearer the surface.

Dr. Kirkwood's work tells us much regarding the general character of the lake flora and will serve as an excellent beginning for the work yet remaining to be done.

## Summary

(1) As in the case of the animal plankton, or fish food, in Flathead Lake, so in that of the plants there is large variety but not great abundance.

(2) The probable explanation of this relatively small quantity is given in paragraph 2 of the summary of the zoologist's report.

(3) The great majority of plants are found in the shallow bays.

(4) The most important of the microscopic plants in the lake are the diatoms.

(5) The green algae (Chlorophyceae) are the most numerous in species.

	Surface	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.	70 ft.	160 ft.	200 ft.
Asterionella	400,000	7,600,000	19,600,000	15,900,000	10,600,000	9,900,000	4,500,000	900,000	.....
Rhizosolenia	800,000	1,200,000	500,000	4,100,000	12,800,000	39,100,000	15,600,000	200,000	600,000
Dinohryon	3,900,000	23,100,000	42,300,000	58,200,000	78,000	420,000	.....	.....	1,600,000
Fragillaria	.....	5,200,000	10,700,000	15,300,000	6,800,000	5,500,000	1,100,000	.....	.....
Synedra	.....	.....	.....	200,000	78,000	840,000	500,000	.....	300,000

# The Physics of Flathead Lake

By PROF. G. D. SHALLENBERGER



G. D. Shallenberger

**H**EREWITH I am submitting a summarized report of the results of my summer's work on Flathead Lake. I was commissioned to investigate (a) the depth of the lake, (b) the penetration of light through the water, and (c) temperature variations, cooperating with the other men who were carrying on investigations bearing on the fish conditions in the lake.

## I. Depth

Before this work was started conversation with boat and lake people revealed considerable misinformation as to the depth of the lake. Reports came to us of localities of great depth, some aspiring to several thousand feet. These false ideas were undoubtedly due to the fact that no systematic study covering the whole lake had been made. So far as can be determined Dr. Elrod's soundings, to the number of about twenty-five, are the only ones on record.

In this investigation depth measurements were obtained with an improvised sounding device consisting of a reel, a calibrated phosphor-bronze line, and a plumb-bob. Locations were made by taking the bearings of three land-heads with a Brunton compass.

In all about one hundred and twenty-five soundings were made. These, supplemented by those previously taken by Dr. Elrod, permit the drawing of a map, which gives one a definite idea of the topography of the bottom.

The greatest depth that we have recorded is 329 feet, located about two and one-half miles southwest of Yellow Bay. In general the depth is greater on the east side than on the west. The average depth over all is about two hundred feet. The distribution and values of our soundings make it probable that there is no depth in the lake greater than 350 feet.

## II. Light Penetration

Anyone who has ever observed the sickly growth of potato sprouts in a dark cellar can readily understand the importance of the influence of light on plant life. Light penetration in water therefore becomes a vital question when it is recalled that the primary food of fishes is plants—microscopic plants.

The determination of the amount of light that is to be found at various depths is not a simple process. It requires scientifically designed and carefully operated equipment. In our measurements we made use of a photoelectric cell, with a current amplifying at-

tachment. This device was built in one of the laboratories at the state university at a low cost.

The unit in which illumination is measured is the foot-candle. The direct illumination from the sun has a maximum value of about 10,000 foot-candles; that from the sky at twilight is about 33 foot-candles; while that from the moon is only .02 foot-candles.

The following table illustrates the variation of illumination with depth. The data for this table were taken on August 20 between 11:45 A. M. and 12:02 P. M., when the sun's illumination was 8,000 foot-candles.

Depth-Illumination Table

Depth	Approximate illumination foot-candles
Just submerged	6,400
10 feet	2,500
20 feet	1,100
30 feet	700
40 feet	350
50 feet	240
60 feet	160
70 feet	74
80 feet	47
90 feet	30
100 feet	17
110 feet	11.7
120 feet	8.0
130 feet	5.3
140 feet	3.4

## Elk Becomes Pal



**J**ACK F. GOLDSBY, deputy game warden stationed at Polson, has a hobby of making friends with things that are wild. He doesn't care for the human wild things—much—but specializes in getting on speaking terms with denizens of the woods. During the last severe winter he not only devoted months to toting hundreds of pounds of wheat on his back to feed the prairie chickens, Hungarians and grouse, but made the elk respect and love him because of his constant kindnesses. He is shown here inducing a lady elk to eat out of his hand. During the heavy snows Deputy Goldsby fed the elk baled alfalfa supplied by the State Fish and Game Commission.

A study of the above table and others reveals the fact that the water at certain depths absorbs more light than at others, namely, the 30-40 foot and the 60-70 foot slabs. The inference to be drawn at this time from this fact is that in these slabs there reside greater quantities of non-aqueous material, probably fish food in the form of microscopic plants and animals.

## III. Temperature

Because of its influence on plant and animal life, we decided to study the variation of temperatures with season, with depth, and with air conditions. The data for this study were taken with a deep-sea reversing thermometer, loaned to Dr. Young by the Federal Bureau of Fisheries.

Given uniformity of sunshine, the principal cause of variation of temperature is wind. In general the agitation thus produced results in cooling the surface and in warming the water down to thirty or forty feet or in some cases more, depending on the vigor of the agitation. The maximum surface temperature variation observed during the summer was 7.5° C. (13.5° F.). This variation had a maximum of 1.5° C. (2.7° F.) at a depth of 100 feet. At 300 feet the temperature was confined between the limits of 4.5° C. (40.1° F.) and 4.2° C. (39.4° F.).

To get the day and night temperature variation a series of observations were made in the evenings and mornings of the 9th and 10th of August. The variation was on this occasion 3° C. (5.4° F.) at 30 feet. The variation would of course be affected by wind condition.

During the two months spent at the lake a large quantity of data was collected. A part of this has been studied, but there remains yet a considerable amount which must be worked over in conjunction with my colleagues, in order that the significance and bearing of the many facts may be determined. This is a tedious but important part of the enterprise.

## ADVERTISE

The codfish lays a million eggs  
And the helpful hen lays one;  
But the codfish doesn't cackle  
To tell us what she's done;  
And so we scorn the codfish coy,  
And the helpful hen we prize,  
Which indicates to you and me  
It pays to advertise.

## PERMANENT WAVE

Most of the family were at the parlor window watching the parade go by. Suddenly the mother turned to her daughter—"Where's your auntie?"

"Upstairs," came the reply, "waving her hair."

"Mercy!" exclaimed the mother, "can't we afford a flag?"

# The Chemistry of Flathead Lake

By PROF. J. W. HOWARD



J. W. Howard

**S**TUDY of the chemistry of the waters of Flathead Lake was undertaken from two standpoints, first, the dissolved gases and minerals which would affect the fish directly, and second, those which would affect the plant and animal life on which the fish feed.

As the accompanying data sheets show, this study was made at many different places on the lake and at various depths at each place; as well as at different times so as to detect seasonal changes.

Oxygen (noted in the table as cubic centimeters, cc., of oxygen, O<sub>2</sub>, per liter of water) is essential for the life of the fish. It was found to vary in different parts of the lake from 5.4 cc. to 7.7 cc. per liter, indicating that there was plenty of oxygen for fish life, even at depths of 300 feet.

Carbon dioxide (indicated in table both as bound and free carbon dioxide, CO<sub>2</sub>), would be harmful to the fish if present in large amounts in the free state. However, excessive free carbon dioxide was not found to be present. In most cases free carbon dioxide was entirely lacking and when found occurred only in small amounts, 0.25 to 0.75 cc. per liter. The bound carbon dioxide was there in the form chiefly of calcium and magnesium bicarbonates coming from dissolved limestone. These compounds are responsible for the so-called PH values, which are simply a measure of the relative acidity or alkalinity of the water. The water of Flathead Lake would be classed chemically as very slightly alkaline in reaction. This does not mean it is an "alkali"

water as popularly understood and is not of sufficient alkalinity to affect the fish.

Ammonia and organic nitrogen were determined for evidences of pollution, but were found in such small amounts as to indicate no dangerous pollution. Nitrites and nitrates are used by the plants as food and the fact that nitrites were never found and nitrates were found in only very small amounts would indicate these two plant foods are lacking in the lake.

The mineral analysis indicates that the mineral matter is present in such small amounts that the water would ordinarily be classed as "soft" water. No minerals were found which are injurious to fish. In fact no chemical condition was found which would be unhealthy for the fish. The only possible chemical lack in the water were some compounds necessary as plant food.

The following sheets contain the details of the data on which the above conclusions are based:

Samples Taken from Various Other Places in the Lake as Indicated  
Skidoo Bay—7-17-'28

Depth in feet	cc of O <sub>2</sub> per liter	cc of bound CO <sub>2</sub> per liter	cc of free CO <sub>2</sub> per liter
Surface	5.9	17.6	0.0
10	6.0	17.6	0.0
20	6.2	17.6	0.0
30	6.3	18.2	.25
50	6.8	18.2	.25

Elmo Bay—7-24-'28

Depth in feet	cc of O <sub>2</sub> per liter	cc of bound CO <sub>2</sub> per liter	cc of free CO <sub>2</sub> per liter
Surface	5.4	18.2	0.0
10	5.5	18.2	0.0
20	6.2	17.6	0.25
25	6.3	17.6	0.25

Alkalinity or PH=8.63.  
Dayton Bay on 7-24-'28 gave at surface: 5.5 cc O<sub>2</sub> per liter; bound CO<sub>2</sub>=18.2; free CO<sub>2</sub>=0.0.  
Alkalinity or PH=8.46.  
Rollins Bay on 7-24-'28 gave at both surface and 9 feet depth: cc O<sub>2</sub> per liter=5.6; cc bound CO<sub>2</sub>=18.2; cc free CO<sub>2</sub>=0.0.  
Alkalinity or PH=8.46.

Samples Taken from Flathead River Where It Flows Into the Lake

Date	7-2-'28			7-14-'28			8-3-'28		
Depth in feet	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter
S	6.5	15.1	0.75	6.0	18.2	0.25	5.6	20.3	0.50
18	.....	.....	.....	6.1	18.2	0.25	5.6	20.3	0.50

On 7-14-'28 were found .026 parts per million; .018 parts per million; no nitrites; no nitrates. Alkalinity or PH value=8.21.

Samples Taken from Swan River Inlet to Lake

Date	7-13-'28				8-1-'28				
Depth in feet	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter
Surface	6.1	16.6	0.5	5.4	17.6	0.25	5.4	17.6	0.25
S	6.1	16.6	0.5	5.4	17.6	0.25	5.4	17.6	0.25

Samples Taken from Main Float—Station No. 1

Date	6-26-'28			6-28-'28			7-5-'28			7-12-'28			7-19-'28			7-26-'28			8-2-'28		
Depth—feet	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter	cc. of O <sub>2</sub> per liter	cc. of bound CO <sub>2</sub> per liter	cc. of free CO <sub>2</sub> per liter
5	6.3	19.7	1.2	6.3	18.2	0.5	6.2	18.2	0.5	6.0	17.6	0.25	6.2	17.6	0.0	5.5	18.2	0.0	5.7	18.2	0.0
5	.....	.....	.....	6.3	18.2	0.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	6.3	20.2	1.0	6.5	17.6	0.5	6.4	18.2	0.5	6.7	17.6	0.25	6.3	17.6	0.25	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	6.7	18.2	0.25	6.5	18.2	0.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	6.6	19.7	1.0	6.7	17.9	0.25	.....	.....	6.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	.....	.....	.....	6.7	17.9	0.25	6.7	18.2	0.25	.....	18.2	0.5	6.2	17.6	0.50	6.1	18.2	0.0	5.9	18.2	0.5
30	6.7	19.7	1.0	6.7	18.2	0.25	6.8	18.2	1.00	6.7	18.2	0.5	6.4	18.2	0.50	6.4	18.2	0.25	6.2	18.2	0.25
50	6.8	19.7	1.0	6.8	18.2	0.5	6.8	18.2	1.00	6.7	18.2	0.5	6.7	18.2	0.50	6.6	18.2	0.25	6.7	18.7	0.5
100	.....	.....	.....	7.2	18.7	0.5	7.3	18.7	0.75	7.2	18.7	0.5	6.9	19.2	0.50	7.0	19.2	0.5	7.1	19.2	0.5
200	.....	.....	.....	.....	.....	.....	7.7	19.7	0.75	7.4	19.2	0.5	7.2	19.7	0.50	7.2	19.7	0.5	7.3	19.7	0.5
300	.....	.....	.....	.....	.....	.....	7.5	19.7	0.75	7.0	19.7	0.5	7.2	20.0	0.75	6.9	19.7	0.5	7.2	20.3	0.5

Samples were also analyzed on July 5th for ammonia, organic nitrogen, nitrites and nitrates with following results:  
At surface—0.062 parts per million of ammonia; 0.1548 parts per million of organic nitrogen. No nitrites and no nitrates in 20 cc.  
At 100 feet—0.108 parts per million of ammonia; 0.138 parts per million of organic nitrogen. No nitrites or nitrates.  
At 300 feet—0.168 parts per million of ammonia; 0.138 parts per million of organic nitrogen. No nitrites or nitrates.  
Alkalinity or PH values varied from 8.21 to 8.35.

Samples Taken from "Narrows" Channel

Mineral Analysis

Samples were taken for mineral analysis, near Somers, at the Main Float near Yellow Bay and near Polson, in order to ascertain if there were variations in the lake. Results were practically identical in all three places, namely, 85 parts per million—a very low mineral content.

This was further analyzed with the following results:

Date	7-7-'28			7-23-'28		
	Depth in feet	cc of O2 per liter	cc bound CO2 per liter	cc free CO2 per liter	cc of O2 per liter	cc bound CO2 per liter
Surface	6.5	18.2	0.5	5.7	18.2	0.0
10	6.5	18.2	0.5	5.7	17.6	0.15
15	6.5	17.6	0.5	5.8	18.2	0.25
20				5.8	17.6	0.25
25	6.8	17.6	0.5			
30	7.0	17.1	0.5	6.0	17.6	0.25
50	7.3	18.7	0.25	6.3	17.1	0.50

Mineral	Parts per million
Silicon Dioxide	8.2
Iron and Aluminum Oxides	9.4
Calcium Oxide	28.0
Magnesium Oxide	8.8
Chlorides	0.315
Nitrates	.0008
Sulfates	24.97
Sodium Oxide	0.865

On 7-7-'28 this water was found to contain 0.038 parts per million of ammonia; 0.090 parts per million organic nitrogen; no nitrites; no nitrates, at surface. At 50 feet gave .048 parts per million of ammonia; 0.132 parts per million of organic nitrogen; no nitrites; no nitrates.  
Alkalinity or PH value=8.21.

Samples Taken from Wood's Bay, 7-13-'28

Depth	cc of oxygen per liter	cc of bound CO2 per liter	cc of free CO2 per liter
Surface	6.4	18.7	0.50
50 ft.	6.7	19.0	0.50
90 ft.	6.9	18.7	0.50

Alkalinity or PH value=8.38.

Samples Taken from Yellow Bay, 7-10-'28

Date	7-10-'28		
Depth in feet	cc of O2 per liter	cc bound CO2 per liter	cc free CO2 per liter
5	6.3	18.2	0.25
10	6.4	18.2	0.25
20	6.6	18.2	0.25
30	6.6	17.6	0.25
50	7.2	17.6	0.50
70	7.3	18.2	0.50

Alkalinity or PH value=8.50.

Samples Taken from Hell Roaring Bay

Date	6-30-'28			7-7-'28			7-23-'28		
Depth in feet	cc. of O2 per liter	cc. bound CO2 per liter	cc. free CO2 per liter	cc. of O2 per liter	cc. bound CO2 per liter	cc. free CO2 per liter	cc. of O2 per liter	cc. bound CO2 per liter	cc. free CO2 per liter
5	6.2	19.2	0.25	6.3	18.7	0.0	5.5	18.2	0.0
5	6.2	18.7	0.25	6.5	18.2	0.0	5.5	18.2	0.6

On 7-7-'28 this water gave 0.026 parts per million ammonia; 0.074 parts per million organic nitrogen; no nitrites and no nitrates.  
Alkalinity or PH value=8.21.

Samples Taken Near Log Boom of Somers Lumber Co. at Somers on 7-2-'28

At surface—5.3 cc. O2 per liter; 18.2 cc. bound CO2; 0.75 cc. free CO2.  
At 25 feet—6.3 cc. O2 per liter; 17.6 cc. bound CO2; 1.00 cc. free CO2.  
Alkalinity or PH value=8.21.

Samples Taken Near Somers—Station No. 3

Date	7-3-'28			7-14-'28			8-1-'28		
Depth in feet	cc. of O2 per liter	cc. of bound CO2 per liter	cc. of free CO2 per liter	cc. of O2 per liter	cc. of bound CO2 per liter	cc. of free CO2 per liter	cc. of O2 per liter	cc. of bound CO2 per liter	cc. of free CO2 per liter
5	6.3	17.6	0.25	6.3	18.2	0.25	5.6	17.6	0.25
5	6.3	17.6	0.75	6.3	18.2	0.25	5.6	17.6	0.25

On 7-14-'28 were found 0.66 parts per million of ammonia; 0.106 parts per million of organic nitrogen; no nitrites; no nitrates.  
Alkalinity or PH value=8.21.

First Rules for the Flycaster

**H**OLD the rod lightly but firmly with the thumb pointing in line with the rod and keep your elbow close to your side. Strip a little line from the reel and begin casting easily, stripping a little more line from the reel at each cast. Don't work too fast and thrash. Use only the wrist and forearm, bearing in mind the rod should and will do the work and not the arm. When you make the back cast, that is bring the line behind, bring the rod straight back over the shoulder, not out to one side. At the completion of this back cast the rod should be slightly back of perpendicular. It is a common fault of a large number of casters to bring the rod too far back. To acquire the proper form, and to prevent oneself from falling into this bad habit, it is well to adopt the rule of bringing the rod up directly in the face, thereby preventing the rod from going back too far and driving the line into the water behind.

In making the forward cast the rod and forearm should be in the same line, making the forward cast with an easy, sweeping motion of the rod and finishing it with a smart forward turn of the wrist only, letting the rod go forward or follow through until it is nearly parallel with the water. You will get the correct motion quicker if you practice casting with the elbow held tight to the side, the forearm vertical, and use the wrist above.

To make the back cast, hold the rod parallel with the water and pull in any slack line with the left hand. Begin the backward motion of the rod slowly but accelerate the movement until it ends with a sharp backward flip of the rod, nearly a jerk made by the wrist only.

Do not let the rod go very far back. Behind you a little to the rear of vertical is correct. Hold it in this position allowing the line to straighten out behind. If you start the forward cast too soon or too sharply you will snap the flies off. Remember that the line must go as far behind as it does in front. A little practice will teach you the proper turning of the forward cast. A good way to begin is to wait until you feel the pull of the line then cast forward.

A beginner should not attempt to cast a long line at first; it is a bad and common fault. To be able to handle a long line right you must first master the short line, and this can only be done with much practice and then some more practice. Remember, too, that most actual fishing is done with a fairly short line, not often over 30 or 40 feet. It is best to start practicing with a fairly heavy line as it works easier, but the best for fishing is the lighter line. It is absolutely necessary that the line should be of a size to fit the weight of the rod and if they are not in balance your rod will not snap out your line properly, and your casting will be greatly impaired. A double tapered line is by all odds the best to use for good work.

Young Squawfish



Young squawfish of this size take the hook readily in Flathead Lake and are caught in large numbers, but are not often eaten. There is no reason why these fish should not have more extensive use for food, according to scientists. Fish of this size are about right for food, as the entire fish, head removed, will make one good portion for a meal.

# MONTANA STATE FISH AND GAME COMMISSION

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VOLUME II

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NUMBER 1

### THE WORK OF MONTANA SCIENTISTS

**M**ONTANA'S State Fish and Game Commission, in this edition of MONTANA WILD LIFE, presents to sportsmen of the state and nation a composite, scientific review of achievements of experts employed by the Commission in searching the waters of Flathead Lake for informative data. These scientists of the University of Montana, working under direction of Chancellor M. A. Brannon, President C. H. Clapp and Dr. M. J. Elrod, have been paid by the State Commission to apply their knowledge and experience to the solution of piscatorial problems of Montana's greatest body of water. It has been an experiment unique in the annals of conservation in the nation. Reports of these trained men have been compiled for the benefit of other conservation organizations, for the information of sportsmen of Montana and as the foundation upon which the Commission may work in stocking the lake formed by "millions of dewdrops." The reports are self-explanatory. They deal in detail with the zoology, physics, chemistry and other features of the lake and form a rare collection of authoritative information that may well find its place in reference libraries of schools, universities, colleges and libraries of the United States.

Don't blaze a trail indiscriminately. A few conspicuous blazes are better than ten times the number that are hard to find. Always look back to make sure your last blaze is in sight before you make your next one. Place your blazes at least breast high. Always study a map before going into a new country.

### GAME COUNTED FROM THE AIR

**P**RACTICAL value of the airplane in making game surveys has recently been demonstrated in Alaska. On a recent flight over the Big Delta region southeast of Fairbanks, Alaska, according to one of the game protectors of the Alaska Game Commission, an official of an Alaska airways company saw about 500 caribou and nine moose, and three days later near the Toklat River counted 20 moose, 12 of them in pairs, three in one bunch, and five in another. The reactions of the moose and of the caribou to the airplane and its noise, says the protector, were quite opposite. The moose paid practically no attention to the strange machine, lifting their heads now and then to look at it but usually not becoming frightened. The caribou, however, became considerably alarmed and ran away. The tracks and trails of the animals were plainly visible from a considerable height. It is illegal to hunt game animals of any kind in the territory from an airplane.

### BIRDS NEEDED TO CHECK INSECTS

**L**OSSES due to insect pests throughout the country are estimated by Professor P. J. Parrott of the New York state agricultural experiment station at \$1,600,000,000 annually. It would be interesting to know how much of this huge loss might have been averted had birds been protected. While not many species of birds have been wiped out, as was the passenger pigeon, great reduction has occurred in their numbers. At the same time, extension of cultivation has spread a feast for many varieties of insects to which they come in their swarming billions.

We are now increasing the number of bird refuges and protecting them in their migrations. It is a movement which should continue until the balance of nature is re-established and we get all the help possible in the task of holding insects in check.

### BEAUTIFY THE HOME

Now is the time for all good men to come to the aid of their homes by securing and setting out shrubs and ornamental trees, as well as fruit trees. You will do well to bear in mind that flower seeds planted and tended bring priceless sunlight into and around the home.

### GAME BIRDS FOR MONTANA

**C**ONSTRUCTIVE steps taken by Montana's State Fish and Game Commission to establish a state game farm for the rearing of Hungarian partridges, Chinese pheasants and prairie chickens, have been greeted with acclaim by sportsmen of the Treasure state. They realize that fields and coverts must be restocked. Unfavorable seasons have necessitated closed seasons. The seed birds have been saved in years past by timely action of the Commission. The establishing of the game farm for the artificial propagation of game birds for liberation is another step forward.

The game restoration program advocated by Arthur L. Clark in the "National Sportsman" contains a vast amount of practical advice. Following is a fair sample:

"If you want more game, the very quickest way to get it is to raise it. What could be more direct and obvious? The fact that nearly every state game department now operates one or more game farms, or at least buys game for restocking, shows that sportsmen generally appreciate the necessity of raising and liberating game to restock their covers.

"There are still many who labor under the delusion that having paid their license fee, joined some organization and contributed a few dollars to the cause, their obligation is ended and better hunting and fishing will result. Doubtless it will in a general way, but the effect of the few dollars so expended won't be noticeable in the covers where you do most of your hunting. A license fee of \$3, for example, would buy only one bird even if it could be spent wholly for that purpose, which it can not. Your contribution to the cause won't affect your own sport materially. The point is that having discharged these obligations as you see them or as required by law you still have your own interest to look out for. Every dollar which you spend in improving conditions in your home covers under your supervision will return direct benefit to you of many times its original value. You are not particularly interested in the conditions in some distant place. A certain amount of philanthropy is laudable, but after all if you will work and spend money to improve conditions in your locality, and if the sportsmen in every other locality would do the same, each one acting as the game breeder and gamekeeper for some favorite cover, the whole problem would be solved and waste effort would be avoided."

## COMPLAINTS SHOW GAME INCREASE

**M**ONTANA'S laws provide no means whereby farmers who declare that elk or deer have injured their crops or destroyed hay stacks, may be recompensed. Hence, when these claims are presented to the State Fish and Game Commission, the law requires that they be disapproved. The optimistic view of the situation is taken by the sportsman who sees in these alleged domestic raids the increase of big game in the state. Similar word comes from Michigan. The true conservationist gives willingly of his feed in order that big game and game birds may be fostered.

The increase in number of complaints to the Michigan Department of Conservation regarding damage done to livestock and agricultural crops by deer, bear, beaver, pheasants and other wild creatures is interpreted by that department as unmistakable evidence of increases in wild animal life and is taken as a matter of congratulation, notwithstanding the annoyance incident to the complaints.

In one county in Michigan it is reported that 200 deer were seen grazing in a farmer's clover field. A conservation officer found from 500 to 1,000 deer wintering in a cedar swamp. In the vicinity of one lake thousands of geese threatened the newly sprouted grain crops of the farmers. Reports of damage by bear are numerous and beaver invariably create havoc where they become established in a settled community. The pheasant is complained of by certain farmers because of his propensity to pull up sprouting corn.

These incidents have to be dealt with as the farmer is entitled to protection, but at the same time they do indicate a growing population of wild creatures, which is the objective of the conservation departments of states. It is often found that reports of damage are greatly exaggerated and sometimes purely imaginary, although there are many cases on record of injury. The announcement of the department doesn't indicate that the situation is considered serious as the problem of taking care of the increasing wild life is far less difficult than the problem of increasing it.

If you are going any distance into Montana mountains do not rely entirely on an electric flashlight. Good candles are indispensable. A good light or "bug" can be made from a five-pound lard pail or jam tin with a jagged hole in the side to hold the candle and the handle placed lengthwise of the tin directly above it.

## THE GAME BAG

**G**OD has lent us the earth for our life; it is a great entail; it belongs as much to those who come after us as to us, and we have no right by anything we do or neglect to involve them in any unnecessary penalties or to deprive them of the benefit which was in our power to bequeath."—Ruskin.

Your camp jack knife should not be too large, of good steel, with two strong blades, a can opener, leather punch and a file.

## RAISE FOOD FOR GAME

**F**OLLOWING the recommendation of the American Game Protective Association and the New York Development Association, the New York Conservation Department began this spring the establishment of seed beds at its forest reserves which are expected to turn out from five to six million trees a year and in addition to growing stock for forest purposes, a new nursery which is being established this spring will be used for raising food plants, trees and shrubs for planting on state game refuges to insure an abundant supply of food for game. The varieties which will be cultivated at this nursery for this purpose include the white mulberry, red mulberry, Russian mulberry, several species of dogwood, chokeberry, hawthorn, Virginia creeper, bayberry, mountain ash, withered, arrowwood, black haw, wild crabapple, winterberry, and Japanese barberry. Other food plants will be added as they are found to be suitable for cultivation in this way.

The New York Conservation Department recognizes the fact that game refuges may not prove all that is expected of them. It also realizes that closely planted commercial forests are not suitable for game. Game refuge areas are being created in the forest reserves of New York and other parts of the state which will be managed with a view of maintaining a maximum supply of food which, with adequate protection, will mean a rapid increase in game.

## YELLOWSTONE BOUNDARY COMMISSION

**T**O SETTLE the disputes of some years' standing regarding proposed changes in the boundary of Yellowstone National Park, the last session of Congress passed a bill authorizing the President to appoint "The Yellowstone Park Boundary Commission" to study the territory and report its findings. Acting on this authority, President Hoover has appointed Dr. E. E. Brownell of San Francisco, and Dr. T. Gilbert Pearson, President of the National Association of Audubon Societies, as two members of this commission because of their "interest in the conservation of wild life and in the conservation principles embodied in national park creation." The other members of the commission are Dr. Arthur Morgan, President of Antioch College of Ohio, who is an authority on irrigation and water power problems; C. H. Ramsdell of Minneapolis, landscape architect and member of the National Park Committee of the American Association of Landscape Architects; and Arthur Ringland of Washington, expert on forest resources.

The members of this commission will spend two weeks or more this summer riding on horseback the south, southeast, and southwest boundaries of the Park, in order to get an opportunity to study on the ground the problems which are involved.

There are many questions to be settled in the Yellowstone Park boundary. Very important is whether there shall be an extension from the southeast corner of the Park to include a considerable territory occupied by the Yellowstone southern elk herd during the autumn and winter. Today this is a popular region with elk hunters. Montana is deeply interested.

## THE MIGRATORY BIRD BILL

**R**EPORTS received from various sources indicate the passage of the Norbeck-Andressen bill has been received with acclaim on the part of sportsmen, conservationists and state game administrations throughout the United States, and its passage is considered as one of the most advanced steps in conservation which have been made in many years.

Generally speaking, hearty cooperation has been had by the Biological Survey on this bill, the states realizing that one or more refuges coming under this bill would be the salvation of duck shooting in their localities. The state of Washington, however, has surprised conservationists, in view of the fact that Washington has always been considered as a progressive game state.

Information has been received that a bill "concerning the acquisition by the United States of land, water or land and water within the state for migratory bird reservations authorized by act of Congress February 18, 1929," passed both the house and the senate of Washington, but was vetoed by the governor, who gave as his reason the withdrawal of more land from the tax roll would affect the finances of the state.

It is not believed that the true situation was understood by the governor, because of the fact that a continuance of good duck shooting would bring into the state more money in the way of license fees and purchases of outdoor equipment than could possibly be obtained by taxation over the same areas.

Such an area as would be desired by the federal government for a migratory bird refuge under the Norbeck-Andressen bill would be a swamp area not capable of producing much besides migratory birds and for that reason not subject to a high rate of tax.

## WASHINGTON WATERFOWL SURVEY

**T**HE State of Washington, under the management of S. F. Rathbun, Superintendent of the Department of Fisheries and Game, has undertaken a comprehensive and exhaustive survey of waterfowl areas and resources of that state. One of the objects is to determine areas suitable for development as waterfowl refuges. All such areas will be carefully examined and mapped. Not only areas now in existence as valuable waterfowl resorts will be examined, but all which may offer opportunity for development. Reports of such areas as a result of this survey will show location, acreage and ownership of all areas examined, character and abundance of waterfowl food found in them, species of waterfowl frequenting them, and information as to increase or decrease in numbers of such birds.

# Food for Montana Game Fish

**M**ONTANA'S trout angling season opened on May 21. But the waters in creeks, rivers and lakes have been high and the fly fisherman has been biding his time. Anglers who prefer to use the well known barnyard hackle or sand flies, otherwise known as angle worms, have been hooking a few big ones in favored holes. Then, too, the fellers who enjoy snagging a snucker and feeding the meat of that poor fish to hungry game fish, have been getting enough to stink up a pan.

But when come the fly fishing days, come the days of real sport. It's the time of year when the sportsmanship of anglers reaches its zenith. The trout and the grayling are given a chance. The increasing popularity of the barbless hook, which places the burden of the job on the guy with the pole, is playing an important part in making Montana fishing worth while.

One of these Arkansaw yanks when a trout strikes, throwing the poor fish over the shoulder onto the bank and into a mess of brush, has no place in the category of the sportsman who delights in playing and giving the fish a chance.

Here's a little bit of Waltonian philosophy that's well to think about: When you're fly casting, do you look about you? Do you scan the waters and ascertain what the trout are feeding on before dropping in your fly? Do you study the condition of the waters and satisfy yourself that the trout are feeding in the holes or the riffles? After you land your first one do you make an examination of the stomach to further enlighten you regarding acceptable trout food?

George A. Coleman has written an interesting article on "The Food for Trout" in Outdoor Nebraska and it is published herewith for the information of Montana anglers:

"The more I study the data available from the dissection of the stomachs of trout caught in our lakes and streams, the more I am convinced that our trout in the wild state exercise great powers of selection of their food from the available natural supply, whether that be insect or crustacean. Just what the factors are that govern this selection is a problem which has not yet even been worked upon.

"The contents of the stomach of a trout caught in any lake or stream on any given day does not by any means determine the food of that trout through the year. It is simply an index of the available supply of food for that particular section of the lake or stream where the trout was caught and of what the trout in question selected during the day.

"There is frequently a great variety in this daily menu. I am often very much surprised to find not a single specimen of the insect or crustacean which is in the greatest abundance and by all man-made rules should fill that trout's stomach to bursting. I have

often watched young trout fry, only an inch or so long, jumping at gnats, or midges, on the surface of the water. I have observed them catch and swallow insects almost as large as their heads when they could, without any trouble, be quietly taking great quantities of minute crustaceans available in the water. This must be explained as some biological urge of which we know nothing, otherwise we would put it down as just 'pure cussedness.'

"In order to make sure that my eyes did not deceive me in this matter, I caught and examined the stomachs of some fry, but ten days old. The collection was made between 10 and 11 a. m., after a good morning's meal. One such lot gave the following results:

"One fry averaging 25 mm. in length—  
Average No. gnats (2 species).....20 each  
Chironomous larvae ..... 1 each  
Young water boatmen ..... 1 each  
Crustacea (very abundant) ..... 2 each  
Water fleas ..... 2 each  
Water fleas Daphnia ..... 1 each

"It would seem, in this case, that in spite of the prevalence in the water of thoroughly good natural food, the instinct to jump and catch food on the surface was stronger than the mere hunger urge—even at this early age.

"On the other hand, when circumstances require it, young trout will go to any trouble and exercise great ingenuity in obtaining food. An instance illustrating this fact occurred during the course of an exploration on the headwaters of the Kern and Kings Rivers. This was an exceptionally dry year. We found many instances of small tributary streams which were dried down to a series of mere pools only a few yards in extent. In many

cases these would be a mass of decaying vegetation and mire. In these I often found hundreds of young trout, 2½ to 4 inches in length, their stomachs filled with the larvae of Chironomous (a midge) and other insect larvae which were available in the mud of these pools. This adaptation enables the young trout to survive until the middle of October, when the early snows would supply these streams with water, and these trout would again be able to assume a somewhat normal existence.

"Thus, mother nature has provided the fish organization with wonderful powers of adapting itself to its environment. If this were not so, the fish culturist would never be able to take fish from their natural environment and place them in entirely artificial surroundings with artificial food, and still make good fish of them.

"Age has a great influence upon the selection of the daily menu of trout. Apparently they become cannibalistic in their tendencies after they are a few months old and become more so as they reach adult size. It further seems that they find it easier to devour a few of their fellows, who have already fed on insects, than to hunt up their own insect or crustacean food. It, therefore, takes something unusual in appearance in the way of an insect or crustacean, alive or in artificial bait, to attract a big fish whose predaceous instincts are fully developed.

"The question whether a given stream or lake is suitable for trout and, if so, how many it will support, is one which can not be determined definitely by a hasty survey of that lake or stream on any given date. The plant life plankton, insect and crustacean food must be studied at different seasons in order to obtain reliable data on the available supply throughout the year. Physical data, such as temperature, dissolved oxygen and carbon dioxide and chemical composition, must also be noted. Then, if there are trout living in the lake or stream, collections of these and examination of their stomach contents at different seasons will give further reliable data.

"Another study, which should engage our attention before any extensive planting of our barren lakes at high altitudes with either plant or insect food is undertaken, is an intensive study of the life histories of a few of our more abundant aquatic insects which we know to be frequently taken by trout for food. This study should further embrace an investigation of a few of the most abundant crustaceans, their requirements for food, temperatures for growth and other physical requisites.

"As we compile more and more data on the food requirements of each species of trout, and gain more knowledge about the plant, insect and crustacean life of each lake and stream, we will arrive at a sounder and more scientific basis upon which to rely for the distribution of the trout from our hatcheries."

## Beaver Cuts 'Em Down



**H**ERE'S a splendid picture of a Montana beaver tree. The sharp-toothed little animals work days and nights whittling away at these whopping trees in the hope that they may eventually fell them for use in damming creeks and brooks to preserve their homes. Thousands of Montana farmers, miners and woodsmen are proud to have such landmarks of beaver activity on their farms and claims. The marks of the chisel-teeth of the little animals whose fur is so eagerly sought are plainly visible in the picture.

# Fur Farms Produce Millions

**M**ONTANA'S State Fish and Game Commission has issued permits to 191 fur farm operators up to June 1 of this year. To the man in the street who has given fur farming but passing notice, it is but a sportsman's hobby. To the business man who has given the subject careful consideration, fur farming is one of the budding industries of the state with possibilities that are roseate. Equipped with natural surroundings that are ideal, with climatic conditions that are perfect, with hills, swamps and dales that are the



Breaking the ice at the Atwater beaver fences in the creek.

native habitat of foxes, rabbits, muskrats and other fur-bearing animals, millions of dollars will soon be harvested from the fur farms of Montana.

Silver and black foxes have already come into their own as prized Montana products. The farms at Red Lodge and Kalispell have taken the lead.

Manager Atwater of the newly established Black Beaver Fur Farms has imported Lake Superior Black Beaver and placed them on his tracts in Montana after first securing the approval of the State Fish and Game Commission. He is also planting Montana stock on these naturally located breeding areas. Photographs accompanying this article were taken on the Atwater farms.

Long before Lewis and Clark, the



Here's Mr. Beaver shown held harmless and without injuries in the clamshell trap approved by the government Biological Survey for the trapping and transportation of beaver to locations other than which he occupies.

The trappers came before the gold hunters. Their catches began bringing profits to Montana long before the gold was being panned in Last Chance Gulch,



This is another view of the "clamshell" trap approved by the government, with the beaver in the trap, loaded on the Atwater truck ready for transporting.

Alder Gulch, Virginia City, and camps that are now listed among ghost villages.

Even the "little striped kitten" is contributing his share, despite one of the hackneyed quips:

Teacher: Rastus, what animal is most noted for its fur?

Rastus: De skunk; de more fur you gits away from him de better it is fur you.

The number of fur farms in the state has more than doubled in the last three



Mr. Atwater is shown here tagging beaver for purposes of identification in case he strays away from the fur farm.

years. An interesting fact is that they are scattered in 37 of the 56 counties of the state. Flathead leads with 15 fur farms, Yellowstone has seven, Lake has six, Carbon and Gallatin five each. Other counties having more than two farms are: Missoula, Lewis and Clark, Sanders, Stillwater, Park, Lincoln, Deer Lodge, Ravalli and Broadwater.

Some of the farms have been quite successful. One near Kalispell is an example. Started from a small beginning a few years ago, the ranch now not only breeds and raises silver foxes but also takes fox pups from Alaska breeders for finishing off, as the Montana climate is known to produce the finest quality fur.

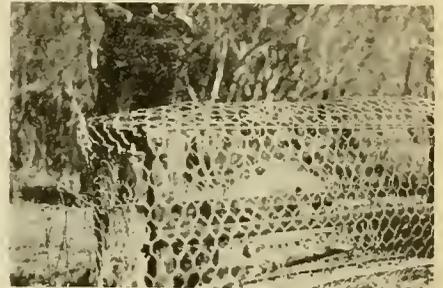
Another is said to be the largest muskrat farm under fence in the United

States. Five acres are fenced near Swan Lake in Lake county and more than 100 experimental pens have been constructed. It is expected that within a short time the ranch will produce 20,000 to 30,000 pelts annually.

A farm in Yellowstone county raises skunks, otter, raccoon, 'possum, mink and muskrat. An account of this farm says: "Furs shipped from this section of the country command a higher price as a rule than those from other states, climatic conditions being good for the production of high quality fur."

A farm in Mineral county has domesticated lynx and one in Missoula county now has about 600 foxes.

A ranch in Cascade county has purchased 1,000 pairs of muskrats, while one north of Corvallis in the Bitter Root raises Karakul sheep, the bearers of Persian lamb fur for trimming wear-



This picture shows a beaver caught in an ordinary box trap equipped with wire netting.

ing apparel, besides black foxes, skunk, raccoon and muskrat.

Demonstrating shifts in the fur industry, it is pointed out that the lowly jack rabbit probably contributed more to state income in Montana last year than any other fur animal with the exception of the muskrat. During the winter of 1926-27 one firm alone took 53,498 rabbit skins out of Montana. Practically all of these skins were jack rabbit skins. The skins of the white rabbit, stretched and dried, brought 60 cents a pound, or about 17 cents each, and the gray rabbit skins 40 cents per pound. The rabbits are of some value as food and game and their flesh is sometimes fed to poultry. Chinchilla rabbits are now raised in many counties.

## HOW IT STARTED

"What are those holes in the wood?"

"Those are knot holes."

"They are holes! Don't you think I know a hole when I see it?"

## LOOK OUT!

Jones (out for the first time in his new car): "Don't talk for a few moments, my dear; here is a telegraph pole coming."

## Montana Shots Meet at Helena In July

**T**RAPSHOOTERS of Montana—men who respect and revere ideals and teachings of sportsmanship in field and on stream as well as the dictates of the cleanest and most wholesome sport in the world, will gather at Helena July 19-20-21 for the 36th annual tournament of the Montana State Sportsmen's Association. They will determine the trapshooting championships for 1929. They will hob-nob with old trapshooting companions, mingle with men who speak the same language from other states, revive memories of trips afield and at clubs where clay pigeons frolic. Members of the trapshooting fraternity are men who are leaders in supporting the expansive program of conservation of wild life sponsored by the Montana State Fish and Game Commission.

Under the leadership of officers of the Helena Gun Club, plans are being made for one of the most interesting shoots in the history of the sport in the state. Extensive alterations are being made in the rustic clubhouse at Helena, huge umbrellas and canvas covers will be erected to provide shelter for families of participants. Luncheon will be served on the grounds and every effort put forth to please and satisfy families and trapshooting enthusiasts who gather annually for their scattergun frolic. Predictions are that this will be Montana's greatest shoot. Dates have been arranged with adjoining states so that there will be no overlapping. Marksmen from other states may attend all shoots in Montana's neighborhood without conflict. Two years ago Helena's club established a shooting attendance record of 91. This mark is expected to be eclipsed in July.

Leaders of the Helena Gun Club have arranged an extensive program of entertainment aside from championship events scheduled during the three days. President Reynolds Prosser and Secretary Floyd L. Smith are being aided in their efforts by directors. Fred E. Kessler of Helena is president of the state association, Robert H. Hill, State Game Warden, is vice-president, and C. H. Smith of Butte is secretary. Mr. Smith has held this position for some 77 years—more or less—and is still going strong.

The story of the last state tournament at Butte is a story of smashing of records.

When the final scattergun barked its farewell message at the 1928 tournament, sponsored by the Montana State Sportsmen's Association at Butte last year, such trapshooting scores had been made as caused shotgun enthusiasts of the nation to gasp.

John J. Robinson, fire laddy from Anaconda, broke three all-time records for Montana's thirty-fifth tournament before the last bird in the three-day meet was officially "dead" at the Butte club's range on the last day, July 15. In the feature race, the 200-bird Ama-

### MONTANA CHAMPIONS

Amateur Singles Champion, J. J. Robinson, Anaconda, 200x200.  
 Amateur Singles Runner-up, E. J. Boe, Great Falls, 196x200.  
 Amateur Doubles Champion, Joe Lattimer, Butte, 49x50.  
 Amateur Handicap Champion, F. G. Knight, Great Falls, 99x100, 23 yards.  
 Amateur Women's Champion, Mrs. D. G. Stivers, Butte, 178x200.  
 Amateur All-around Champion, Frank G. Knight, Great Falls, won shoot-off, 339x350.  
 Amateur All-around Runner-up, J. J. Robinson, Anaconda, 339x350.  
 Amateur High-over-all, E. L. Ford, Ogden, Utah, 596x610.  
 Professional Single Champion, C. L. Flannigan, Great Falls, 194x200.  
 Professional Single Runner-up, G. A. South, Great Falls, 190x200.  
 Professional Double Champion, G. A. South, Great Falls, 47x50.  
 Professional Handicap Champion, G. A. South, 94x100, 22 yards.  
 Professional All-around Champion, G. A. South, Great Falls, 331x350.  
 Professional High-over-all, Rush Raze, Denver, 591x610.

teur Trapshooting Association state championship event, Robinson broke a perfect 200, the first of the kind ever scored in a Montana tournament by an amateur, and one of the few registered under the same conditions in the United States. The previous high mark for Montana was 197.

Robinson's first record was hung up the preceding day when he completed

a run of 222 consecutive targets before missing one. After the miss he finished the day with an unbroken run of 123. Winding up the championship race with another perfect 100, he topped his 24-hour-old record with an unbroken run of 223.

Robinson won the high average honors with a count of 490 out of a possible 500, just one better than the high mark of 489 set by Ted Renfro of Dell, and also better than any previous score by a Montana shooter in a home tournament.

Frank G. Knight of Great Falls, former state singles champion, also broke a record when he won the state handicap championship with 99 out of a possible 100. As a 1927 leader he had to do his shooting from the 23-yard mark.

Joe Lattimer of Butte broke still another record when he broke 49 out of 50 doubles in that championship race.

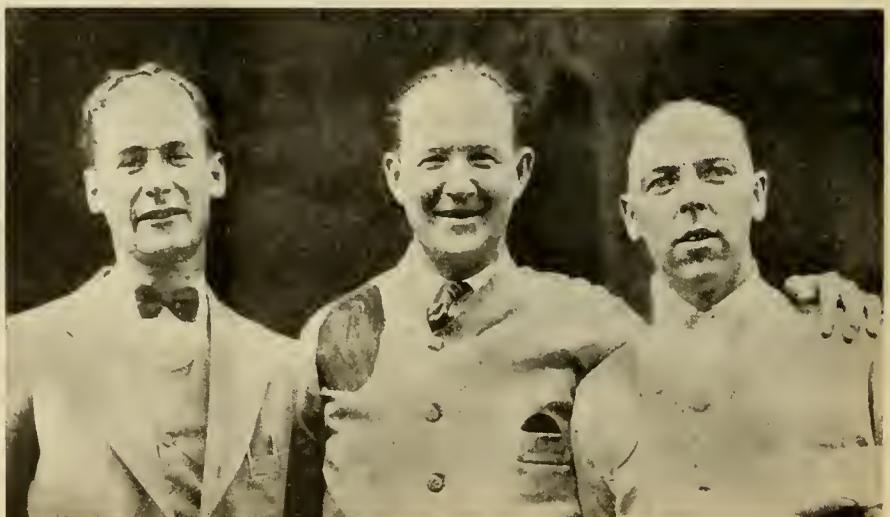
In a special shoot-off for the all-around championship, Knight beat Robinson, 38 to 35x40. They had tied on 339x350.

In the state singles race four tied for second honors with scores of 196x200. E. J. Boe of Great Falls won the shoot-off for the runner-up medal with a perfect 25, V. W. Rothrock of Billings getting 24, Ted Renfro and Otto Schulz of Sheridan 23 each.

Mrs. D. Gay Stivers of Butte won the women's championship with 178 out of 200, which, incidentally, beat a number of men.

Non-resident and professional honors were equally hard fought for. Ernie L. Ford of Ogden, Utah, was high on

### Montana Champions to Defend Titles



FRANK G. KNIGHT  
Great Falls  
Handicap Champion

JOE LATTIMER  
Butte  
Doubles Champion

JOHN J. ROBINSON  
Anaconda  
Singles Champion

all targets with 596 out of 610. Gus L. Becker, Ogden, broke 590x610.

Rush Razez of Denver led all professionals in the same field with 591. Great Falls professionals copped all the honors for their class. Charlie Flannigan won the singles with 194. G. A. South won the doubles with 47, the handicap with 94, and the all-around title with 331 out of 350.

What is believed to be a world's record was made in the three championship events last year. Only two targets were lost out of 350, one in the doubles and one in the handicap. High scores in the 200 state championship targets in addition to those mentioned were G. F. Egbers, 197; Roy Tisdale and Steve Arnold, 195; Frank Knight, Joe Lattimer, H. L. Hart, 194; R. H. Hill, 193; C. Goddard, Jack Boehme, W. R. Wilcoxsen, 192; J. A. Poore, N. J. Birrer, Holter, Somers, Reynolds Prosser, 191.

In the handicap, E. W. Renfro, 97 from 24 yards, Ed Dickinson (Shreveport), 21 yards, and Prosser, 20 yards, 95.

In the doubles, E. L. Ford, Ogden, and Rush Razez, 49; Otto Schulz, G. A. South, N. J. Birrer, J. J. Robinson, V. W. Rothrock, 47; Gus Becker, H. S. Mills, Frank Knight, Sam Sharman, 46; E. W. Renfro, R. Tisdale, Guy Egbers, 45.

## Check Up On Quail

**I**N ORDER that it may be learned just what methods it may be necessary to employ to maintain a maximum supply of quail throughout the corn belt and other northern states, the Sporting Arms and Ammunition Manufacturers' Institute, on recommendation of Aldo Leopold, in charge of the institute's game survey, has decided to establish a series of quail demonstration areas in several states.

To encourage this undertaking, fellowships carrying a maximum stipend of \$3,000 each are being established in agricultural colleges and universities. The U. S. Biological Survey has agreed to cooperate by furnishing the services of Herbert L. Stoddard to supervise this work. Mr. Stoddard having practically completed his research work on quail in Georgia and Florida.

Mr. Leopold describes the survey work he is carrying on in an article in *AMERICAN GAME*, the bulletin of the American Game Protective Association. His article is accompanied by graphs illustrating the plans for carrying on the quail demonstration areas. It is Mr. Leopold's contention that the maintenance of a supply of quail in the north central states depends less upon legislation and closed seasons than upon cooperation with the farmer on whose land quail must be raised. By restoration and establishment of suitable cover, methods of winter feeding, and protection from natural enemies, it is believed that any average farm can produce a considerable supply of quail without interference with its normal productivity of crops and livestock.

## Homing Instinct in Fish

**I**T HAS long been recognized from casual observation that the different species of Pacific salmon resort to certain streams for spawning purposes. Proof of homing instinct of these fish is furnished by the U. S. Bureau of Fisheries as the result of tagging experiments on Chinook salmon in the Columbia River extending over a period from 1916 to 1927. During that period many thousands of young salmon were marked in the various tributaries of the Columbia and liberated. Many of these marked fish were taken in the sea off British Columbia and southeastern Alaska but it is a significant fact that none have ever been taken in any stream except the Columbia and its tributaries.

It has been an open question as to whether the homing instinct of these fish was a purely hereditary matter or whether it was determined largely by the early environment of the fish. Results of the experiments tend to discount the hereditary theory because only a small percentage of marked fish returned to the tributary where eggs

were taken but a large percentage were recovered in the tributaries where the fry had been liberated and where the young fish spent a portion of their early lives. It is not believed, however, that environment is the sole governing factor but hereditary instinct figures to a limited extent.

A striking instance of the return of the fish to the home stream has been found in a tributary called Spring Creek. This creek is so extremely small that it is difficult to see how the salmon could find it at all, yet 82 marked fish were recaptured therein as adults, while only four were taken elsewhere. This is taken as definite evidence of the validity of the home stream theory.

It has also been developed that the homing instinct is disturbed to some extent by transplanting the eggs from one tributary to another. This is a matter of considerable importance in fish cultural operations, particularly in cases where attempts are made to rehabilitate runs by transplantation from other streams.

So far as experiments have gone, they indicate that the better practice is to stock each stream with eggs native to that stream.

## The Cannibal of Montana's Streams



Bull trout caught at the mouth of Rattlesnake Creek, near Missoula, with 103 small trout and other fish in its stomach.

**M**ONTANA sportsmen have declared war on the Dolly Varden or bull trout, the cannibal of the trout family, in the realization that the big fellows are devouring their daily toll of fingerlings and larger trout planted and preserved through activities of the State Fish and Game Commission. The photograph above is a sample of the manner in which these cannibals of the creeks and lakes devour these little fish. These bull trout abound in Flat-head Lake. When they are brought up in the seine the smaller fish are given a better chance to survive.

The great destruction of small fish by bull trout is easily understood when one considers the case of a fish caught in the Bitter Root River by Sergeant Thomas Cummings in the spring of 1922. A twelve-inch bull trout when examined had in its stomach the undigested bodies of 103 minnows. These may have been small native fish, or the young of game fish. The bull trout will take one as quickly as the other. Small fry, just planted from a hatchery, would be an easy prey for such a voracious enemy.

# Coyote Poison---The Trapper's Side



R. E. Bateman

game and livestock. The protest voiced by the writer was apparently read by thousands, if letters received by the State Fish and Game Department may serve as a criterion.

In keeping with the announcement made last month in connection with the anti-poison article, the matter was taken up with R. E. Bateman, leader of predatory animal control in Montana. In correspondence with Mr. Bateman, who has had years of experience in the work, methods used by state and government trappers and hunters were outlined. Mr. Bateman explains plainly, in his letters, that he does not desire to enter into a controversy over the matter. Hence, in keeping with his request to avoid a controversy, the following facts are taken from his letters as conclusive and published for the information of Montana sportsmen, by the State Fish and Game Commission:

"For the last few years there have been a few critics who have studied one side of the poison campaign. They have looked upon it as being one of the greatest menaces to game birds, song birds, and small fur-bearing animals. Outdoor magazines have published articles written by fanatics. Some of these articles have been written by hunters formerly employed by the Biological Survey and who did not make good. Whether these articles were written to relieve their hard feelings toward the bureau or not, I can not say, but the facts and the truth of the work have never been published correctly, as I see it.

"They condemn the Bureau of Biological Survey for scattering poison promiscuously over the range in game countries and poisoning small fur-bearing animals. This is not true in Montana. The only way that poison is distributed in Montana is by sportsmen or hunters assigned to certain localities where coyotes are slaughtering the deer in the deep snow or stock or poultry on the range.

**S**TOCKMEN and sportsmen of Montana, who are contributing thousands of dollars annually for control of predatory animals preying on cattle, sheep and game animals, have expressed an intense interest in the article published in the May edition of MONTANA WILD LIFE, written by Alexis Smytheson, opposing the use of poison in the eradication of Senior Yip Yap, otherwise known as the coyote, and other foes of

"A few years ago on the Thompson River the stockmen and ranchers of that vicinity estimated that coyotes killed between 1,000 and 1,500 deer during the time when there was a crust on the snow and the deer broke through. Seventeen deer were killed in one night in a small pasture of about 15 acres. There were deer ranging up and down the valley, and many were bitten so badly by these coyotes that were killing for sport that they lived for only a few days. This report can be substantiated by E. R. Young, living on the Thompson River north of Plains, Montana, and other stockmen in that vicinity.

"An appeal was made to the Biological Survey and Montana's Fish and Game Commission to give these people some assistance in destroying coyotes. Another winter would have practically cleaned up the deer. A hunter was assigned to this locality the following winter, and placed poison stations under the supervision of the Biological Survey and the Montana Fish and Game Commission. By using systematic methods in placing out small baits and not poisoning carcasses, he succeeded in one winter in practically exterminating the coyotes that had caused this great loss.

"The following winter he worked about two months, but the coyotes were scarce and did no damage. Reports from sportsmen of Plains, Mont., show that there was a great increase in the deer, and a few years later more deer were killed by hunters than at any other time since they had kept a record. Animals which were taking a heavy toll of the deer had been exterminated.

"No poison is scattered in the high mountains where marten or fisher are

usually found. Anyone who has made a study of the deer situation knows that during the heavy snows the deer yard up along the creeks and the marten are usually found in the higher country. Many believe that the poison placed to exterminate the coyotes kills off song birds and other birds of value. This is not true. We have no song birds in Montana during the time of the year that this poison is placed. The only birds we have destroyed with this poison are the magpies, which cause losses to our game bird and song bird families. These magpies are usually poisoned by the hunter with a different kind of bait than is used for the coyotes.

"The eagle is seldom poisoned by these baits, as he usually feasts on the carcass, which has no poison in it.

"Poison placed for coyotes is in a small piece of meat less than an inch square. It is not placed on the carcass, but is placed back 10 to 50 yards from the carcass, where the coyotes usually pick them up before they go to the carcass to feed.

"Magpie poison baits are usually put in a larger piece of meat and tacked in a tree, out of reach of dogs or other animals. These magpie baits are only used in the prairie country where the magpies are abundant, and not in the heavy timber where the work is being carried on to protect the deer.

"The eagle, our national bird, is very much on the increase in many localities. During the last winter the eagles have destroyed at least \$1,000 worth of coyote fur taken by the hunters reporting to this office, and the hunters report that eagles are hard to poison as they feed on the carcasses and not on the small baits placed out for the coyotes.

"The radical idea of the poison killing song birds and small fur-bearing animals is something that could only be considered by someone in a far eastern city who had not the opportunity to study intelligently the conditions of the west and know real enemies of small fur-bearing animals and song birds. Some people apparently believe that the reason for the decrease in mink, marten and muskrat in Montana is because the government hunters have poisoned them. Some urge the use of traps, not the poison. If our work is confined to trapping there will be a great increase in coyotes and a decrease in game animals and game birds.

"No trapper can compete with a professional in the use of poison during a winter like we have just experienced in Montana. The trap is the agency that has put our muskrat, mink, marten and fisher almost into extinction in this state.

"If some of these writers would visit some of the small towns adjoining the marten sections early in the fall and check up on the hunters packing their

## One Day's Catch



**G**EORGE HENDERSON of Polson, Montana, is a foe that coyotes, killers of stock and game, may well fear. The picture shown above shows five "good Senior Yip Yaps" that have fallen victim to the wiles of the veteran trapper and hunter. Their days of nest robbing, killing of chickens, Hungarians, Chinese pheasants and other birds, as well as sheep, lambs and calves, have passed.

winter supplies back to the high ranges in the marten country, and the number of small traps they are taking in, they would know why the marten is becoming scarce. Few of these hunters, I dare say, ever take poison with them to get the marten. The trap is also what has depleted our streams and sloughs of the muskrat. The only animals which have been able to thrive under trapping conditions are the coyote and the wolf.

"The coyote, one of our worst enemies to stock, poultry, game, and game birds, is still plentiful in Montana. It is necessary that every agency be used to control and keep down the increase of this animal. He thrives well in civilization. He destroys more game birds than all of the hunters. He consumes at one feeding the entire nest of eggs of a sage chicken or grouse, and how many of these he finds during the season is unknown. He also destroys the young before they are able to fly. He preys on poultry of all kinds.

"Authentic reports from poultry raisers show that they have lost as high as 150 turkeys in one season by coyotes. It takes an average of a lamb a day to feed a small den of coyotes when they are about six weeks old. In certain sections of the state where these coyotes become accustomed to killing deer, they also kill young calves in the early spring.

"The magpie, the principal bird poisoned by the government and state hunters, is accountable for the destruction of many a nest of both game and song birds. It is necessary that we use every effort to control these magpies, along with our other work. They also are a menace to livestock and poultry raisers.

"The catch made by Mr. Warren, which is shown in the December issue of MONTANA WILD LIFE, was the result of scientific poison work. No bad results were obtained by Mr. Warren in the use of poison. No squirrels nor song birds were destroyed by his poison.

"Poison has been used in Montana for many years. The old stockmen and the old time wolfers employed by the stockmen used it in great quantities. The entire carcasses of cattle and horses were filled with it. Dogs have been poisoned from eating dry hides around these carcasses two years afterward. Now the old crude way of handling poison has been discontinued. Safer and better methods have been developed. The United States Bureau of Biological Survey has for years made a study as to the most effective and safest way to use poison to aid the stockmen and sportsmen in the control of predatory animals, and a close record is kept of each animal poisoned.

"The records of small fur-bearing animals poisoned in Montana do not show any mink, muskrat, marten, o' fisher, very few skunks, and possibly 10 or 11 red foxes poisoned since 1915, when the work began in this state.

"To my knowledge there are no song birds that feast on coyote baits. Poison is dangerous and should at all times be under close supervision. It should not be scattered promiscuously on the open range or in the mountains. Poison is never furnished to anyone from this

office until it has been approved by stockmen who give the hunters permission to use it on their range, or by rod and gun clubs asking for it to protect deer or other game and game birds.

"Our hunters are instructed to pick up and destroy the small baits around each of their bait stations before spring. No poison is distributed in Montana during the summer months. Our hunters are now cleaning up all small baits around their stations and will devote the rest of the summer to trapping, den hunting, and hunting with dogs and with a rifle.

"It may be because we do not furnish this poison to each and every one that some individual trappers who are interested in taking the coyotes for the fur are trying to get something started to stop the state and government hunters and cooperative men from using the poison. For this reason we receive during the winter many requests from individual trappers, stating that they make a business of trapping but on account of the weather conditions they would like to get poison, as coyotes are numerous in their locality and they are unable to trap them.

"These requests are not complied with. We are not permitted to furnish poison except to the hunters on the cooperative work carried on in this state. The high price of coyote furs for the last few years has caused much criticism of the work of the state and the government to exterminate the coyotes. The individual trapper does not want the state or government to destroy the coyote which is bringing him a good revenue as a fur-bearing animal. If the price of coyote furs dropped to \$3 each we would have no more complaints."

## The Right Propellor

**I**N SELECTING an outboard motor, bear in mind the specific task for which it is intended. Every outboard motor carries with it a choice of propellers, according to the kind of work it is destined to do. These propellers vary considerably in shape, diameter and pitch of blade, and each has been found by elaborate tests to be most efficient with that motor for certain kinds of work. You may think your motor lacks power if you get the wrong propeller for the job. It does, and it isn't the engine's fault.

A high-speed propeller for pushing a heavy load will show up any motor to poor advantage. The same motor with two different propellers on it, seems to be two different motors. With the proper propeller you can get the maximum of power for the job and the best satisfaction.

This relationship of propeller to load and other resistances together with the speed desired, comprises one of the major problems in marine engineering. No amateur should attempt to solve it alone unless he is ready to buy a number of propellers and conduct complicated experiments over a measured course, with stop-watch timing in dead water and on windless days. And then he will find that the designer just about knew his stuff after all.

Makers of sporting equipment often spend many thousands of dollars and much time in research work to perfect their products. They do this for the advantage of their customers. The wise amateur is the one who leaves well enough alone.—Field and Stream.

## Smell the Java? An' the Bacon An' Things?



**M**ONTANA'S 1929 outing time is here. Thousands of residents of sister states will soon be guests of other thousands of Montana residents who look forward to their days and weeks in woods and along streams. It's God's own out of doors that causes the Red Gods to beckon and call. It's the tonic that relieves tired minds, braces

fagged muscles and renews tissues that cause commercial wheels to grind throughout the year. George Moore of Pablo, Mont., is shown here preparing the evening meal for the gang after a trip into that last Paradise in the South Fork of the Flathead. It's one of the few spots in Montana left to the trail blazer.

## Game Farm at Warm Springs

**M**ONTANA is to have a game farm near Warm Springs where pheasants, partridge and other birds may be produced to restock barren fields, coverts and hillsides. Final action on the matter, which has been under consideration for more than a year, was taken at the meeting of the Commission at Anaconda June 7. J. F. Hendrichs, trained game bird expert now employed by the Oregon state commission, has been secured to take charge of the Montana bird farm and steps are now under way to erect the buildings, secure the brood stock and prepare for the 1930 season.

At the Anaconda meeting Chairman Marlowe gave a report of his investigations into the establishment of the farm. Gene Simpson of the Oregon game commission made a trip to Montana and had advised that he considered the Warm Springs sites the best location. He stated that Dr. H. A. Bolton is in accord with the location of a game farm at Warm Springs. On motion of Commissioner Kelly the proposed game farm site at Warm Springs was accepted and plans made to proceed to erect the necessary buildings, providing suitable arrangements can be secured from the State Board of Examiners. The Secretary of the Commission was instructed to get a suitable permission or easement from the State Board of Examiners, giving authority to use whatever ground might be necessary for the game farm.

Chairman Marlowe advised that Mr. Simpson had recommended J. F. Hendrichs, now employed by the Oregon game commission, as a capable man for the position of superintendent and Mr. Marlowe was authorized to employ Mr. Hendrichs, upon conditions as stated to the Commission, as superintendent of the state game farm. Mr. Hendrichs will come to Montana, and in company with Mr. Marlowe and as many of the members of the Commission as possible, inspect the two tentative sites at Warm Springs to determine the exact location of the farm. Mr. Marlowe was also authorized to purchase necessary brood stock to begin operation. It is the desire of the Commission to purchase enough brood stock to produce 3,000 or 4,000 birds the first year.

Mr. Hill read a letter from D. R. Crawford of the College of Fisheries of the University of Washington, outlining a tentative plan for work in the hatcheries this summer. Mr. Hill had been requested, at a former meeting, to request such an outline from Mr. Crawford. Mr. Crawford had applied for a position instructing members of the Montana fisheries department in the scientific habits and care of fish. Mr. Crawford was employed for three months by the Department and he was instructed to report to Chairman Marlowe at Missoula for instruction.

Game Warden Hill read a letter from the secretary of the Musselshell Valley Sportsmen's Association at Harlowton, requesting that Battle Creek, a tribu-

tary to Sixteen Mile Creek, in Meagher county, be closed to fishing, and on motion of Commissioner Kelly the stream was closed until opened by the Commission.

It was brought to the attention of the Commission that Fishtail Creek, in Stillwater county, has been closed by the Commission, but the tributaries are not closed, which makes patrol work difficult, hence Fishtail Creek and all its tributaries were closed to fishing until further order.

Paul Redington, chief of the Bureau of Biological Survey, advised by letter that the President of the United States had just signed an order establishing the former Fort Keogh Military Reservation as a federal refuge for game and birds. Mr. Redington asked the desires of the Commission relative to fishing on this refuge. On motion of Commissioner Moore the waters in the artificial lake at the Miles City pond cultural station, which is part of the federal refuge, were designated as a spawn-taking station and closed to fishing until further order.

Bruce Nowlin, State Fish and Game Commissioner of Wyoming, suggested by letter that the Commissions of Montana, Idaho, Utah and Wyoming meet

in Yellowstone National Park this summer to confer on joint problems. The Commissioners expressed themselves favorably for such a conference but suggested the latter part of July as the ideal time for this conference. Dates were left open awaiting the desires of the other commissioners.

Commissioner Moore advised that he had investigated Mr. McCracken's request to seine Hollins Lake. He explained that after he had shown Mr. McCracken that this lake is full of catfish, Mr. McCracken had withdrawn his request. Mr. Moore stated that it is Mr. McCracken's desire to secure bass for planting in the lake.

Mr. Hill advised that the pelican is protected by the state laws but is not protected under the federal laws, which causes a conflict, and on motion of Commissioner Kelly the pelican was declared a predatory bird in Montana.

Mr. Hill advised that the Department now has 21 men on the regular deputy force and under the law another may be added. Special Deputy Warden Sailor was placed on the regular warden list of the second class and Mr. Hill suggested the appointment of William Gird of Babb as special deputy game warden for Glacier, Toole and Pondera

## Help Your Son to Become a Sportsman



**I**F MONTANA WILD LIFE, in its sincere effort to aid residents of the state, west and nation in conservation of fish and game, accomplishes little else than inducing dads of Montana to become pals of their sons, it will have achieved a goal worth while. Montana's trout season is on. The lad who has not yet reached his teens naturally is interested. Take him with you on fishing trips. Educate him along lines of natural philosophy. Teach him how to distinguish the tracks of ani-

mals, the varieties of trees, the birds, bees, butterflies and the ways of the woods. Indelible marks will be made in his memory of his Dad long after you have gone to the Happy Hunting Grounds with other good Indians. Here's a snapshot of Harold L. Walden, 929 Tenth avenue, Helena—as big a fisherman as the rest of us, casting with his crude pole in Trout Creek, near York, where the Elkhorn Council of Boy Scouts maintain their summer camp.

counties. This position was left vacant by Deputy Des Rosier. Mr. Gird was employed, effective June 15, 1929.

John W. Schofield, field assistant in charge of hatcheries, advised that he had a bid of \$770 for the aquarium at Great Falls, and the matter was held over until the next meeting.

Mr. Schofield advised that while in the West Gallatin district he had found an ideal spot for a rearing pond on the Childs-Anceny land. He has secured an easement for ten years with the privilege of renewing it for five additional years for this site. The approximate cost of building this pond will be \$500, half of which will be paid by the Commission and the other half by the Bozeman Rod and Gun Club.

Commissioner Moore advised that he had found just one site on the Stillwater River that would be suitable for a rearing pond site. Mr. Schofield was instructed to try to procure an easement.

Mr. Schofield was authorized to have running water put into the residence at the Lewistown hatchery.

Dr. I. H. Treece, field assistant in charge of hatcheries, advised that Fish Culturist O'Brien had seined Dickey Lake to determine the kind of fish therein. This action had been requested and Dr. Treece gave a report of Mr. O'Brien's findings.

Mr. Schofield stated that for the last two years the Fish and Game Commission had had an agreement with the Bureau of Fisheries that the Department should approve all applications received by the bureau for fall spawners before they were filled by the bureau. None of these applications have been received by any Department members for approval and Mr. Schofield was instructed to check up with Superintendent Thompson of the Bozeman hatchery on the distribution.

Game Warden Hill was instructed to advise the United States Bureau of Fisheries that the Montana State Fish and Game Commission has found that the cooperative agreement with reference to the spawn-taking operations in the Madison and the planting of spawn in the streams of this state has not been lived up to, and to inquire if the Department intends continuing this practice.

Harry Meyers, attorney for Louis Cooper of Butte, joined the meeting. Mr. Meyers read an unsigned petition from Mr. Cooper asking that skins confiscated by Assistant Game Warden Carney be returned. Mr. Carney and Mr. Meyers were cross-examined by Chairman Marlowe. Both Warden Hill and Mr. Carney expressed themselves of the opinion that the hides should not be returned and the Commission ordered the skins confiscated.

Glen A. Smith of Missoula, chairman of the Montana State Sportsmen's Association, asked the Commission for their ideas on a cooperative plan with the State Sportsmen's Association.

The motion of Commissioner J. L. Kelly follows: "I move that the State Fish and Game Commission set aside \$2500 per year until further action, to be used in paying the salary and expenses of an Educational Secretary, providing, however, that the State

Sportsmen's Association will pay any other amount necessary to secure the services of a competent person for this position and that they also revise their schedule of dues now assessed to affiliated clubs so that in no case would any club dues be more than \$50 per year, and that we suggest this proposition to the State Sportsmen's Association for its approval, and ask that we be informed as to their acceptance or rejection within 30 days from this date. This order is to be effective on and after June 15, 1929." Seconded by Mr. Moore and carried.

Glen A. Smith advised that through an error in drawing up the bill, the legislative assembly had incorrectly defined the boundaries of the Judith River Game and Bird Preserve created at the last session. Two creeks had been named that are non-existent, and therefore no game laws can be enforced on this preserve. To enforce the game laws in the Judith River Game and Bird Preserve, the Commission ordered that the boundaries of the preserve are to remain as they were in the preserve heretofore created and established by the Commission.

When the Commission met at Anaconda on May 15, those present were Thomas N. Marlowe, chairman; E. A. Wilson, G. T. Boyd, W. A. Moore, J. L. Kelly, Commissioners; State Game Warden R. H. Hill; Field Assistant John W. Schofield; Kenneth MacDonald; George Mushbach, U. S. Game Protector; and Deputy Warden W. A. Hill of Missoula.

On motion of Chairman Marlowe Nine Pipe Reservoir, in Lake county, was closed to fishing for bass from May 21, 1929, to March 14, 1930, both dates inclusive.

Mr. Marlowe read a letter from J. F. Brooks, supervisor of the Missoula forest, suggesting that a portion of Rock Creek and all of Spring Creek in Granite county be closed to fishing for restocking purposes, and on motion of Mr. Kelly that portion of Rock Creek between the mouth of Brewster Creek and the mouth of Spring Creek, and all of Spring Creek, both of which are in Granite county, were closed to all fishing until further order by the Commission.

Mr. MacDonald advised that, due to the late spring, it had been impossible to carry on the regular spawn-taking operations in Georgetown Lake and that an extended closed season was imperative. Mr. Marlowe's motion provided that, in view of the extreme lateness of the season, which had made it impossible to carry on the regular spawn-taking operations in Georgetown Lake, that the closed season for fishing in this lake be extended from May 21 to June 28, 1929, both dates inclusive.

Mr. Marlowe's motion provided that Georgetown Lake be closed to fishing for a distance of 300 feet on either side of the mouth of Flint Creek, and extending out into the lake 300 feet from the shore, until further order of the Commission, said area to be marked by buoys or signs.

Game Warden R. H. Hill read a letter and three petitions from sportsmen of Fromberg, Bridger and vicinity, asking that Blue Water Creek and tributaries, a tributary of the Clark's Fork River, in Carbon county, be closed to fishing for three years for the purpose of restocking the stream, and the Commission granted the request.

J. L. Adams, Secretary of the Thompson Falls Rod and Gun Club, asked that Prospect Creek and all its tribu-

## Remnants of Montana's Last West



**T**IME was when Montana's Indians with their travois, their cayuses and their pack trains formed a portion of the parade that participated in keeping ahead the winning of the west. Here's a fleeting glimpse of what's left of the redskin parade. These two Blackfeet squaws—and incidentally the women always did the work—are piloting their pintos into camp with the travois trailing behind toting their trinkets and equipment.

Look at the picture again. It's a portrayal of historic significance. Note the rope hackamores, the steering wheel attached to the lower jaw of the cayuses, the indolence wrought by inroads of the white man, the lackadaisical mannerism, the distant hummocks in the hazy hills that now mean nothing more than distance to Fenimore Cooper's Mohican.

taries above the mouth of Dry Creek, in Sanders county, be closed for a period of two years; and that the West Fork of Thompson River and all its tributaries, in Sanders county, be closed for an indefinite period. On motion of Mr. Boyd the petition was granted.

State Senator E. A. Richardson of Lodge Grass requested that fishing be allowed in the Big Horn and Little Big Horn Rivers at all times of the year as far as the mountain foothills and the matter was referred to Commissioner Moore for further investigation.

The Secretary of the Musselshell Valley Sportsmen's Association, L. R. Daems, requested the Commission to close the slough in which that club is planting loch leven trout. On motion of Mr. Kelly the slough in Wheatland county in which loch leven are being planted, from its source in the W. J. Tucker place to its junction with the Musselshell River, was closed to all fishing until further order of the Commission.

A request was read from the Broadwater Rod and Gun Club, of Townsend, asking that the Commission declare an open season on Chinese pheasants this season, the same as the open season on grouse. The matter was deferred until such time when other petitions of like nature are considered.

The Deer Lodge Anglers' Club asked a closed season on upland birds in Powell county this year. This matter was held over until a later meeting. They also asked that the season on elk this year be closed in a portion of Powell county. This matter was also held over. Their third request was for loch leven trout to plant in the Little Blackfoot River. Action was deferred on this matter as no loch leven are available for planting at the present time.

J. G. Findlater of Baker suggested that the Baker Lake near Baker, Mont., be made into a duck preserve, and action was deferred until Commissioner Moore looks into the matter.

Attorney Myers appeared before the Commission for Louis Cooper, a hide and fur buyer, and presented a petition for the return of two lots of beaver skins. The matter was laid over for further investigation.

Deputy Warden W. A. Hill suggested that the closed season be extended on Cottonwood Lakes in Powell county and the request was granted from May 21 to July 5, both dates inclusive, of each year, until further order of the Commission.

Mr. Hill asked if it were the intention of the Commission to have a wild life exhibit at the state fairs this fall and on motion of Commissioner Kelly the Commission voted to stage the wild animal exhibit and the fish exhibit at the fairs again this year.

The Hamilton Sportsmen's Club asked assistance from the Commission in purchasing block salt for the deer and elk on the West Fork of the Bitter Root valley and it was granted and 2,000 pounds of sulphurized block salt was ordered purchased.

The Hamilton Sportsmen's Club asked if the Ravalli County Fair could have the wild life exhibit this fall and Warden Hill was authorized to inform them

that if the dates of the Hamilton fair do not conflict with the dates of the fairs at which the exhibit was shown last year, the Commission will put on the exhibit at Hamilton.

The Conservation Department of North Carolina asked the Commission to send Montana grouse and prairie chickens to a club in that state, but it was decided that, on account of the scarcity of birds, Montana will be unable to fill this application.

Mr. Hill presented a claim for \$225 of Tyler Williams, agent of the B. Gross Fur Company of Sheridan, Wyo., for muskrat skins which the Department confiscated and the claim was disallowed.

Warden Hill reported that he had made an investigation of the dam in the Gallatin River. He said he found that the fall of water over the dam is not more than two feet at the present time, and in his opinion trout can readily ascend this fall.

J. W. Schofield made a report of the progress he is making with the rearing pond construction.

George Mushbach, United States Game Protector, reported on his investigation of having a refuge at Big Lake. He stated that it is his opinion that the expense for acquiring land in this vicinity at the present time would be too great.

He explained that it is the desire of the Bureau of Biological Survey that the Fish and Game Commission be satisfied with the elk shipments made from the Bison Range and liberated within the state, and offered to assist in securing a refund of some of the expense incurred if things are not entirely satisfactory. Mr. Marlowe stated that the Commission wished to thank the bureau for their attitude in connection with this matter.

The Commission discussed the matter

## Lunch Without Red Ants



**T**HE opening of the tourist season, the picnic lunch days and the Sab-baths when Dad must heed the demands of the family and take his sandwiches to the woods, have arrived. Dad cares little for the red ants that doll up the salad dressing. But he's a lover of the out-of-doors and he pilots the car and enjoys the day with the family. Here's Ma and Pa Chipmunk enjoying their June luncheon without interruption. The red ants don't bother. In fact it required Deputy State Game Warden Frank Snyder several hours to sneak up close enough to snap the picture of the chipmunks without disturbing the luncheon in the Montana pines.

## Saving Your Fish

**A** NGLERS are proud of their catches. When they arrive home and display their fish to dotting relatives, said angler's most fervent wish is to make a hero of himself. It is one of the great moments of his day. More frequently than we like to admit, however, the enthusiasm aroused is not of the spontaneous and animated variety. What is the matter? Nice fish, plenty of them. Sure. The only trouble is they look and smell like something the cat dragged in. All of us at some time in our lives have come home with these fragrant petrified mummies. There is no excuse for this. It all depends on how the fish are handled.

A fish, for one thing, should never be pounded on the head to kill it. The bruise produced will be the first to go bad. A better way is to bleed it immediately after landing by putting a knife through the gills and into the backbone. Some fishermen break the vertebrae by bending the head back. This method, however, has about the same effect as a bruise.

After the fish has been bled it should be washed and then wiped dry.

If you are trout fishing from the shore, gather a few leaves or grass or preferably some evergreens. Moisten these and put them in the creel with your fish. In the event that you are fishing from a boat, a clean, moist piece of cloth will serve to keep your catch wholesome and sweet.

of closing the season on muskrats and opening the season on marten, and in view of the numerous requests for a closed season on muskrats and an open season on marten, the chairman was asked to write to clubs to ascertain what the general sentiment is with reference to this matter.

Mr. MacDonald advised that he would like authorization to build rearing ponds at the Anaconda hatchery and the request was granted.

Mr. Boyd asked the Commission to close to fishing the water drainage from the Sheep Creek rearing ponds, in Cascade county, and his motion prevailed.

### HOW'S THIS!

The boy left the farm and went to the city, where he did well and eventually got in the swim to some extent. A brother stuck to the farm. One day the farm boy got a letter from his city brother, and among other things it said:

"Thursday we autoed out to the country club where we golfed till dark. Then we motored to the beach and Fridayed there."

The farm boy wrote back:

"Yesterday we flivvered to town and baseballed all afternoon. Then we went to Mead's and poked till morning. Today we muled out to the corn field and geehawed until sundown. Then we suppered and piped for a while; after which we staircased up to our room and bedstedded until the clock fived."

You might have a chance at the race track if the horses went as fast as your money.

# Montana, Land of Shining Mountains

A Review of the "Dude Ranches" by EDITH G. BRISCOE, State Division of Publicity

**I**NTO the heart of every man, woman and child comes again and again the desire to get out into the wide open spaces, back to nature. To city people hurrying, hurrying day by day, to work and to play, the goal of that desire is the Great West—that marvelous, almost unbelievable country where children of the East still think the Indians roam the plains in war bonnet and paint, every man wears chaps and totes a gun. Now, more than ever before, that wonderful West about which they dream and plan some day to visit, has come to mean Montana, Land of the Shining Mountains. To meet these demands upon forests and streams Montana's State Fish and Game Commission is striving diligently to restock and conserve wild life.

Nowhere else in all the world will there be found attractions that lure the tired and weary business man and woman, the overworked mother and eager, restless child, that here await those who long for something new.

Perhaps to the majority of those planning vacations in the West, the dude ranch has an unusual appeal. The name "dude ranch" comes from the days when an occasional easterner visiting a ranch home during the summer months was referred to as "a paying guest" and all outsiders were known to the cowboys as "dudes." It is significant that the dude ranch has today become one of the important industries of the state.

The 150 dude ranches in Montana offer a great variety in accommodations, entertainment and price. For a modest sum one may live in a tent house with stoves for heat, candles for light, eat in the main dining hall, hike and dance for entertainment, or the other extreme, live in a modern house with baths, electric lights, telephone and telegraph service, everything in the latest style for \$60 a week, all trips, even to the nearest town, which perhaps is 50 to 80 miles distant, at extra expense. Even at \$250 a month one is expected to pay for the privilege of riding horses, or rowing a boat. However, this exclusive service is the exception rather than the rule.

At the moderate priced camps guests are well taken care of. Beds are clean, the food wholesome, the best the market affords and well cooked, and the entertainment consists of fishing, hunting, swimming, hikes, boating, trips with pack horses and dancing. At various times rodeos, or roundups and bucking contests, are staged for the entertainment of guests, or perhaps, if the ranch is located near one of the reservations, the Indians will feature their dances or the guests are taken to the reservation to one of the ancient ceremonies. There is something doing every minute at a dude ranch.

Montana offers to the fisherman his choice of more than 500 lakes. Rivers and streams, ice cold and sparkling,

go tumbling down the mountains and ravines, in whose icy waters are found the finest of mountain trout.

For those who prefer hunting in Montana—today considered the nation's greatest reservoir of wild life—bear, elk and deer will be found. Sage hens, prairie chickens and rabbits abound in all sections of the state and on the lakes and rivers are varieties of wild waterfowl. The state maintains 35 game and bird preserves and 14 fish hatcheries to replenish hunting and fishing areas. During the hunting season trained guides are available for trailing big game. Lake Bowdoin in Phillips county is one of the greatest wild duck areas in the United States.

To those who are seeking rest and quiet Montana offers the grandeur of the mountains, invigorating air, gor-

geous sunsets, whispering pines, and babbling brooks. Whether the size of a man's pocketbook enables him to spend his time at one of the famous pleasure resorts, or the Goddess of Fortune having smiled less kindly and the vacation is being spent in a tent in the forest, the tourist in Montana has for his delight that which is found nowhere else in the world.

There is not a mile in Montana that has not its own particular attraction. From seething geysers in the southern part of the state to awe-inspiring glaciers in the north is a long cry—what other section of Old Mother Earth can offer these?

In eastern Montana are found the "bad lands." In time these will become an attraction—this freak formation of colored sandstone can not help but attract attention. In Carter county these formations are so similar to known objects that they have been named "The Masonic Temple," the "Cathedral" or "Garden of the Gods."

In Carbon county is found Grasshopper Glacier, where millions of grasshoppers are frozen in layers.

In Jefferson county is located the Lewis and Clark Cavern, destined to become one of the great attractions of the world. It is said that this cavern is without a rival.

Lewis and Clark county boasts the largest enclosed natural hot water plunge in the world at Broadwater, near Helena.

In western Montana the Mission range of mountains is proclaimed the most beautiful of its kind, and at its side is found Flathead Lake, the largest fresh water body in the state, where the State Fish and Game Commission established the first biological station in the world in cooperation with scientists of the University of Montana.

Not one of Montana's 56 counties is lacking in some attraction for the tourist. There is only one Butte, built over a network of tunnels and shafts.

Anaconda has the largest copper smelter, East Helena the largest lead smelter and Great Falls the largest copper wire mill in the world.

In precious stones the Yogo sapphires found in Judith Basin county surpass any yet discovered and rank in value with diamonds.

In addition to the natural resources the state abounds in historic spots, notable among them being Virginia City, headquarters of the Vigilantes; old Fort Owens, the site of the early trading posts and Indian battles; the Gates of the Mountains near Helena, through which passed Lewis and Clark on their famous expedition up the Missouri River in 1804, and in the Bitter Root Valley, at Stevensville, is found old St. Mary's Mission where Father De Smet, a Jesuit missionary, tilled

## Mr. Pincushion



**D**ID YOU ever sit down on a mess of Montana cactus? Or a flock of hornets? Or an animated pincushion? Then you have never enjoyed shaking hands with a Montana porcupine. This closeup picture was taken by Deputy State Game Warden Frank Snyder when Old Porky was ready to become friendly in case the deputy was in similar mood. But the deputy wasn't. All of which revives the old question: "Does a porcupine throw his quills?" Next time this question comes up in class just answer "No" on general principles, and you'll be right. Then ask some woodsman or sportsman to explain why. Ask him how many times he has pushed the quills through the lips of his favorite dog rather than trying to pull them out. Ask him if he ever struck a porky with a stick and then tried to pull the quills out of the club.

and seeded the first patch of ground in 1840, thus becoming Montana's first husbandman.

It is not possible in a short time to tell of the many wonderful and interesting things that Montana has to offer her citizens and her guests, nor would it be wise, for fear of discrimination, to attempt to point out the advantages of certain resorts; suffice it to say that the Treasure state is destined to become the Pleasure state of the world.

In pleasure resorts, as in other things, Montana is the Treasure state. It is difficult to segregate dude ranches from other resorts. Hot springs, log cabin camps, chalets and pretentious hotels, equipped and operated in an up-to-the-minute manner, stand side by side. Even in buildings of the same construction and offering the same accommodations and entertainment one is called a dude ranch, one a hot springs, another a recreation camp or perhaps a hotel.

They are all about the same, serving the same purpose, and catering to the same class of people, the only difference being that in some cases the dude ranch operates only during the late spring, summer and early fall months, while the others are open the year 'round. The smallest dude ranches accommodate from 12 to 15 guests while the largest have facilities to take care of 225.

It is said that 80 per cent of the dude ranch trade comes from New York and adjacent territory. Most of the ranches have already been booked solid for the 1929 season and it is estimated that this will bring \$1,200,000 to the state.

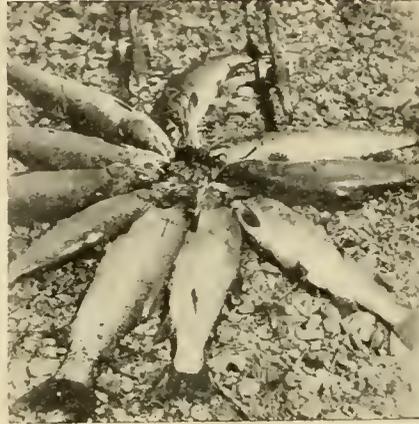
The tourist trade in Montana in 1927 reached \$12,000,000, in 1928, \$16,000,000, and this year the estimate is placed at \$20,000,000.

## Ducks In Louisiana

**M**OST people think of wild ducks breeding in the north and being south only in winter. It may be a surprise to some Montana folks, therefore, to learn that one or more sub-species of the black duck breeds commonly in the brackish-water marshes of the Louisiana coast. These birds begin their domestic activities much earlier than is usual with those that migrate northward to breed. This is indicated by a report recently received from Richard Gordon, Superintendent of the Rainey Wild Life Sanctuary, owned and maintained by the National Association of Audubon Societies, that young black ducks appear in May. This territory borders on the Gulf of Mexico, about 140 miles west of New Orleans.

Stanley C. Arthur of the Louisiana State Conservation Commission stated that thousands of the southern black ducks are breeding in the marshes in the neighborhood of North Pass near the mouth of the Mississippi River. The blue-winged teal also breed sparingly in southwestern Louisiana, and occasionally it is found that the curious goose-like Felyus tree duck lays its eggs in the same region. Wild ducks also nest in limited numbers in suitable regions of Texas and Florida.

## Planting Brings Results



**G** G. HASH of Missoula has provided MONTANA WILD LIFE with this photograph as further proof that fish planting by the State Fish and Game Commission is producing results. This splendid catch of trout was taken May 5 in Flathead Lake, where experiments have been conducted for the last year by scientists of the Greater University of Montana employed by the Commission. The fishing season in streams and creeks, not ordinarily passed on by the Commission, opened May 21. In the lake, however, the season was open at the time the picture was taken. Just a word from Chairman Thomas N. Marlowe tells the story:

"These fish shown in this picture were taken in Flathead Lake. Mr. Hash, with Walter Anderson of this place, went to Flathead Lake and caught 16 fish from the shore of the lake. The 16 fish taken by them weighed 40 pounds or made their limit for them. One of the 16 was of the Dolly Varden or bull trout variety, two were rainbows, and the remainder natives. This would indicate that our efforts in stocking this lake are beginning to show results.

"Anglers are certainly having some wonderful fishing now in Nine Pipes Reservoir. This reservoir was made several years ago by the United States Reclamation Service and about five years ago we stocked it with bass, sunfish and bullheads. I believe that in the last three weeks fishermen have taken at least 5,000 bass out of this place and there seems to be still a good supply left. The bullheads and sunfish are there by the thousands. In view of the fact that this is practically the only place around here where we can fish at this time it is giving the fishermen a lot of real satisfaction to have some place to go during the closed season and be able to fish. Another satisfaction in this particular instance is the fact that so many kids and women go there to fish and seem to get a real kick out of it.

"In view of the fact that the bullheads have done so well in this place I am of the opinion that real catfish would also do well there and have written to the Bureau of Fisheries at Washington to

ascertain whether we could get some catfish for this place.

"The great number of sunfish in this reservoir will make it possible for us to get all of the sunfish we need for stocking the entire state and just yesterday men in the employ of the Department went there and filled 20 cans with sunfish which are going to be sent to N. O. Miller at Roy, Montana."

## Montana Humps Thrive

**I**NTRODUCTION of buffalo into Alaska is an experiment that is being watched with much interest by wild life conservationists. Twenty-three of these animals were shipped from the National Bison Range in Montana to the territory by the Alaska Game Commission in June, 1928, through an appropriation made for the purpose by the territorial legislature. Nineteen were liberated near McCarty, Alaska, and four were held at the reindeer experiment station of the Biological Survey of the U. S. Department of Agriculture at Fairbanks for experimental purposes.

In a recent report to the Biological Survey, L. J. Palmer, in charge of the reindeer station, stated that up to January 9 the buffalo were located on Jarvis Creek, not far from where they were liberated, and were feeding to a large extent on wild vetch. They seem to have adapted themselves to the country, he said, and to be doing well. On February 18 the herd was reported on Clear Water Creek, nine miles from McCarty, a stream that has open water throughout the winter and a good growth of brush and grass. The Alaska Game Commission has hay stored at McCarty for feeding the buffalo if necessary, but up to mid-February the animals were finding sufficient food and were in good condition, although there had been some unusually heavy snowfalls.

The buffalo retained at the reindeer station are fed at the rate of 15 pounds of hay a day, and are in excellent condition—round and fat. The winter has been unusually mild at the station, but during one brief period when the temperature ranged from 30 to 40 degrees below zero with high humidity, it was noted that the animals were covered with hoarfrost, and as soon as they finished feeding at the corrals each morning they would immediately seek an upper sheltered hollow in the middle of one of the pastures or the top of a warmer adjoining ridge. During warm weather the buffalo remain near the feed troughs at the corrals. On the range, when not grazing, they seek shelter in the forest.

## INJURY OPENLY ARRIVED AT

She: "Did I ever show you the place where I hurt my hip?"

He: "No-no."

She: "All right, we'll drive over there."

## WHY, HOW TALL!

"My, but your little brother is growing!"

"Yes, he comes up to the hem of mama's skirt now."

## What is a Dude Ranch?

**A**RTHUR CHAPMAN, author of "Out Where the West Begins," in answering the query of an easterner as to what is a dude ranch, says: "The dude ranch is the connecting link between the east and west. It is a contradiction of Kipling's assertion that 'Never the twain shall meet,' for on the dude ranch the east and west mingle on terms of the utmost good fellowship."

The word "dude" is an American colloquialism, writes Herb Peet in the Great Falls Tribune. It originated back in the middle of the last century as a word to apply to the "dandy," the "fop" or the "swell." After the pioneer cattlemen had become established in the west, they applied the appellation of "dude" to anyone from the east who wore good clothes and was not familiar with the ways of the cow-country. It was natural, then, that when old cattle ranches were opened up to the vacationists they should be called "dude ranches."

There are many kinds of dude ranches. On some, particularly in the Wyoming country where the business has been well developed, you will find perhaps 100 guests. On others the number may be limited, say to a dozen or even less. It all depends on how many guests the dude rancher feels that he cares to look out for and also on the personal wishes of the guest.

Some people like plenty of social life, with dancing, bridge and general entertainment of a more familiar nature mixed with the simpler pleasures of outdoor life. For such the larger dude ranches are the real thing.

Some prefer less of the social life. Perhaps they want an isolated cabin and the certainty that they will have a few table companions at dinner time. A smaller ranch would suit them best.

Or for both classes of guests some of the larger ranches have hit on a happy solution. They have smaller ranches, accommodating a dozen or less, a few miles from the "home ranch." Perhaps these smaller ranches are high in the Montana mountains where scenery and fishing are ideal, but where it is not so easy to provide accommodations for a large number of visitors.

Horseback riding may be classed as the main amusement on a dude ranch. Fishing, hunting, visiting nearby scenic or historic spots, or just loafing around the ranch in the bright western sunshine, are some of the ways of passing the time, which goes all too quickly.

The dude ranch as established in northern Wyoming and southern Montana has systematized the old hit-or-miss western trip for easterners. No more is time wasted in negotiating for guides or in collecting one's own outfit of bedding, tents and supplies. The dude ranch has everything ready.

Commenting upon this, Mr. Chapman says in an article in a recent New York World: "No other country in the world has a system comparable with that of the dude ranch of western America. It affords the quickest, easiest and most economical way of getting into the heart of the real outdoors. Then, too, the dude ranch maintains a certain life and

color which give zest to every day of a vacation. It breathes of the old west and yet provides all the comforts of the new. It takes people away from the rush and strain of city life and yet, even in the most remote places, surrounds them with every comfort and not a few luxuries."

## Land For Refuges

**T**HE United States Bureau of Biological Survey will on July 1 begin the examination of lands for acquisition under the Migratory Bird Conservation Act passed at the last session of Congress, for which an initial appropriation of \$75,000 was made. To facilitate the business-like conduct of this survey, a land acquisition division has been formed in the bureau to have charge of this work and also of the acquisition of lands for the Upper Mississippi Wild Life and Fish Refuge and the Bear River Migratory Bird Refuge.

Rudolph Dieffenbach, who has had charge of the acquisition of lands for the Upper Mississippi Wild Life and Fish Refuge, will head this new division of the bureau.

With reference to carrying out the provisions of the Migratory Bird Conservation Act, Chief Paul G. Redington of the bureau said:

"It is necessary to ascertain by examination of the numerous potential areas to be found throughout the United States those that are best adapted for refuges, to make appraisals in order to determine their character and value, and to conduct other activities incident to their acquisition with the funds



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"The units selected for migratory bird refuges must be of such character as will best serve the purposes contemplated under the act. Usually they will be more or less extensive areas of lowland, comprising marsh and woodland contiguous to or embracing water areas, or they may be areas that were formerly well suited as feeding and nesting grounds for migratory birds, but now useless by reason of drainage developments or evaporation and subject to restoration to their natural conditions. The Migratory Bird Conservation Commission created by the act will consider and pass upon all lands recommended by the Biological Survey for acquisition for refuge purposes. The Secretary of Agriculture is chairman of the commission."

Mr. Dieffenbach, who will be in charge of the land acquisition program, has had long experience in this sort of work covering a period of 20 years. He served first in the United States Forest Service in connection with the classification of lands and later was in charge of surveys of lands purchased for national forests under the Weeks law. He has served as forest valuation engineer in the treasury department and recently has been in charge of the purchase of lands for the Upper Mississippi refuge.

## WHAT DID EVE SAY?

Whatever trouble Adam had,

No man in days of yore

Could say when he had told a joke,  
"I've heard that one before."

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"Do you teach observation?"  
"Yes."

"Then I will take the class. Now, children, shut your eyes and sit still."

Following this the inspector made a slow whistling sort of noise and followed with, "Now, children, what did I do?"

For some time there was no answer but ultimately one little boy piped out, "You kissed teacher."

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Your old blood boils at his sassy yap,  
And you pray the devil has sprung a trap.

His tummy is bulgin' with a royal feast,  
He's sucked from the throat of some poor beast,  
For he cares not whether it's lamb or calf,  
It makes him give that devilish laugh.

Then git the old trusty and let her crack,  
Just trustin' to luck you bust his back,  
If you nail him square he's past all harm,  
He's made his last raid on your old farm.

If you can't get the critter in any other way,  
Then S. O. S. the Biological Survey.  
They'll set a trap, or a pill will roll;  
And I'll tell the world that's Coyote Control.

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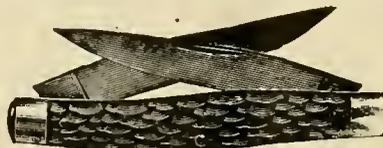
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**Gill's Chub**



Scientists of the University of Montana, employed at the Biological Station on Flat-head Lake, which was the first of its kind established by a state commission in the world, have found that the *Leuciscus gillii* or Gill's chub, is an abundant fish in the lake, which is Montana's largest body of fresh water. Scientists say in their reports to the State Fish and Game Commission that Gill's chub is an important food fish for other species. On account of its small size this fish is not used as food, although without doubt its flesh is good.

**NOT BIG ENOUGH**

Dora—"Why do her people object to him?"

Doris—"There are seven in her family and the car holds only six."

**POLICE ANESTHETICS**

Judge—"The prisoner seems to be drugged."

Officer—"Yes, sir. I drug him five blocks."

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## A Cure for the Blues

By JAMES J. MONTAGUE

*I know of a brook that is singing its song,  
To the grass and the sky and the trees—  
That murmurs of happiness all the day long,  
And mocks at the sigh of the breeze.  
It wanders away through the meadows and hills,  
Where cat tails and water grass quiver—  
Till, joined by a legion of silvery rills,  
It goes on its journey—a river.*

*But down in the glade, where it still is a brook,  
That a little boy's footsteps may cross,  
You will find by a boulder a soft little nook  
With a carpet of velvety moss,  
And there you may gaze, all the afternoon long,  
At the butterflies over you winging,  
And list to the lulling and slumberous song  
That the stone-fretted riffles are singing.*

*The sunbeams about you in long slanting lines,  
Reach down from the heaven's blue zone—  
Through rifts in the limbs of the needle-clad pines  
That are singing a song of their own.  
There's a rustle of birds in the sycamore trees,  
Afar a lone partridge is drumming,  
And up on the hillside a half million bees  
Are happily, busily humming.*

*So if you are weary, or laden with care,  
Or tired of the struggle and strife,  
And find but a dull and a dreary affair  
The workaday business of life,  
I will lead you some day to the soft mossy nook,  
And if you will cast off your sorrow,  
And listen a while to the gay little brook  
Life will seem well worth living tomorrow.*



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