BULLETIN 229 JUNE, 1945

SOME MONTANA BIRDS

Their Relationship to Insects and Rodents

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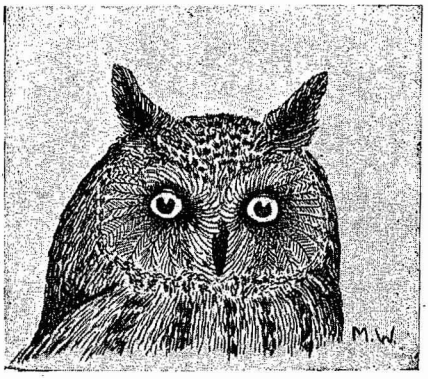

Long-eared Owl

MONTANA STATE COLLEGE
AGRICULTURAL EXTENSION SERVICE
BOZEMAN, MONTANA

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Montana Extension Service in Agriculture and Home Economics, J. C. Taylor, director.
Montana State College and United States Department of Agriculture cooperating.
Distributed in furtherance of Acts of Congress, May 8 and June 30, 1914.

6-45 5-M

SOME MONTANA BIRDS

Their Relationship to Insects and Rodents

For many years it has been becoming increasingly evident that many of the nation's native birds have been decreasing in numbers. This was first apparent in the thickly settled regions along the Atlantic coast, but the condition has moved westward with the gradual settlement of the interior, until it is now evident throughout the whole of the United States.

Areas in which agricultural interests are preeminent are faced at times with the necessity of reducing and controlling various birds and mammals which destroy an abnormal amount of the crops or which adversely affect domestic animals in one way or another. This control is just as important as is the control of weeds.

In order to reconcile our desire to save some birds from undue destruction with the necessity to protect crops and domestic animals, we must know what birds are primarily harmful to our interests, and to what extent others are valuable or harmful. A Cooper's hawk may make a wild dash into a flock of chickens, killing one and spreading consternation among the rest. That hawk should be killed, but this does not justify shooting the next hawk seen which may be a large, slow-moving Swainson's hawk or some other beneficial species.

It has long been know that many birds which come under the heading of "vermin" are not culprits, and that they may even be beneficial, but we have been slow to accept this information. The great majority of birds has been shown to be beneficial, and even the offenders may be beneficial to a certain extent. The purpose of this circular is to present facts concerning the value or harmfulness of some of the common large birds which have been accused (and properly so in some cases) of conflicting with agricultural or game interests in Montana, and to call attention to some species largely beneficial which are nearing extermination and are thus in great need of protection.

The control of harmful birds should not be undertaken without a knowledge of which ones are harmful, and to what extent. The value of any control measure is proportional to its selectivity for the species which we desire to control. Bounties on harmful birds

may do more harm than good to agricultural or game interests until we learn to distinguish species. When we are able to separate the bad from the good, bounties may be a valuable incentive where such is needed. Neither organized hunts nor the use of poison is selective, and either method of control sacrifices many forms which should not be suppressed. Investigations carried on in California (Hall (1)* Linsdale (2) and (3)) demonstrated what may happen when poison is carelessly or wantonly exposed.

Information now being obtained by game management specialists tends to show that predators have but little effect on normal populations of game species, and that the check which predatory species apply to the increase of these valuable forms is negligible. Furthermore, the most of the predatory birds, destroy more rodents and other small mammals than game birds, and in Montana, where rodents form a natural reservoir for such diseases as tularaemia, plague, and possibly spotted fever, these birds should be conserved as natural checks on the small, disease-carrying animals. Birds of prey kill first that which is most easily killed. The very traits which lead us to include certain mammals, birds, and fish in the category known as "game" make them difficult for predatory and fish-eating birds to capture.

We have only to examine such figures as those compiled by Errington and Bennett (4) to realize that part which hunters are playing in the destruction of game species. These investigators found that as many as 59.7 per cent of the ducks actually shot in one area were not recovered, and from 19.4 per cent to 39.4 per cent of the pheasants dropped never reached the bag.

One will be surprised to discover how many of and to what extent our predatory and other so-called "vermin" birds feed on insects. We are likely to consider such small creatures too ignoble prey for these comparatively large species. The fact is that they eat great quantities of insects, sometimes, as in the case of the Swainson's and the sparrow hawk, almost to the exclusion of other food. Great value doubtless results, but we must temper our examination of the data in the light of the fact that all insects are not harmful to man's interests. Furthermore, birds destroy the greatest percent of the insect populations when there are comparatively few insects present. The ability of insects to reproduce

*Figures in parenthesis refer to Reference List.

is so much greater than is the same ability in birds that they can appear in hordes while the bird population remains stationary or nearly so. The effect of birds on insect outbreaks is likely to be very local in nature unless there is a general migration of a species or several species into an area of high insect concentration. Such migrations have been known to occur, and great benefit has been derived from flocks of birds thus brought together. This occurs so seldom, however, that it attracts unusual attention. Birds as insect eaters, then, are most valuable in their constant and relentless attack on small normal insect populations, and may be important factors in the stemming of many potential insect outbreaks, the possibility of which escapes our attention. It naturally follows that insect eaters deserve protection just as much when insects are few as they do when insects are inflicting great losses.

Birds which are of service under ordinary conditions may do much harm when excessive amounts of food are made available to them. Such areas as game farms, fish hatcheries, and overstocked covers or streams, may furnish this extra food and considerable loss may then occur from otherwise inocuous birds. At such places special precautions must be taken. A 4-H Club poultry project should include some work upon the protection of flocks from hawks[1] along with other essentials in the care of their flocks.

PREDATORY BIRDS

The hawks, eagles, and owls are included in this group. There have been times in the past when some of these birds have caused considerable loss to the farmer. During recent years, because of the constant and indiscriminate shooting of these species and the destruction or occupation of their breeding places, their numbers have visibly decreased all over the United States. In Montana this is especially true of the golden and bald eagles, but the most of the hawks and owls which frequent areas of human habitation have also decreased appreciably.

A few species are undoubtedly harmful, and because of these few all of the hawks and larger owls have been destroyed whenever possible. It does not follow that the larger the size of the hawk the more damage it does. In fact, the majority of the harm-

[1]Information may be obtained from United States Department of Agriculture Leaflet 96, "Protecting poultry from predacious birds."

ful species are not large, and most of the large bodied, slow flying species are beneficial to agriculture, although occasional individuals in the latter group sometimes cultivate the habit of visiting poultry yards.

In the early fall of 1935 there were several fields south of Dillon, Montana, which were heavily infested with grasshoppers. For several days one of these fields, which was in line of migration, was visited by large numbers of the heavy bodied hawks which gorged themselves on the destructive insects. Many of them ate such great quantities that in the evening they found it difficult to rise from the ground. This feeding produced a definite local effect on the number of grasshoppers.

Birds of prey are often classed as vermin because of attacks upon game birds and mammals. It is a well established fact among specialists in game management that an area can carry but a certain number of game birds or mammals, just as the stockman knows that only a certain number of sheep or cattle can graze in a given area without deterioration of the range. This is often overlooked by sportsmen who do not realize that game may overstock an area. Careful observations have shown that game birds are comparatively safe from predators, and that predacious animals do not have much effect on their numbers, except in cases where there is not enough food or cover for all of the game. Conclusions have been reached recently (Errington and Hammerstrom (5) after a study of bob-white coveys in which the excess populations were removed by shooting, and others in which these excesses were not hunted, that the destruction of birds by predators was an unimportant item where the population of bob-whites was held to the carrying capacity of the areas inhabited, and that destruction increased only when the birds were present in such numbers that adequate food and protection was not available. It thus seems that too much stress has been placed in the past on the effect of predatory animals on the abundance or scarcity of game. In the words of Dr. Paul L. Errington ". . . . more and more the accumulating data indicate that predation has not nearly the influence in determining animal populations that is generally thought by scientific people as well as by laymen. So much of predation seems to be of little real significance to populations, insofar as it represents largely pressure upon badly situated sur-

pluses which seem to have the cards stacked against them in the first place."

In summing up the case of our predatory birds, we find that there are only a few species which habitually feed on smaller birds and poultry. Occasionally there are individuals belonging to definitely beneficial species which cultivate a taste for poultry, but the habits of these individuals should not incriminate the species as a whole. The attacks of predatory birds upon game have been greatly misjudged in the past and, save where there is more game than an area can support, the effect of these predators is likely to be insignificant.

Mr. P. A. Taverner (6) lays down the following generalities: The most of the summer hawks on the prairies are likely to be beneficial. All dark hawks are positively beneficial. Those seen in late autumn and winter are likely to be harmful to bird life. We might add further that any long-tailed hawk with blunt wing tips and stealthy, skulking habits may be injurious, and that all of the broad winged hawks with broad, short tails and conspicuous soaring habits are distinctly beneficial.

TURKEY VULTURE (*Cathartes aura*).—The turkey vulture or turkey buzzard is one of the most easily identified of the flesh-eating birds. At close range its bare red head and uniformly dusky plumage will at once separate it from all other North American birds of prey. It appears to be entirely dark in flight but for a slightly lighter cast to the feathers in the hind half of the lower surface of the wings. The front margin of each wing bends at a definite angle midway between the body and the tip of the front flight feather, the lines leading from the base to the angle and from this point to the tip are nearly straight. In size the turkey buzzard is a little smaller than an eagle. It can be distinguished in flight at a considerable distance.

The turkey vulture is a carrion eater, practically to the exclusion of all other types of food, and its bill and feet are comparatively weak. Its value is unquestioned as a scavenger, and it must be classed as entirely beneficial.

It was formerly abundant especially in the eastern part of the state, but it is now rare. Saunders (7) suggests that its abundance may have resulted from the slaughter of the bison on the plains, the cessation of which brought about its near disappear-

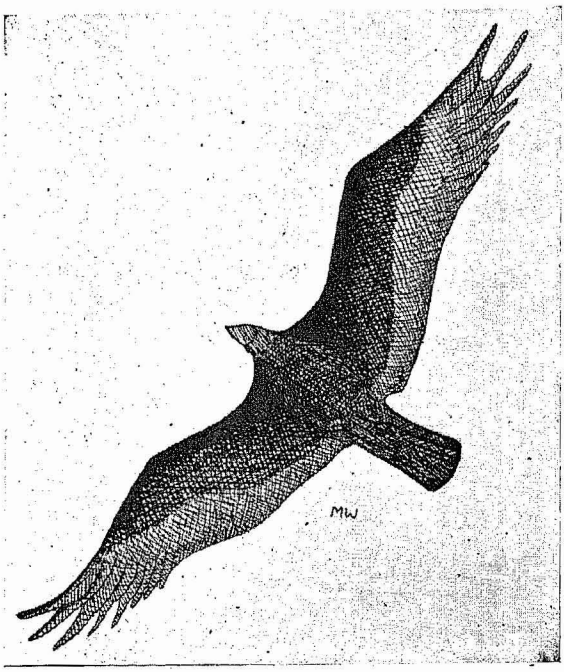


Figure 1. Turkey vulture

ance. It has been shot in common with other birds of prey, however, and occasional specimens appearing in the state are, unfortunately still being destroyed. It is not, but should be, protected by law.

MARSH HAWK (*Circus hudsonius*).—The marsh hawk is one of the most common hawks in the state. It is best separated from its relatives by its comparatively long wings and tail, the conspicuous white patch of feathers at the base of the tail, and its flight habits. It is a low flier, beating its wings several times and skimming slowly a few feet above the ground. When soaring its wings are not held horizontally as in most hawks, but the tips are raised considerably above the level of the body. The flight is slow and erratic and quite similar to that of a gull. This species is of medium size—a little larger than a crow. The sexes differ in color; the males are slate-gray, while the females and young are rusty brown.

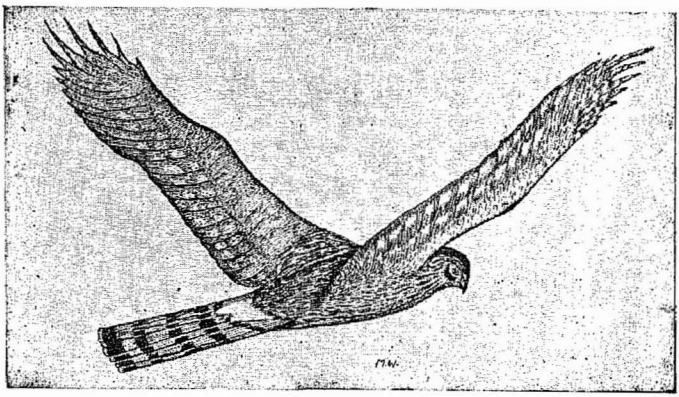


Figure 2. Marsh hawk

The marsh hawk has a rather diverse bill of fare. The following table of food items will give an idea of the importance of the various kinds of food. McAtee's figures were obtained from the examination of 601 stomachs, May's from the examination of 418, and Errington's from information procured by retrieving prey from hawks, examination of numerous gullets and stomachs, and from regurgitated pellets of undigested material.

	Authority					
	McAtee (8)	May (9)	Errington (10)	Total		Per cent
Mammals	277	259	295	831	or	55.1
Poultry or game	55	10	1	66		4.4
Other birds	265	176	48	489		32.4
Other vertebrates	28	27	15	70		4.6
Insects	39	11	0	50		3.3
Miscellaneous	2	1	0	3		.2

From the above figures it is seen that the largest single item of food for the marsh hawk consists of mammals, the quantity being nearly double the amount of its nearest competitor. The list of mammals consists largely of mice, ground squirrels, and young cottontail rabbits; all of which are considered harmful. The next item in size on the marsh hawk's menu includes birds other than game and poultry. The birds in this list most commonly eaten were the sparrows and their kin, bobolinks, young meadow larks, and young redwing blackbirds. Poultry and game birds

were encountered 66 times. The figure is abnormally large because of the inclusion in McAtee's list of 37 pheasant remains obtain from marsh hawks which were migrating in larger numbers than usual over a game farm.

The generalization has been made that the usual size limit of the kills of this hawk consists of quarter-grown cottontail rabbits, ground squirrels, meadow larks, and flickers. Adult pheasants, sharp-tailed grouse, and chickens have been noted to ignore the presence of marsh hawks.

This hawk is largely beneficial, but it is unprotected by law in Montana.

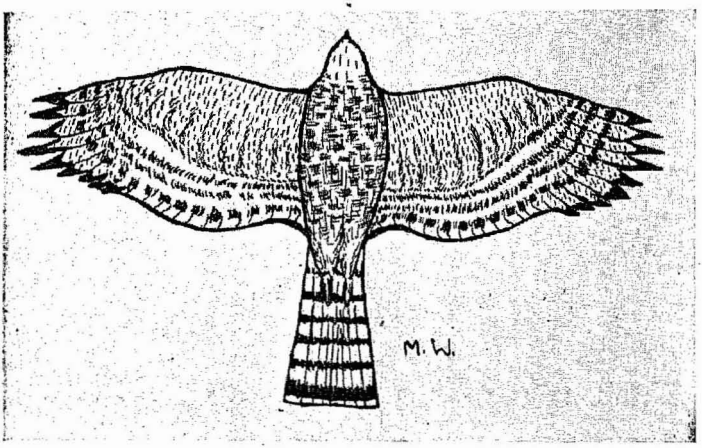


Figure 3. Sharp-shinned hawk

SHARP-SHINNED HAWK (*Accipiter velox*).—The sharp-shinned hawk is one of the small birds of prey. It may be confused with the sparrow hawk, the pigeon hawk, and small Cooper's hawks.

The adult sharp-shin is slate-blue over the back and finely barred with rusty-red and white across the breast. Together with the two species which will next receive attention, this species possesses a rather long, slender, barred tail and blunt, rounded, narrowly-barred wings. It may be easily separated from the sparrow hawk by the absence of the beautiful deep chestnut plumage

of the latter species, and from the pigeon hawk, which also approximates it in size, by rounded wing tips. The pigeon hawk, in common with the other falcons, possesses wings which are pointed at the tips. It may be distinguished from the Cooper's hawk by its smaller size, 14 inches or less in length, and by the square or weakly notched tail in comparison with the rounded tail tip of the larger bird.

This hawk is more deserving of the title "sparrow hawk" than is the little falcon which now goes by that name, for its food largely consists of sparrows and other small birds which are to a great extent beneficial. It will also take young poultry and game birds, and to a small extent such rodents as mice and shrews. Taverner (6) found the stomachs of 107 sharp-shinned hawks to contain in 6 cases poultry or game, in 99 cases other birds, and mice or insects in 11. In 1930 examinations listed by May (9) 28 had eaten mammals; 16, poultry or game; 844, other birds; 45, insects; and more than 106 were empty. McAtee (8) reported after examining 944 stomachs that poultry and game occurred in 7, other birds in more than 708, and mammals in 30 instances. The largest birds noted in the stomachs were a sparrow hawk, a mourning dove, and a band-tailed pigeon.

About ranches where chickens are raised, or about concentrations of game birds, it is probably wise to control this hawk, especially during the season when there are young birds about. Away from these areas, however, there is little justification for shooting it. It is abundant nowhere in the United States and is reduced in numbers over large areas. The fact that it has lived with and on small birds for a great period of time, and that in spite of it these small birds are much more abundant than is the hawk, reasons against any wholesale destruction.

In Montana the sharp-shinned hawk is most likely to be encountered in the mountainous western part of the state. It is rare in the eastern plains region. It is not protected by law.

COOPER'S HAWK (*Accipiter cooperi*).—The sharp-shinned hawk, described above, might be considered a vest-pocket edition of the Cooper's hawk. The two are very similar in conformation and in color. Cooper's hawk, however, is larger, the top of the head is darker, and the back is a clearer, more uniform slate-blue.

The tip of the tail is slightly rounded. In length this species measures from 14 to 18 inches.

Not only is this hawk similar in shape and color to the sharpshin, but its food preferences and habits of hunting are similar. It is primarily a bird eater, moving furtively through trees and brush or among buildings and making furious dashes toward its prey. As we would expect of a larger bird, the Cooper's hawk is capable of taking larger game. It will sometimes attack well grown chickens or adult ruffed grouse. It will occasionally take small mammals and other vertebrates, and sometimes insects, but these items comprise a minority of its food.

Where there is danger of the Cooper's hawk causing losses to poultry raisers, it should be held in check. Its control is also justifiable near game farms or other artificial concentrations of game birds. It is probable, as has been stated previously, that game populations suited to the areas which they inhabit will be but slightly affected by attacks from this species.

Cooper's hawk is a summer resident throughout the state. It is rare in the east, becoming more common in the mountains in the western half. It is unprotected by law.

GOSHAWK (*Atur atricapillus*).—The goshawk, the sharpshin, and Cooper's hawk comprise the group known as the bird hawks. The goshawk (a contraction of the name "goose-hawk") is the largest of the trio, measuring 19 or more inches in length. The adult is slate-grey, the under parts being gray with fine darker markings and none of the rusty-red of the Cooper's or the sharpshin. Dark bars on the under sides of the wings, and the typical long, bird-hawk tail will separate it from the large hawks.

This hawk feeds largely on birds, as do its close relatives, but we find that mammals are represented to a larger extent in its diet than in the case of either of the others. In 881 stomachs reported by May (9), 233 contained mammals, 447 poultry or game, 49 other birds, 13 miscellaneous, and 168 were empty. McAtee (18), reporting on 243 goshawk stomachs, found poultry or game birds in 156, mammals in 80, insects in 4, and a miscellany of moderate sized birds in 3. The mammals were to a large extent rabbits and squirrels.

Were this hawk common in Montana it would be capable of doing considerable damage to poultry raisers. It usually nests in

the tree covered areas of northern Canada and Alaska. Nesting birds are occasionally found as far south as northwestern Montana, but this hawk is seldom seen in the state save in migration in the fall. Because of its limited numbers we have grounds for controlling it only in the vicinity of poultry yards, or concentration of game birds. It is unprotected in the state.

RED-TAILED HAWK (*Buteo borealis*).—In Montana at the present time the relentless and ill-founded persecution of the red-tailed hawk and the three species next discussed is wholly unjustified. The average person includes all of these hawks under the loose and misleading name of "hen-hawk."

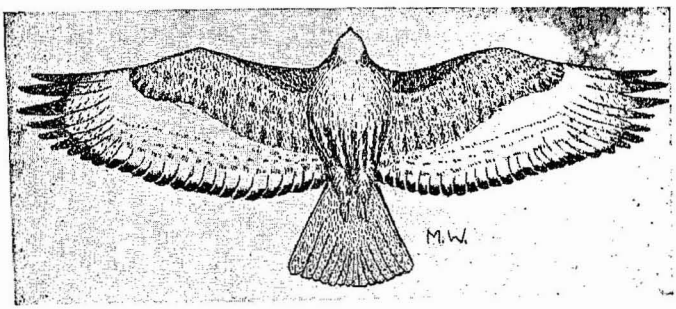


Figure 4. Red-tailed hawk

The red-tail is a large hawk, commonly seen soaring about in the sky or perching in some tree or on a promontory. It is slow in its movements, often conspicuously noisy, and therefore easily discovered and shot. Usually the upper surface of the tail is a bright brownish-red. In the east this is characteristic of the most of these hawks, but in Montana the species is highly variable in color. The tail may be red or bluish-gray; the body may be light or almost entirely sooty-black. The under surface of the wings is usually moderately light, with the tips of the large wing feathers dark and with a dark blotch or "wrist mark" on the front margin near the bend or angle. The under surface of the tail is usually without evidence of crossbands. The under surface of the body is usually slightly dark behind the throat and definitely so on the posterior half.

The food of the red-tailed hawk is predominantly mammalian,

the forms eaten being largely ground squirrels, rabbits, and mice. It does occasionally eat birds, poultry not being excepted. The greatest trouble which poultry raisers experience from this species occurs when the chickens are young. Of 18 chickens taken by this species and noted by Errington (10), 16 were young individuals. May (9) quotes a report of P. G. Reddington, former chief of the Bureau of the Biological Survey, to the effect that in 31 stomachs of the red-tailed hawk from the State of Washington taken in 1927, 83 per cent of the food consisted of ground squirrels, 6 per cent of rabbits, 4 per cent of mice, and 7 per cent of snakes. McAtee (8) found that in 754 stomachs and crops examined, 86 per cent contained mammals, less than 12 per cent contained poultry, 8 per cent other birds, 8 per cent vertebrates, and 15 per cent insects. Studies carried on by English (11) disclose interesting information concerning the food which a pair of red-tailed hawks brought to its young. The nest was located in an area which was highly stocked with pheasants and Hungarian partridges, yet in spite of this fact more than 75 per cent of the food brought to the young consisted of small mammals (mice, rabbits, etc.), about 10 per cent game birds, and 13 per cent other birds. The Hungarian partridges on the area were hand-reared and semi-tame, and had been liberated with one wing clipped. They were, therefore, much more susceptible to capture than would normally be the case. It is stated by May that this hawk and related species often feed on birds or mammals picked up in a dead or crippled condition, and this may sometimes be true with poultry and game. Errington (10) found that 3 out of 5 tree squirrels, 2 out of 2 Franklin ground squirrels, and about a third of 42 striped ground squirrels, were suffering from a mange-like skin disease. The food of this hawk in the western states is composed largely of ground squirrels. These and other small rodents are carriers of at least three diseases which may affect the health of the people of Montana—Rocky Mountain spotted fever, tularaemia, and the plague. The good that this hawk does by helping to reduce the possibility of humans contracting these diseases, and in reducing the damage to range which is brought about by the ground squirrels, far offsets the small amount of injury to poultry raisers from the occasional attacks of individuals upon their flocks.

This species is found throughout Montana but is more com-

mon in the western half of the state. It is unprotected by law but should receive complete protection.

SWAINSON'S HAWK (*Buteo swainsoni*).—The Swainson's hawk is quite similar to the red-tail. It is slightly smaller, its wings are a little more pointed, and it usually has a dark band across the breast just behind the throat. It is found in as many color forms as is the red-tail but it never has a red upper surface to the tail. Not uncommonly it shows evidences of bands across the under side of the tail, a character not evident in the red-tail. Usually the most distinctive character seen in flying birds is the dark band across the breast, which leaves the hind part of the under surface of the body the lightest, and the absence or near absence of a "wrist mark."

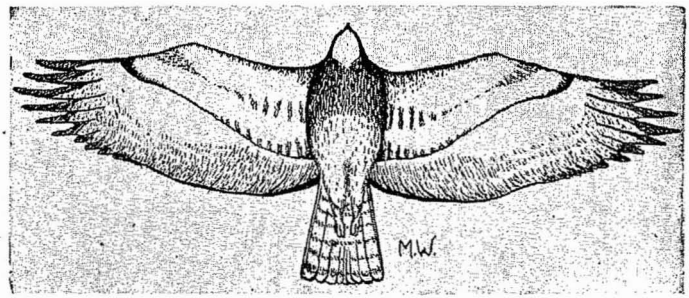


Figure 5. Swainson's hawk

Whereas the red-tailed hawk is found more commonly in broken country, the Swainson's is a dweller of the plains by preference, and is usually the most abundant hawk in eastern Montana. It is commonly seen soaring in great circles or perched silently on some fence post, awaiting the appearance of a ground squirrel or other small rodent.

The Swainson's hawk is one of the most beneficial of our birds. McAtee (8) found 1 grouse, 9 small birds, and 80 rodents in 111 stomachs. Other food found in these crops and stomachs consisted of snakes, lizards, toads, turtles, frogs, and insects. One stomach held 200 grasshoppers; another, 109; crickets and a third, 35 Mormon crickets. In 45 stomachs examined in the State of Washington, 90 per cent contained ground squirrels and 10 per

cent snakes and grasshoppers or other insects. In eastern Montana they have been noted eating many frogs, mice, and grasshoppers.

It is very unfortunate that this interesting and beneficial bird does not receive protection of the law. It is most common in eastern Montana but is to be found in all of the mountain valleys.

ROUGH-LEGGED HAWK (*Buteo lagopus*).—The rough-legged is one of the largest of our hawks. Like the red-tail and Swainson's hawk it sometimes appears in a dark form, and in this color phase it is difficult to distinguish from them. The light phase, which is much more common, will not be confused with either of the other species. The front part of the under surface of the body is light, the head sometimes appearing almost gray. The poster-

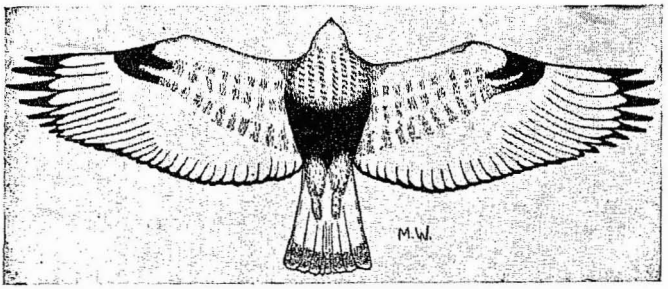


Figure 6. Rough-legged hawk

ior half of the under side of the body is covered by a solid dark band. Dark "wrist marks" are conspicuous at the bends of the wings, and the tips of the large wing feathers are dark. The bases of the tail feathers are usually conspicuously light. The legs are feathered to the bases of the claws, which character furnishes the basis for its common name.

This species is an inhabitant of meadows and marshes where mice abound and is often seen perched on a rock or post or flying low over the vegetation, somewhat in the manner of the marsh-hawk. It is most active at dusk, and this trait, together with its habit of taking a few leisurely wing beats and sailing for a short distance, recalls the actions of some of the owls. Only in the winter is it found in Montana in any numbers.

In choice of food the rough-legged hawk is preeminently a

mouser. From data which May (9) gives from more than 200 stomach and crop analyses, we find that mammals make up approximately 86 percent of the food of this species, poultry or game .04 per cent, other birds 4 per cent, other vertebrates 4 per cent, and insects 9 per cent. McAtee (8) found one ruddy duck and two small birds in 99 stomachs. Meadow and pine mice were found in 51 of these, house mice in 5, other mice in 22, and brown rats in two. Rabbits were recorded from 9, ground squirrels from 5, pocket gophers from 3, and a prairie dog from 1. Other mammals included a weasel in one stomach, shrews in 11, and a mole in one. Prairie dogs and gophers have been noted as the preferred food animals of this hawk in Montana.

The above data indicate that the rough-legged hawk is highly beneficial. Although it is not protected by law in Montana, it is very deserving of it. In this state it is usually a winter visitor both in the mountain valleys and in the plains area, although there are several summer records of its appearance. It may occasionally nest in northwestern Montana.

FERRUGINOUS ROUGH-LEGGED HAWK (*Buteo regalis*).—The ferruginous rough-legged hawk resembles its relative, the rough-legged hawk, in many respects of habit and appearance. It is a large, slow hawk and has been a favorite target for hunters. As in the case with all of our Montana hawks of the genus *Buteo*, this species occurs at times in a dark phase, and in this color variation is difficult to separate from similarly colored red-tailed Swainson's, and rough-legged hawks. In the usual coloration it appears largely light beneath; the long feathers of the legs are chestnut-brown, and when the legs are folded back against the base of the tail, as they are in flight, these feathers form a conspicuous dark V with the point toward the back. The dark "wrist marks" of the wings are not conspicuous and the under surface of the tail is light without the definitely darker tip we find in the rough-leg. When a bird is flying low, or when it is flushed from a perch, the bases of the large flight feathers of the wings show white on the upper surface, which contrast with the dark wing tips. This character is common to both of the rough-legged species but is not noticeable in either the red-tail or Swainson's.

McAtee (8) lists the contents of 17 stomachs taken from birds

of this species. Rabbits were found in 8, ground squirrels in 4, mice in 5, sparrows in 1, a sharp-tailed grouse in 1 and a Jerusalem cricket in 1. Two stomachs contained five mice each. In the 24 stomachs tabulated by May (9), mammals were found in 88 per cent, game in 4 per cent, other vertebrates in 8 per cent, and insects in 8 per cent. He goes on to quote that A. C. Bent found the food to consist almost exclusively of mammals, ranging in size from jackrabbits to meadow mice; together with some reptiles and insects.

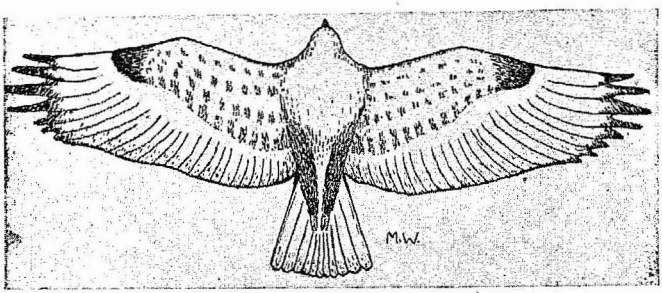


Figure 7. Ferruginous rough-legged hawk

The ferruginous rough-legged hawk, therefore, must be considered as beneficial as the rough-leg. It deserves protection which it does not yet receive. It is abundant in the summer in the eastern part of the state, less so in the mountain valleys of the east slope, and rare west of the continental divide.

GOLDEN EAGLE (*Aquilla chrysaetos*).—Four species of eagles are found at times in North America. Two of these, the golden and bald eagles, are found in Montana. The golden eagle will be confused only with the immature bald eagle. Its large size and uniformly dark color will distinguish it from all other Montana birds. Young golden eagles are not uniformly dark beneath as are the adults. The tail is rather light with a definite black tip to the feathers and there is a light area at the bases of the large flight feathers of the wings. Young bald eagles show more gray beneath the wings, especially at their bases, and the tail lacks the contrasting black and white at the tip which is seen in the immature golden eagle.

The golden eagle is a bird of the mountains, usually seeking out some nearly inaccessible place for its nest, and coursing about through broken regions in search of its food. In the fall and winter it descends to the lowlands where it is more commonly seen during those seasons. It has been decimated over the whole of its range in the United States, and nowhere is it now abundant.

Most people do not realize the importance of carrion as food of the eagles. The carrion-eating habit is less developed in the golden than in the bald eagle, but where this type of food is available, as near Gardiner, Montana, it is not uncommon to see golden eagles so gorged that they are unable to leave the ground.

In the mountains this eagle feeds to some extent on the lambs of the bighorn sheep and kids of the mountain goat when these are available, but Taverner (6) states that ". . . . in the mountains, the damage it does can be easily overestimated, as marmots, rabbits, and gophers are undoubtedly its staple food, the other supplies being probably the result of hoped-for opportunity rather than habitual seeking." May (9) tabulates the contents of 80 stomachs and crops, obtaining the following information: mammals were found in 60, poultry or game in 7, other birds 7, other vertebrates 1, insects 1, miscellaneous 5. On the plains in the fall and winter its food consists mainly of jackrabbits. The sight of an eagle beating after a zig-zagging rabbit is one which never will be forgotten.

While it must be admitted that the golden eagle does some harm, a perusal of the above information on food habits may change our ideas as to the actual amount of injury sustained from this bird. Together with the most of our predators, it is much more beneficial than harmful. It is no longer abundant and should be conserved although it is not at present protected by law.

BALD EAGLE (*Haliaetus leucocephalus*).—The dark body and white head and tail of this species when in adult plumage will not allow it to be confused with any other North American bird. The young may be confused with the immature golden eagle, but the difference between the juvenile plumages has already been discussed.

Were this bird possessed of a bare head instead of one covered with white feathers, its food habits would fit its appearance better. It is a scavenger to a great extent, combing beaches and river shores for dead animals and fish, but accepting any carrion which

may fall into its lot. It does not limit itself to this food as do the vultures, but will take live mammals, birds, and fish whenever available.

From an examination of 58 stomachs, McAtee (8) found fish in 29 (the most of these appeared to be carrion), carrion in 14, waterfowl in 6, domestic fowl in 1, rabbits in 2, and a prairie dog, rat and mouse each in 1. He goes on to say that ". . . . the question arises in the case of almost everything found in the stomach of this bird as to whether it may have been taken as carrion." In 80 stomachs upon which May (9) reports, 9 contained mammals, 12 poultry or game, 35 other vertebrates (largely fish), and 15 miscellaneous (carrion?). There was no food in 11 stomachs.

While the bald eagle is a bird of the coasts and inland regions of large water surface, it is not primarily a fisher, preferring to obtain this food as carrion, by robbing other fish-catching birds, and by picking up wounded or spent individuals. It has been accused of doing great harm to the salmon industry of the Pacific coast, but this injury has never been satisfactorily demonstrated. While it will occasionally take waterfowl, it is a very minor enemy of these birds in Montana, and further, in its present small numbers its attacks are negligible. Although it does not receive the protection of the law in Montana at the present time, it should be protected. It is rare throughout the state but a little more common in the western half.

PRAIRIE FALCON (*Falco mexicanus*).—One is impressed by the subtlety and craft of the bird hawks and by the stolidity of the broad-winged, heavy bodied, soaring hawks; but the falcons are built for speed—sustained speed. They are the embodiment of vitality and the essence of vigor and stamina. The falcon possesses a rather long, slender tail which allows it to change its direction of flight quickly. The slender, conspicuously pointed wings are built for speed. Quick wing-beats and the reduction of the soaring habit characterize its flight.

The prairie falcon is the commonest of this group of hawks in Montana, exclusive of the sparrow hawk. It is a moderate sized bird, rather gray or sandy in color, with the under parts furnished with rows of dots. The face is light gray, darkened behind and with a definite dark streak descending from each eye, forming what is called the "moustache mark."

This species is a dweller of the open prairies; in the Triangle area north of Great Falls and east into the north-central part of the state it is sometimes rather common in the fall, as many as 20 having been seen in a day's drive through these regions. Over the most of the state, and its entire range in the United States for that matter, it has been greatly reduced in numbers. It is seldom seen west of the divide.

To a large extent the food of this hawk consists of small birds and rodents, its speed and agility allowing it to take the former in flight. In compiling information from 40 stomach examinations, May (9) found that 13 had taken mammals, 11 poultry or game, 13 other birds, 5 insects, and 6 were empty. Taverner (6) reports on 8 stomachs, 3 of which contained game birds, 5 other

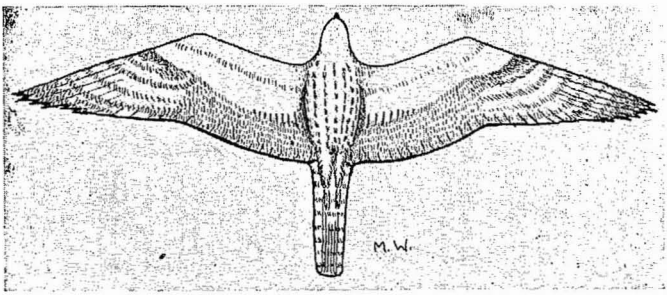


Figure 8. Prairie falcon

birds, 2 mammals, and 2 insects. Fowler (12) identified the following items of food after a prolonged observation of 3 prairie falcon nests containing young: 61 birds (the most of these were western meadowlarks), and 26 mammals. All of the mammals were ground squirrels and pocket gophers.

This information indicates the importance of birds in the diet of the prairie falcon. It does, however, destroy many injurious rodents and at times turns to grasshoppers for sustenance. It may sometimes attack poultry flocks in the north-central part of the state, and may deserve local control for that reason. No cases of attacks on poultry have been called to our attention, however. We are not justified in shooting this bird promiscuously. It is too rare a bird to do appreciable damage, other than possible rare

local injury, and it is not in a position to stand persecution at the present time. It is unprotected in Montana.

PEREGRINE FALCON (*Falco Peregrinus*).—The race of this species which occurs in Montana is commonly called the duck hawk, and is better known by that name. Of the birds of prey which are found in the state, it will be confused only with the prairie falcon and the large, rare gyrfalcon. It is a more beautiful bird than the prairie falcon, its rather finely barred light underparts contrasting with the dark slate of the back. The top of the head is nearly black and the "moustache marks" on the sides of the face are more pronounced and can be seen at quite a distance. Its habits of flight are similar to those of the prairie falcon, and at a distance it will be difficult to separate the two.

That birds are the preferred food of this falcon has been demonstrated time and time again. May (9) tabulates the contents of 102 stomarchs, 3 of which contained mammals, 11 poultry or game, 70 other birds, 12 insects; and 9 were empty. Errington (10) found that the diet of this species in Wisconsin included many domestic pigeons. Although in some areas the peregrine has been found to feed on ruffed grouse, Errington found a nest situated in excellent grouse country and within 50 yards of a drumming log and yet no trace of grouse remains were to be found near the nest. This would seem to be corroborative evidence of the theory which he expounds elsewhere, that game birds which fit properly into their surroundings are but slightly affected by predators.

If this species were common it could reduce populations of birds without doubt. It is rare in the state, more so west of the divide, and its depredations are negligible. The sight of a duck hawk is something of an occurrence. It should be protected before it is completely lost as a member of our fauna.

SPARROW HAWK (*Falco sparverius*).—This friendly little falcon is probably better known than any other of our hawks. It is conspicuous with its coat of bright rufous-bay and the dark markings on the sides of the head. The wings of the male are slate-blue except for the dark flight feathers, and there are patches of the same color on its head. It is about the size of a robin.

One can be assured of an opportunity to observe this bird anywhere in the state at the middle or low elevations. It is commonly seen perched on fence posts or telephone poles, flying when ap-

proached to another perch nearby, or hovering in the air above the suspected location of some prey. Because of the ease with which we may observe its actions it should be a favorite of high school biology classes, 4-H clubs, and similar organizations desiring to record the actions of birds.

The sparrow hawk is misnamed. It should be called the grasshopper hawk. At times it subsists almost entirely on these and other insects, and may be seen diving from its perch, picking the 'hoppers out of the vegetation, and returning to leisurely devour them. It by no means limits itself to this type of food. Mice, other mammals of similar size, and small birds are all acceptable. In 427 stomachs, the contents of which were tabulated by May (9) insects were found in 269, small mammals in 147, small birds in 69, other vertebrates in 13, miscellaneous material in 30, and 29 were empty. McAtee (8) found grasshoppers and allied insects in 491 out of 703 stomachs examined.

The sparrow hawk is predominantly beneficial. This state fails to provide for its protection but should do so.

OSPREY (*Pandion haliactus*).—The osprey or fish hawk is one of our most interesting hawks. It has forsaken the food habits of the most of its relatives and lives on fish, almost to the exclusion of other food. There are a few well substantiated records of reptiles, frogs, and birds entering into its diet, but these records are so uncommon as to excite a great deal of interest.

This hawk is larger than the so-called "chicken hawks" or "hen hawks" and smaller than an eagle. Both the legs and the wings are longer than is usual with most hawks. The under parts are light with a darker crossband across the breast. The tail is faintly cross-banded. There are dark "wrist marks" at the bends of the wings, and the tips of the large flight feathers are dark. The top of the head is nearly white, and a dark band extends through the eye to the back of the neck. The back and the upper surface of the wings and tail are dark. The flight of this bird is different from that of most hawks. The wing beats are deliberate and slow and the soaring habits is greatly reduced. At a distance it resembles a large, dark gull.

The osprey is a bird of the coasts and the inland lakes and rivers. It is an excellent fisherman, dropping with lightning speed into the water, grasping its prey with its sharply taloned, cal-

loused feet, and carrying it to its nest or a perch where it can be eaten without interruption.

Fish predominate so greatly in its diet that the recording of stomach examinations is hardly necessary. Suffice to say that it usually catches the shallow or warm water species. It seldom obtains the swift, deep water game fish. Cottam and Uhler (13) state that in 43 stomachs examined, suckers and menhadden formed by far the most important single item of food, composing nearly 43 per cent of diet. Other fish frequently found included yellow perch, bullheads, sunfish, carp, and flounders. One stomach contained the remains of a trout.

The osprey does practically no damage, and by destroying such spawn-devourers as the suckers it does much good. It is not uncommon in Montana and should be protected by law.

HAWKS OF MINOR IMPORTANCE.—At least four other hawks may be found in the state: Krider's, Harlan's, the gyrfalcon, and the pigeon hawk. The first two have been reported from the eastern part of the state. They are both heavy-bodied, short-tailed, broad-winged hawks and closely related to the red-tail. Their food habits are similar to this species. They are just as beneficial and deserve the protection which this species should have. The gyrfalcon nests in the far north and rarely enters Montana in the winter. It is a large, pointed-winged hawk, gray to nearly white in color, and similar in action to other falcons. It feeds on mammals and birds, its large size allowing it to take correspondingly large prey. In Montana it has been seen attacking mallards, and has been recorded from Shonkin, Collins, and Fortine. If for no other reason than its rarity it should be protected. The pigeon hawk, another falcon, is also rarely seen. It is a small hawk, and might be described as a sparrow hawk with a blue-gray back, barred tail, and light, rusty underparts. In common with the sparrow hawk it eats large quantities of insects, but small birds and mammals form the larger part of its diet. It does not injure agricultural interests directly but does destroy birds which eat insects. Its uncommonness in the state argues for its protection.

LONG-EARED OWL (*Asio Wilsonianus*).—The long-eared owl is a moderately large bird, measuring about 14 inches in length. Its general gray color, size, and the two prominent tufts of feath-

ers (ears) which arise from the forehead will distinguish it from its relatives.

It is primarily a bird of brushland and coulees, and is a night feeder. In the words of Fisher (14), "The Long-eared Owl is one of our most beneficial species, destroying vast numbers of injurious rodents and seldom touching insectivorous birds." In the 107 stomachs upon which he reports, 84 contained mice, 15 contained small birds, 1 contained a quail, 5 contained mammals other than rodents, 1 contained insects, and 15 were empty.

The long-eared owl is a regular permanent resident over the whole of Montana, although it seems to be uncommon in the western third of the state. It is unlawful to shoot this bird.

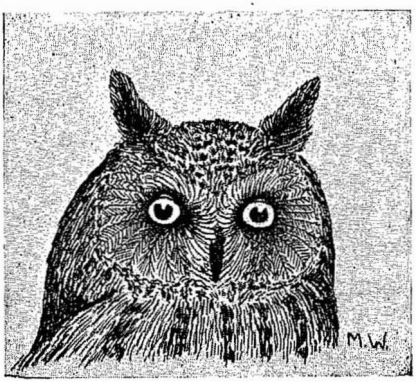


Figure 9. Long-eared owl

SHORT-EARED OWL (*Asio flammeus*).—Another moderately large species, the short-eared owl, will be confused only with the long-eared species. Its buff color, short and inconspicuous ears, and habit of hunting in the day time will separate the two. This species is one of the most diurnal of the owls. While it is more commonly seen in late afternoon or in the evening, it is often abroad at midday, coursing irregularly over the marshes and meadows which it inhabits in the search for the meadow mice which compose the most of its diet.

Fisher (14) found that 11 stomachs contained small birds, 77 contained mice, 7 contained other mammals, 7 contained insects,

and 14 were empty, out of 101 examined.

The short-eared owl is found throughout the state, abundantly in some places. Its habit of frequenting marshes makes it particularly vulnerable to attack by hunters. It is beneficial and is rightly protected by law in Montana.

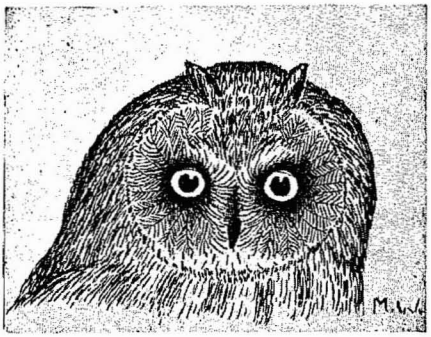


Figure 10. Short-eared owl

SCREECH OWL (*Otus asio*).—The screech owl is a small owl about the size of a robin or a flicker. Its rather small size and possession of ear tufts will distinguish it at once from any other owl now known to occur in Montana. Its beneficial habits have long been on record, and writers are almost universal in praising it as a valuable bird.

Fisher (14) reports that in 255 stomachs of this species examined by the Department of Agriculture, 100 contained insects, 91 contained mice, 38 contained small birds, 1 a pigeon, 11 mammals other than mice, 5 other vertebrates, 16 other invertebrates, 9 miscellaneous material, and 43 were without contents.

This owl is protected by law in Montana. It is rare in the state.

GREAT HORNED OWL (*Bubo virginianus*).—This is the largest of our horned owls, measuring more than 22 inches in length. It is unmistakable in appearance. Its diet often includes enough poultry and game to put it in disrepute both with the agriculturist and the sportsman, and were it not a nocturnal species doubtless more damage of this type would be done than is now the case.

Errington (15) states, "Its food habits as a species are governed by where it is and what it has access to. One can expect practically any animal within its habitat and of a size within its power to handle to be represented in the diet of the Great Horned Owl." Fisher (14) found 78 stomachs to contain mammals (largely mice, rabbits, and squirrels), 31 poultry or game birds, 8 other birds, 10 insects, 1 a scorpion, 1 a fish, and 17 to be empty in an examination of 127 specimens.

The economic position of the great horned owl depends on where it is found. There is no doubt but that at times it causes considerable loss to poultry raisers, and where game birds are abundant it takes toll among their ranks. There is no evidence, though, that it makes excessive inroads on normal game bird populations.

In the present state of our knowledge we are justified in controlling this bird near chicken yards, game farms, and like places. We do not know that it is harmful away from these abnormal concentrations of birds, and we do have definite proof that it eats large numbers of the rodents which are considered harmful. It should not be shot therefore when found at a distance from these localities.

The great horned owl is found throughout the state, but never in abundance. It is unprotected by law.

SNOWY OWL (*Nyceta nyceta*).—The snowy owl is a bird of the arctic tundras, entering Montana as a rare, erratic winter visitor. It is a large bird, the size of a great horned owl, without the feathered ear tufts, and with nearly white plumage.

Fisher (14) found upon the examination of 38 stomachs that there were game birds in 2, other birds in 9, mice in 18, other mammals in 2 and 12 were empty.

This species is not only erratic in its movements while wintering in this state, but it varies in abundance from season to season, possibly because of the abundance or scarcity of food to the north. It is capable of killing rather large game (wild ducks, prairie chickens) and were it more common it might be detrimental to sporting interests. In its present numbers it should be regarded as a very interesting occasional winter visitant, having a negligible effect on the welfare of game in Montana. It should be protected by law, although at present it does not receive that

recognition.

OWLS RARELY FOUND IN MONTANA.—Several other owls exist in the state: the great grey, pigmy, Richardson's, saw-whet, hawk, barred, and burrowing owls having been reported within its borders. All are rare except the burrowing owl, a beneficial species which occurs in the prairie regions. All but the great grey owl are protected. This species is northern in its distribution, as is the snowy, and is found even more rarely in Montana, and then usually in the northern part of the state. It has been found nesting recently in Yellowstone Park, and may nest very rarely at the higher elevations to the north and within our borders. Its food habits are probably similar to those of the snowy owl, but there is very little evidence on this matter. It is deserving of protection.

FISH EATING AND RELATED BIRDS

The intricate relationship of fish to their surroundings are difficult to evaluate, and progress in this field of research is but slowly being made. Data are now being obtained which are changing our ideas greatly, and definite progress is being made in this most difficult field. In few fields of research are the obvious factors, apparently leading to the solutions of the problems, more misleading.

In certain lakes and streams it has been noted that game fish have been reduced in numbers, and sportsmen have naturally taken an interest in the causes of this decrease. Further, streams have been stocked with large numbers of fish from which a very few have been recovered. The well known fact has been stated previously that a certain range can support a certain number of cattle or sheep, and that a cover is capable of providing food and shelter for a certain number of game birds. Individuals inhabiting either an excessively stocked range or cover are logically going to suffer. Just as truly, a certain stream can provide food and shelter for a definite number of fish and no more. Further, certain streams are, by the combinations of factors which sourround them, suitable for certain species of fish. When fish fail to survive or decrease markedly in numbers, dozens of factors, such as the incompatibility of species, unsuitability of water, pollution, etc., may be affecting the well-being of the stream or lake inhabitants.

The average person is unable to perceive or analyze these factors, and judgment should not be passed as to the cause of depletion until the problem has been studied by a specialist. Too often we try to limit the factors involved to one, and then single out the most obvious possibility as the only cause. Because of this tendency, the fish-eating birds have often suffered unjustly at the hands of those interested in the welfare of game fish. It is possible that on rare occasions these birds may reduce fish populations, but such occasions are extremely rare. For thousands of years these two forms of life lived together. Our fish-eating birds have been considerably reduced since the advent of white men, and our game fish have also decreased in the same period. It is not good reasoning in the light of the above facts to lay too much blame at the feet of the birds involved.

Under certain conditions, some of these species should be excluded, and in some areas they should be controlled by proper authorities. There is little argument against control of blue herons or kingfishers which habitually visit fish hatcheries and rearing ponds, and cause losses in these areas of high production. But to kill these species anywhere and everywhere is to let our enthusiasm in game protection get the better of sound judgment.

WHITE PELICAN (*Pelicanus erythrorhynchos*).—Although we are struck by the disproportion of the parts of this bird and are likely to consider it ugly, it is in truth an interesting and a remarkable member of our fauna, and except in local areas is becoming one of our rare birds. Such inroads have been made on its nesting grounds that it is unlikely ever to exist in numbers again. A description of this bird is unnecessary, for most of us are familiar at least with illustrations of the pelican, with its heavy body, short legs, long neck, and monstrous beak.

Before much was on record concerning the food habits of this species it was at times mercilessly slaughtered upon the suspicion that it was detrimental to game fish. In 1925 Hall (16) published an exhaustive study of the white pelican and its relationship to the rapidly decreasing trout of Pyramid Lake in Nevada. On one island in the lake he counted 4534 pelican nests, which would imply the presence of at least 9068 adult birds. The food consisted of 32.4 per cent carp, 58.5 per cent lake minnow, 6.8 per cent lake chub, 1 per cent Sacramento perch, 0.9 per cent red sucker, 0.4

per cent catfish. There was evidence of one trout in all of the material examined, and this was found under conditions which indicated that it had been eaten as carrion. It was found that the trout in the lake were decreasing because of the reduction in flow of water into the lake due to drought conditions and the diversion of water for irrigation purposes, the adults in the lake being thus cut off from their spawning areas up the Truckee River. At the Great Salt Lake in Utah, Behle (24) found no traces of trout remains upon examination of 123 regurgitated piles of food.

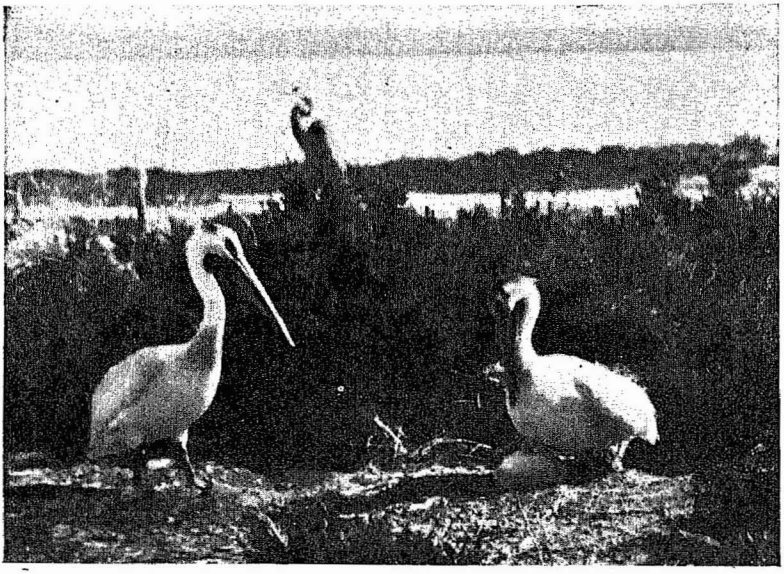


Figure 11. White pelican family, Phillips County. Great bue heron in the background. (Courtesy of Winton Weydemeyer)

An exception to these findings occurs in the colony of white pelicans nesting on the Molly Islands in Yellowstone Lake. Here the food of the white pelican consists largely of trout, for native trout is at the present time by far the dominant species in the lake. But even here this attack on game fish argues against the general use of these species as food. Whereas there were more than 9000 white pelicans at Pyramid Lake in 1924 where there was an abundance of a variety of soft, surface-inhabiting fish, there were from 200 to 400 on Yellowstone Lake with its slightly

smaller size and abundance of trout. It would seem therefore that trout are not so attractive to pelicans as non-game fish.

The white pelican nests at the present time in two places in Montana—in Phillips and Stillwater Counties. It is not uncommon in the spring and fall along all of the major water courses in the state. It is protected by state laws.

FISH DUCKS (*Mergus americanus, M. serrator, Lophodytes cucullatus*).—Three fish ducks or mergansers occur in Montana, the American merganser (*M. americanus*), the red-breasted merganser (*M. serrator*), and the hooded merganser (*L. cucullatus*). They are all separable from other North American ducks by the slender, hooked beak bearing definite horny teeth.

The first two are very similar in appearance when not in the spring breeding plumage. The American is the common one of

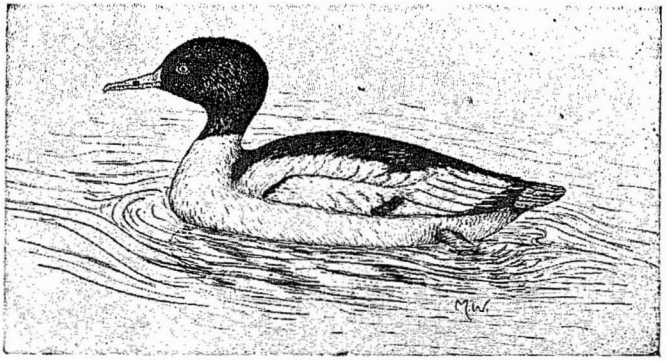


Figure 12. American Merganser

the interior, while the red-breasted is more abundant on coastal waters; the hooded is found throughout temperate North America. In the spring the male American has a deep green head, light neck and underparts, dark back, and in flight the wings are dark but for a large white patch involving all of the basal half of the wing but the front margin. There is no crest in the male. The female is generally dusky, lighter beneath, with much less conspicuous white areas on the wings. The head is rusty red and bears a small crest. In all seasons but the breeding season the male resembles the female greatly, but it always lacks the crest. The red-breasted species is smaller than the American. The male

has the same greenish head in the breeding plumage, but in this case it is furnished with a scraggly crest. The breast is broken by a brownish-red band. In other seasons it resembles the female which in turn is hardly distinguishable from the female American. There are slight color differences between the two and in the red-breasted merganser the nostril is in the basal third of the beak while in the American it is situated in the middle third. The absence of a crest in the male American is also a distinguishing characteristic. The little hooded merganser is quite distinct from the other two species. The head is furnished with a fine large crest

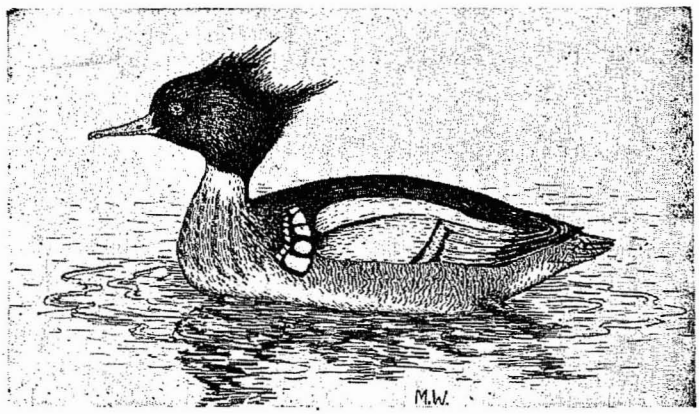


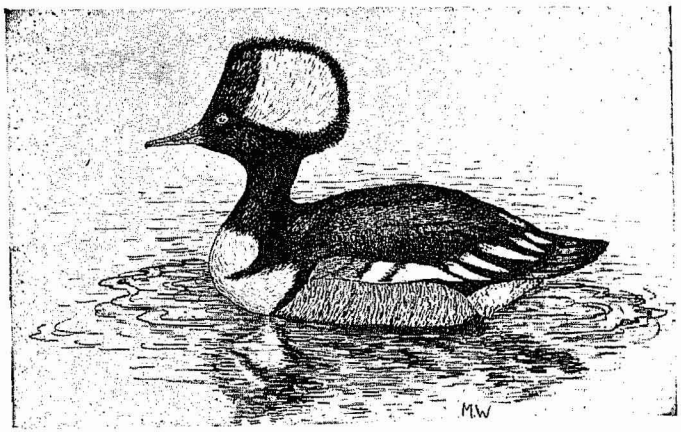
Figure 13. Red-breasted merganser

which is evenly arcuate behind rather than irregular. In the male the head is black, but the rear part of the hood is conspicuously white, margined along the outside with black. The breast is white, the back nearly black, and the flanks dark brown. The female is deep sooty-brown, lighter beneath.

Of the three species, the American merganser may at times destroy considerable numbers of small trout. It often feeds in flocks, spreading across a stream and frightening the little fish ahead. The damage which it does is largely confined to the smaller streams and headwaters to which the trout go to spawn. The damage done is greatly exaggerated at times however. Actual data at hand are as follows: The Bureu of the Biological Survey examined 107 stomachs of the American merganser and found trout in but

27 of them. The food in these stomachs consisted of 33.27 per cent fish which were harmful or of no commercial value, 32.79 per cent commercial or game fish, 7.52 per cent low grade commercial fish which are sometimes harmful (chiefly suckers and carp), 7.42 per cent unidentified remains, and miscellaneous material consisting of crawfish, frogs, insects, vegetable debris, etc. This species remains in the higher parts of western Montana.

The red-breasted merganser is of little importance as a fish eater in Montana. The Bureau of Biological Survey found in the examination of 130 stomachs that the food consisted of 34.23 per cent valueless or harmful species, 14.38 per cent commercial species (no evidence of trout), 3 per cent carp, suckers, etc., 25.08 per cent unidentified fish remains, and 23.31 per cent miscellaneous



Fergure 14. Hooded merganser

material. This merganser is a fairly common immigrant through the state.

The hooded merganser is less of a fish eater than are either of its relatives. The Bureau of Biological Survey examined 138 stomachs of this species and found the food eaten to consist of 24.48 per cent valueless fish, 22.27 per cent crawfish, 5.96 per cent frogs, etc., 4.17 per cent unidentified fish fragments, and 0.26 per cent shellfish. The hooded merganser occurs locally throughout Montana, and nests in the state in summertime.

Fish ducks are unprotected by state law in Montana, but it is unlawful to shoot them under the provisions of the Federal Migratory Bird Act. If, however, it is determined that any migratory bird protected under this federal law is causing excessive damage, it is possible to obtain permission to regulate its numbers in a given area, such as the vicinity of fish hatcheries, recently stocked small streams, etc.

Before such control measures are requested and prosecuted, a study should be made of other methods of eliminating these birds from vicinities of high concentration of small game fish. These are well outlined in an article by Cottam and Uhler (13) which may be obtained from the Bureau of Fisheries, United States Department of Commerce, Washington, D. C.

SWANS (*Olor buccinator, O. columbianus*).—The whistling swan (*O. columbianus*) and the trumpeter swan (*O. buccinator,*) are both found within the borders of the state. The whistler, moderately abundant but rarely seen, passes through Montana twice annually on its migration to and from its nesting grounds in the far north, and occasionally settles down on one of our lakes. It is a large bird, larger than a goose, and pure white but for the lead-colored feet and beak. It might be confused in Montana only with the snow goose, the rare little Ross's goose and the trumpeter swan. From the first two it differs in having the tips of the wings white instead of black, and in its larger size. From the trumpeter it differs in the quality of its voice, its size, distribution, and the shape of the breast bone. The whistling swan can usually be separated from the trumpeter only by an expert. It is a little smaller. Its voice is a rather high-pitched squawk or pipe, very different from the call of the trumpeter, the voice of which is deep, vibrant, resonant, reminding one of the "honk" of the first automobile horns which were operated by means of large rubber bulbs. The whistler nests on the islands west of Hudson Bay and on the Arctic coast. The trumpeter originally nested throughout northwestern United States and north into Canada. It is now limited to the Centennial Valley, Yellowstone Park, and a small area in the interior of British Columbia, and is gravely threatened by complete extinction.

In Montana we are very fortunate in having some of the last of the trumpeter swans, and our responsibility for their safety,

when they stray outside the wildlife refuge, which has recently been established at Red Rock Lakes in Centennial Valley, is very great. The swan has never been considered a food bird; the ducks and geese which surpass it in numbers are far more palatable. Regardless of this it has suffered more from hunters than from an other cause. Both swans are protected by state and federal laws.

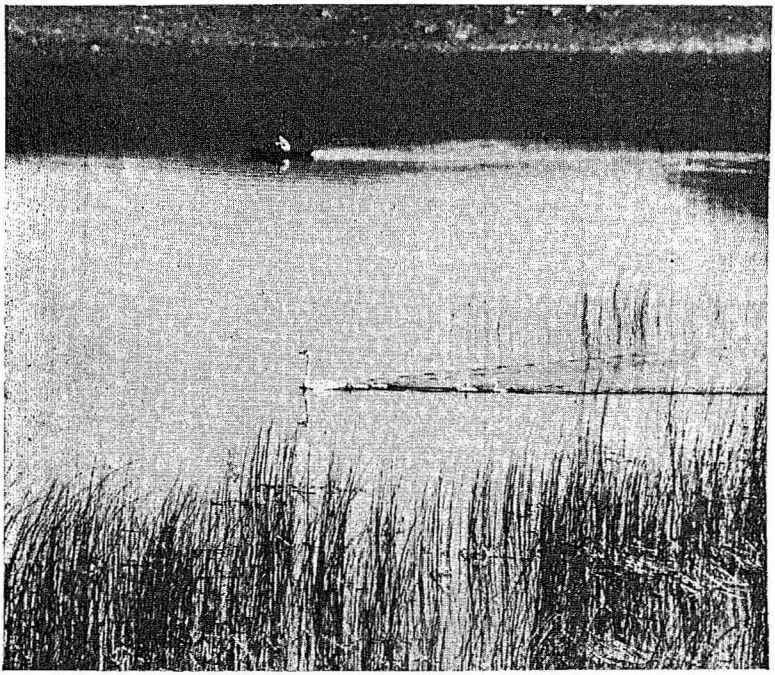


Figure 15. Trumpeter swan family, Yellowstone Park. (Courtesy Wildlife Division National Park Service.)

BITTERN (*Botarus lentiginosus*).—On the basis of fragmentary and often erroneous visual evidence, herons and all birds resembling them have been destroyed as fish eaters. The bittern has been no exception, so some information is presented here as to its food habits.

This species will at once be identified as a heron, or "crane," which is the most common name applied to rather large birds with

long legs, necks, and long, heavy beaks. It will not be confused with any other Montana bird. It is smaller than the great blue heron or "blue crane," about 28 inches in length from the tip of the beak to the tip of the tail, and of a rather pretty yellowish-brown color, striped down the breast with darker brown.

Contrary to the habits of the great blue heron, it does not inhabit exposed areas along stream courses but prefers the rank vegetation of the marshes. In this situation it is not in a position to obtain game fish. Bent (17) says ". . . . it will feed freely, even gluttonously, on almost any kind of animal that it can find in the mashes and meadows that it frequents or about the edges of shallow, muddy ponds. Its favorite food seems to be frogs or small fish . . . . It also eats meadow mice, lizards, small snakes and eels, crayfish, various mollusks, dragon flies, grasshoppers and other insects." Further concerning the mammals which go into its diet, Lantz (18) states, "Of our herons, the American Bittern (*Botarus lentiginosus*) is probably the best known destroyer of voles (meadow mice)."

Finally, Cottam and Uhler (13) list the contents of 133 well filled stomachs. Insects form nearly a quarter of its diet or 23.13 per cent, frogs and salamanders 20.55 per cent, crawfish 18.98 per cent, mice and shrews 9.64 per cent, valuable fishes 9.67 per cent, fishes of little value (chiefly minnows and sticklebacks) 9.55 per cent, snakes 5.21 per cent, unidentified fish remains 1.07 per cent, and the balance of small amounts of crabs, spiders, etc. Three stomachs contained game fish, but all were collected at fish hatcheries. Away from such areas the bittern is a beneficial bird, and protection is given to it in Montana.

GREAT BLUE HERON (*Ardea herodias*).—The large blue heron, feeding singly or in pairs along the borders of streams and lakes, is known to all who visit such places. One can anticipate with considerable certainty the sight of one of these birds whenever he descends from the plains and crosses the Yellowstone, Missouri, Milk, or other moderate or large sized river in the state. Although usually feeding in pairs or alone, the great blue heron often nest in colonies.

The sandhill and little brown cranes are the only birds with which this species may be confused in Montana. These are brown,

however, and are likely to be seen on the prairies rather than along the water courses.

We must admit with some shame that even now the great blue heron is the subject of attack by fishermen in the state. Here are the facts concerning its food habits as discovered by the United States Biological Survey upon the examination of 189 stomachs: Non-game fish made up nearly half of the food found or 43.16 percent, unidentified fish and other food 32.04 per cent, and commercial fish 24.8 per cent. Breaking up the miscellaneous heading we find insects 8.15 per cent (among which were the follow-

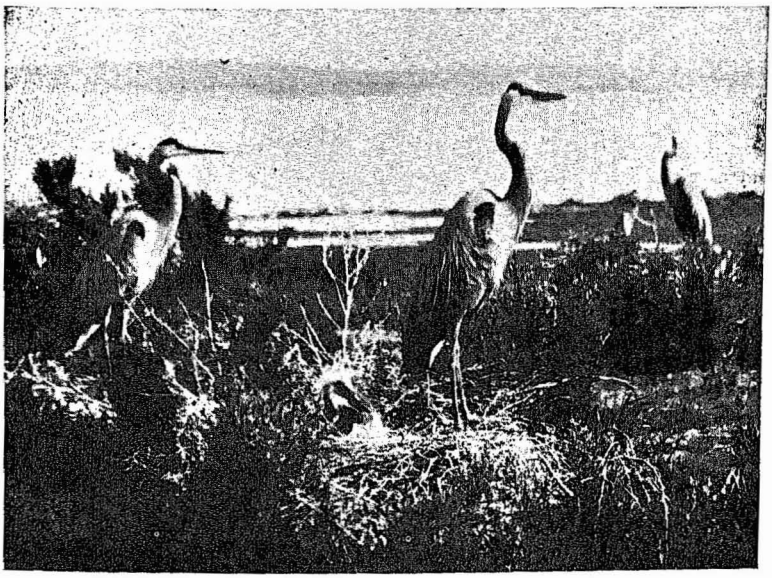


Figure 16. Great blue herons, Phillips County. (Courtesy Winton Weydemeyer.)

ing enemies of small fish: dragon fly larvae in 37 stomachs, giant water bugs in 9, and predaceous diving beetles in 7), crawfish 6.54 per cent, related forms 0.91 per cent; frogs, snakes, etc., 4.25 per cent; mice and shrews 4.66 per cent, unidentified fish remains 3.59 per cent, and debris 3.94 per cent. Bent (17) says ,"Altogether the food habits of this species are decidedly beneficial. It may

occasionally take a few trout, but it does not ordinarily frequent the streams where trout are found."

The great blue heron is capable of inflicting considerable injury in such areas of artificial concentrations of fish as we find at fish hatcheries and in highly stocked streams. A federal permit may be obtained which will allow control in such places. The federal game laws prohibit the shooting of this bird and it should be protected by our state wardens as well.

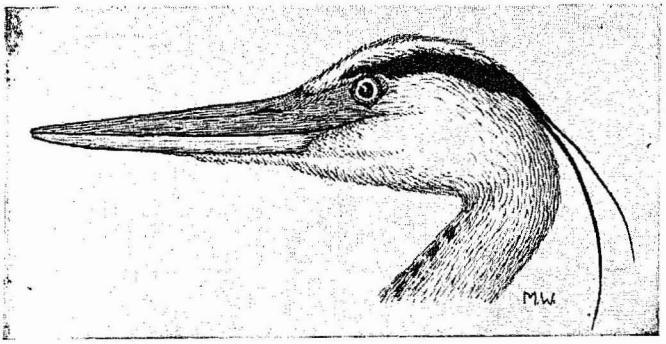


Figure 17. Head of male great blue heron

CRANES (*Grus americana, G. canadensis*).—Three cranes may occur in the state, the whooping crane (*G. americana*), the sand hill (*G. canadensis canadensis*) and the little brown crane (*G. c. tabida*). The whooping crane is a large white bird with the bright red skin of the face destitute of feathers. The tips of the wings are black. It can be mistaken for no other Montana bird. It is now approaching extinction, but there is a slight chance that it may be seen in the eastern part of the state. Two adults and two young were seen near Mercer, North Dakota, in 1930. It doubtless nested in Montana at one time, although actual evidence is apparently lacking. The last sight record was dated April 8, 1918, Billings. Great care should be taken to protect any which may be seen in the state, and their presence should immediately be made known to the Montana State College or the United States Biological Survey.

The sandhill crane may be confused with its more northern form, the little brown crane, and great blue heron. From the heron

it differs in its brown color, its habit of visiting the prairies far distant from water, and its body carriage. The long axis of of body approaches the horizontal while that of the heron approaches more nearly the vertical. It differs from the little brown crane only in size and geographical distribution, being larger and nesting farther to the south. The cranes are more omnivorous than are the herons, feeding not only on small mammals and water animals, but often on seeds and the bulbs of plans. They are protected in Montana.

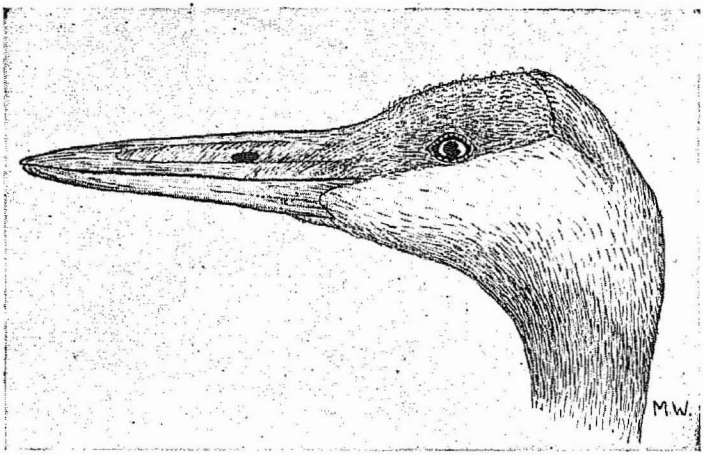


Figure 18. Head of sandhill crane

Occasionally the sandhill crane may nest in this state, but it is now so rare that it too faces possible extinction. The little brown crane migrates through Montana in the fall. A flock of about 500 birds which were probably of this subspecies were seen the first week in October, 1935, in Custer County about 20 miles south of Miles City.

GULLS.—At least seven different species of gulls occur in Montana. These are the Franklin, Bonaparte, Sabine, ring-billed, California, herring, and western gulls. These birds are of moderate size, usually gray or white, with long, well shaped black tipped wings. Their habits of flight are graceful in the extreme, and the apparent ease with which they fly is astounding.

Gulls are primarily aquatic but they are in no way limited

to the vicinity of water. They are often found far inland, especially during the migratory seasons. Their food consists largely of refuse and carrion, and this diet makes them valuable to man, especially about reservoirs from which water is taken for domestic purposes. They are also inveterate insect eaters, and often follow the plow in the springtime in large flocks to obtain the insects thus uncovered. They are not adverse to the eating of eggs and young birds; such species as cormorants, murres, pelicans, etc., sometimes suffering from their forays. Occasionally they feed on live fish, following immense shoals of small marine species. These birds are beneficial and are protected by both federal and state laws.

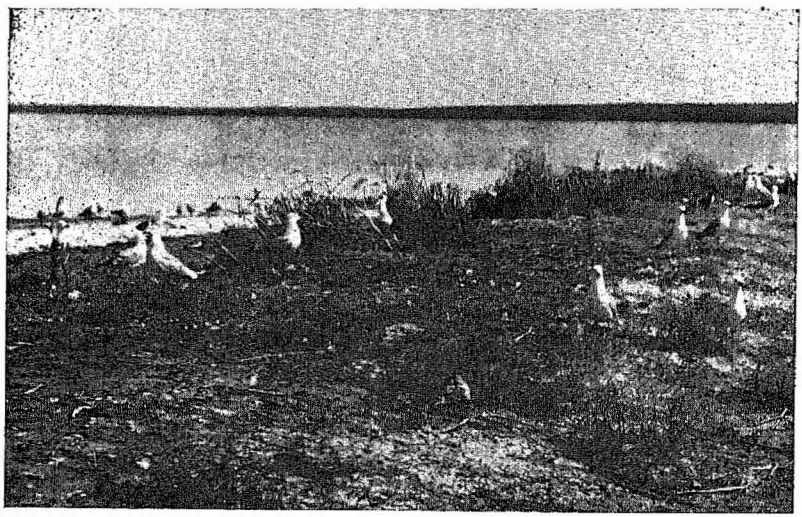


Figure 19. Ring-billed gulls, Phillips County. (Courtesy Winton Weydemeyer.)

BELTED KINGFISHER (*Megaceryle alcyon*).—This heavy-bodied, short-tailed, conspicuously topknotted blue bird is a resident throughout the state. It is about the size of a flicker, but its beak is longer, and its topknot and blue color will not allow confusion with any other North American bird. The top of the head, the back, and a band across the breast are slate-blue; while the

under parts, a ring around the neck and a small spot before each eye are white. A chestnut band crosses the breast of the female, below the blue band, and extends down the sides.

The kingfisher is adept at fishing. It dives from a perch or from flight upon small fish and water animals, somewhat after the manner of the osprey. The United States Biological Survey examined 313 kingfisher stomachs, and concluded that less than half of the fish taken were of the species used for human consumption. Furthermore, many of the non-edible species were notorious spawn eaters, and thus injurious to game fish. Crawfish formed 16 per cent of the food, frogs more than 5 per cent, and water beetles about 4 per cent.

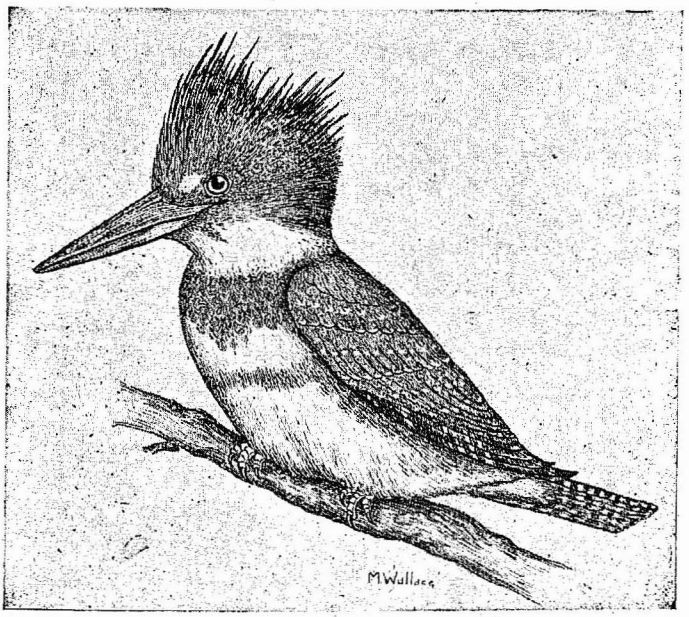


Figure 20. Female belted kingfisher

On the whole the kingfisher is considerably more beneficial than harmful, and should be protected by law from constant shooting. It must not be overlooked, however, that at times it does eat game fish, that it has made considerable inroads in the fish populations of rearing ponds at fish hatcheries, and that

highly stocked streams are good fishing grounds for it. It is solitary in its habits or at the most feeds in pairs, so that what injury it may do is minimized.

COMMON BIRDS SOMETIMES CONSIDERED HARMFUL

The two birds which have possibly received more attention during the last 30 years than have any other two species, are the crow and the magpie. They have been observed both casually and specifically by a great number of investigators, and much has been written concerning their habits. They doubtless do much harm, and just as surely they do much good. In the spring of 1935, crows were seen following the plows in the potato fields of the Bitter Root Valley and destroying large numbers of exposed white grubs, which larvae do much damage to tubers. Below are given facts of common knowledge concerning these birds, together with some information which has recently come to light.

AMERICAN MAGPIE (*Pica pica hudsonia*).—The magpie needs no introduction. It is abundant throughout Montana in winter and summer; and were it not common, its long tail and contrasting black and white color pattern would still draw much attention to it. It is resourceful, well able to take care of itself, and its wide range of food interests aids it in its ability to withstand or to cope with the advances of civilization. Upon the settlement of the upper Mississippi states it withdrew from some of its eastern range, but at the present time it gives evidence of reclaiming a part of this region, and apparently is also migrating eastward and northward in Manitoba and Alberta. Throughout the western states, exclusive of the extreme south and the Pacific coast, it is the most conspicuous member of our bird fauna.

The faults of the magpie are apparent and its good points difficult to observe. It is therefore generally condemned as is any bird whose faults, no matter how few they may be, are easily seen. Its habits have been thoroughly investigated by Mr. E. R. Kalmbach (19), from whose report much of the following information was obtained.

A total of 313 adult and 234 nestling stomachs were examined in a study of the food habits of this species. Insects compose the largest single item of food for the adults, 37 per cent; this being followed by carrion, 13.8 per cent; small mammals, 7.6 per cent;

miscellaneous animal material, 0.52 per cent; domestic fowls and eggs, 0.49 per cent; wild birds and eggs, 0.38 per cent. Wild fruits in the summer and grain in the winter supplement this animal food. The nestling food as learned from stomach analysis consists of 67.16 per cent insects and spiders, 11.75 percent small mammals, 9.33 per cent carrion; wild birds and eggs, 3.13 per cent; poultry and eggs, 1.78 per cent; and miscellaneous animal matter, 0.93 per cent. Vegetable matter (chiefly rubbish) made up but 5.87 per cent of the food. We thus see that the adults feed the young on animal matter to the exclusion of plant materials. The percentage of injurious animals (insects and rodents) which are eaten by the nestlings is greater as is the percentage of wild and domesticated birds and their eggs. The actual facts concerning the food eaten are highly complimentary to the species, especially when we consider that such insects as grasshoppers, mormon crickets, and in some regions alfalfa weevils are destroyed in large numbers.

Many vicious deeds are correctly laid at the magpie's door, however. When it is feeding its young, it may do much local damage to poultry flocks. Only 2 of the 313 stomachs of adults examined contained remains of poultry and in 13 were found the shells of hen's eggs. Nevertheless instances are not uncommon where much damage has been done. In one place in Colorado, 100 chicks were destroyed in a day, and in another locality 11 of a brood of 13 were taken in 48 hours. Such ravages are absent where the chicks are properly protected.

There is very little evidence to substantiate the wide-spread idea that magpies are arch-enemies of game birds. Depredations against these valuable species seem to be limited chiefly to places where cover for nesting game birds is meager or lacking.

The most villanous deed which the magpie does, and this damage is sporadic and local, is embodied in its attacks upon domestic animals. In cases where sheep have received cuts during shearing, or cattle and horses bear branding wounds, saddle galls, wire cuts, or other injuries, these birds will perch on the animals' backs and feed on the flesh surrounding the wounds. There are cases on record where they have fed on the backs of sheep, penetrating the body cavities and devouring the kidneys of the living animals. Berry (20) noted 15 rams in a flock of less than 350 in Wheatland County, all showing magpie injury at the same time. A hole was

made through the back and into the stomach of one cow before it died. Calves have been blinded and in some cases had their eyes removed from their sockets. Such injuries represent substantial losses, and cannot be overlooked; where they are noticed, the magpies should be dealt with immediately, the sooner the better.

There is no basis in fact that the magpie transmits such diseases as hog cholera. Studies carried on with other birds have shown that the virus of this disease is digested in the alimentary tract of the turkey buzzard, and it has been found impossible for pigeons to carry the disease on their wings, feet and beaks. While we should not dogmatically say that the magpie will never carry the disease, it is highly improbably that it does.

At times it becomes necessary to control these birds for the protection of poultry and domestic animals, but it is questionable if it is necessary to reduce their numbers for the protection of game birds. Were there some poison or some method of exposing poison which would be selective for magpies, this would be the most efficient method of controlling them. Until such a poison or method can be discovered, however, control measures should be carefully considered before being instituted. Furthermore, the destruction of these birds by large, organized hunts cannot be resorted to without considerable loss to beneficial forms of life. Except where injury has been serious and where their numbers are excessive, magpie shoots should be limited to a small number of people who have a vital interest in the protection of the domesticated animals involved.

In summing up the case of the magpie: This bird is common. It is versatile in food habits and competent to care for itself. It has been shown that it is beneficial to a considerable extent because of its consistent attacks on insects and injurious mammals. It is mildly injurious in its attacks on wild birds and their eggs and occasionally upon fruit. *Sporadically and locally* it is intensely injurious to poultry and livestock, and in these situations it should be vigorously controlled by shooting.

CROW (*Corvus brachyrhynchos*).—The crow is neither so abundant nor apparent in Montana as is the magpie, and in some areas it may be considered a rare bird; but regardless of its comparative numbers it is too well known to require description.

In the middle west and the east it bears the same relation to the humans with whom it comes into contact as the magpie does in the west. It is cunning, wary, versatile, and has adapted itself admirably to the changing conditions brought about by the settling of its range.

Its food habits differ most from those of the magpie in the amount of vegetable material eaten. After an examination of 2118 stomachs, Kalmbach (21) found that corn alone composed 38.42 per cent of the diet. In general, however, it eats much the same material as the magpie: insects, carrion, small mammals, birds and their eggs, grain, fruit, and weed seeds.

The good which the crow does is largely embodied in its insect-eating proclivities, and the harm, in its habit of eating seed corn or ear corn in the milk stage. Injury is greatly reduced in Montana because of the facts that the bird is not so abundant here as farther east, and because corn is not widely planted in the state. It is a great destroyer of some of our common injurious insects: 85 May beetles (adults of white grubs) were found in one stomach, 72 wireworms in another, parts of 123 grasshoppers in a third, and 483 small caterpillars in a fourth. It will, when the opportunity appears, avail itself of small birds, bird eggs, and even poultry. Where it shows tendencies toward this last type of food it should be controlled. It also attacks cultivated fruits, sometimes indulging in wholesale destruction of watermelons.

As with the magpie, the crow has been pointed out as a destroyer of the nests of young game birds, especially those of ducks. This habit was studied by Bennett (22) during an investigation of the difficulties surrounding nesting ducks. Bennett states: "Damage done to nests by crows might be called incidental. Only six nests observed were destroyed by crows. In all cases the nest cover had been reduced to such an extent that the nests were in full view to any aerial predator." He found further that a week or two before nesting, eggs were dropped in many locations. Many of these eggs were eaten by crows, but the nests were not destroyed. Errington and Bennett (23) say, ". . . the one *effective* method of game management predator control is to *make game difficult for preditors to get.*"

Unquestionably the crow is at times a harmful bird; in Montana, however, the amount of injury is smaller than in other parts

of the country. If control measures become necessary, it should be destroyed to check the damage it does. Beyond this point we are killing a beneficial bird. The remarks concerning methods of control in the discussion of the magpie apply equally as well to the crow. It might be added that where damage is being done in a garden or a chicken yard, a crow's body attached to a pole or to the fence where it will swing in the breeze will usually frighten the remainder of the flock from the vicinity.

ACKNOWLEDGEMENTS

Acknowledgements are due to Dr. Paul Errington of the Iowa State College, Dr. J. Grinnell of the University of California, Mr. Clarence Cottam of the Bureau of Biological Survey, Prof. E. D. Lumley of Great Falls, and Mr. Winton Weydemeyer of Fortine, for assistance received in the preparation of this material. Mr. Weydemeyer and the Wildlife Division of the National Park Service kindly furnished the photographs reproduced herein. The drawings were prepared by Miss Martha Wallace.

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