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Relation of Wild Birds to Our Forests

Senior Thesis

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Lower margins.
Interesting. An important
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Table of Contents

I Introduction----------page I

2 Mankind and His Interests- " 2

3 Studies in Ornithology---- " 3

4 Structure of Birds---- --- " 3

5 Facts on Food Consumption- " 4

6 Birds and Our Forests----- " 5

7 Bird Families---------- " 6

(A) Hawks and Vultures--- " 6

(B) Grouse---------- " 7

(C) Doves---------- " 7

(D) Owls---------- " 8

(E) Nighthawks & Swifts--- " 8

(F) Woodpeckers---------- " 8

(G) Flycatchers,Swallows,

Crows-------- " IO

(H) Chickadees,Nuthatches,Wrens

Creepers,Kinglets,&Vireos I2

(I) Warblers---------- " I2

(J) Thrushes---------- " I8

8 Conclusion-------- -------- " I8

INTRODUCTION

This paper is written in an endeavor to show the part played by wild birds in the life of our forests. An effort has been made to present the known facts leading to indirect as well as direct influences as they tie into that great circle known as nature's balance.

The structure of birds has been briefly outlined to show why they are adapted to consuming such great quantities of food.

The families relating chiefly to the forest are described as to their food, young and general habitate.

The information for this paper was obtained from publications by the U. S. Biological Survey, books by eminent ornothologists, ornithological magazines, and personal observations.

With these facts in mind it must be realized that the supply of information can always be added to by those interested in the field of ornithology and if possible this paper is written in a hope of interesting a few more in the value of fact finding studies relating to our wild birds so that man may not be led to the wrong conclusions by the most obvious facts relating to his immediate environment.

MANKIND AND HIS INTERESTS

Man as an individual is interested in those factors which influence his mode of living. The farmer and forester have their crops to grow and harvest. It is vitally important that they should understand the biotic factors influencing their crops. It is necessary that they should know as nearly as possible the complete history of facts relating to any one subject.

The most obvious facts dealing with man's environment are those direct facts where he can see his money dwindling away dollar by dollar before his very eyes. They are most influencial with his nature and he is blind to all further fact finding or believing; thus the sheep man is prone to kill every coyote within reach of his carbine or beckon of the trapper or poison capsules. Does he often stop to think of the number of rodents a coyote kills? Does he care to estimate the pounds of grass seed destroyed by rodents which in turn would grow more forage for his sheep? Rarely!

Man is truly a poor one to judge until he has delved into the facts deeply and comes out with an appreciable understanding. The more he learns about these factors, the slower he is to render a verdict of condemnation.

Song birds are usually more pleasing to man than those which do not sing, but they are not necessarily more beneficial. English sparrows, the noisy "pests" of our cities that drive out song birds still do their part in destroying weed seeds and insects.

The forester is interested in many factors such as plant fungi, insects, animals and last but not least, birds. Before going into the study of birds, it is of interest to know what people or organizations have been instrumental in carrying out these fact-finding projects.

STUDIES IN THE FIELD OF ORNITHOLOGY

Ornithology as other of the sciences gained its prominence in governmental concern. Many intensive studies of wild birds have been carried out by the U. S. Biological Survey. In the last fifty years over 85,000 birds have been disected to study; the contents of their stomachs and crops. When this action was necessary the specimens were placed in museums and collections in order to utilize their death to the fullest extent.

The results of this necessary research are most astonishing and often quite contradictory to the belief of their feeding habits set up by simple field observations. The crow in the cornfield is not always bent on pulling up corn, but undoubtedly prefers cut worms as well.

This does not mean that the many organizations intent solely in field observation and study are not of value. Careful study and observation has led to many true facts of great importance regarding our wild birds and should be carried on indefinitely.

Structure of Birds

From Leaflet Number 7 of California Auduban Society -- "Each species of bird has its special office. One cares for the leaves and twigs of trees, another guards the trunk and limbs from attack; still another hunts upon the ground beneath the fallen leaves and loose soil."

Birds have become adapted to their various forms of feeding in many ways. The woodpeckers with prop tails, sharp claws and chisel bills, can cling readily to a tree trunk and search out insects and larvae beneath the bark. The nuthatches and creepers probe the cracks and crannies of the bark with their long slender bills for larvae. The warblers, chickadees, kinglets, and others confine their activity chiefly to the twigs and branchlets where they search out the scales, aphids and larvae.

The tremendous capacity of birds for food is not so astounding when one realizes that they are most adapted for their work. They are the most energetic of nature's creations. Quoting from Henry W. Henshaw, Former Chief of the U. S. Biological Survey.

"As a rule birds do not live very long, but they live fast. They breathe rapidly, have a higher temperature and more rapid circulation than other vertebrates. This is a fortunate circumstance, since to generate the requisite force to sustain their active bodies a large quantity of food is necessary and as a matter of fact, birds have to devote most of their waking hours to obtaining insects, seeds, berries, and other kinds of food.

"The activity of birds in the pursuit of insects is still further stimulated by the fact that the young of most species, even those who by no means are strictly insectivorous, require great quantities of animal food in the early weeks of existence, so that during the summer months - the flood time of insect life - birds are compelled to redouble their attacks on our insect foes to satisfy the wants of their clamorous young." Young birds eat from two to five times their weight in food each day. The temperature of birds is between 108 and 112 degrees Fahrenheit. Their power of flight consumes a tremendous amount of energy.

Following is some of the astounding data on food consumption of our native birds.

Economic Facts on Food Consumption

Henshaw states: "Some idea of the money value of the sparrows may be realized if we estimate that the total consumption of weed seed by the combined members of the sparrow family resulted in a saving of only one percent of the crops -- not a violent assumption -- the sum saved by these birds in 1926 was $78,802,719."

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Reed states: "It has been found, by observation and dissection that a cuckoo consumes daily from fifty to four hundred caterpillars or their equivalent, while a chickadee will eat from two hundred to five hundred insects, or up to four thousand insects or worm eggs. One hundred insects a day is a conservative estimate of the quantity consumed by each individual insectivorous bird. By carefully estimating the birds in several areas, I find that in Massachusetts, there are not less than five insect-eating birds per acre. Thus this state with it s 8,000 square miles has a useful bird population of not less than 25,600,000 which, for each day's fare, requires the enormous total of 2,560,000,000 insects. It has been computed that about 120,000 insects fill a bushel measure. This means that the daily consumption of chiefly obnoxious insects in Massachusetts is 21,000 bushels. This estimate is good for about five months in the year, May to September, inclusive; during the remainder of the year, the insects, eggs and larvae destroyed by our winter, late fall and early spring migrants will be equivalent to nearly half this quantity."

Birds and Our Forests

Quoted from Forbush: "It is no exaggeration to say that for the preservation of the forests, which supply the raw material for nearly all wood products, man is largely indebted to birds. The service that birds perform in protecting trees against the inroads of injurious insects is more nearly indispensible to him than any other benefaction that his feathered friends confer, for the money value of trees while great in the aggregate, is not ordinarily large enough to repay the owners the expense of protecting the trees against insect enemies, even were this possible.

A single species of insect may be too much for man to cope with when it infests his woodland. The wild animals and venomous serpents of the

woods he may exterminate; but in spite of all his efforts, insects dangerous to human life and destructive to property, still infest the land."

"Dr. A. S. Packard enumerates that over four hundred species of insects feed upon our oaks. All other forest trees have many enemies of their own. Insects attack all parts of the tree, and in so many insidious ways that man cannot hope to check them all. Were the natural enemies of insects annihilated, every tree of the woods would be threatened with destruction and we would be powerless to prevent the impending calamity. (Insect predators and parasites of their own kind however, must be taken into consideration with a knowledge that this could never happen). It must also be remembered that birds and other natural insect enemies do not discriminate between predatory and parasitic insects.

Birds attain their greatest usefulness in forests because the conditions prevailing there closely approach the natural, and organic equality and nature has a chance to adjust her balances without much human interference."

Bird Families

Our country is gifted with approximately fourteen hundred species of native birds north of the Mexican border. These species are grouped together under eighteen orders, eight of which abound in species relating to our forests. We shall take these orders and their comprising families and show as clearly as possible, how they influence the forest. The woodpeckers and warblers will be especially stressed.

Order Falconiformes

This order comprises two important families, the vulture family and the hawk family. The vultures are important factors in the sanitation of our forests as they are as typical scavengers of the forests and fields as the gulls are of the ocean and rivers. The vultures feed on dead cattle and

sheep as well as many of the lesser animals. This is of some significance to the recreationist who revels in the sanitation of the forest.

The hawks and eagles are usually plentiful in a forested region. Very rarely are they scavengers. Their chief diet is rodents. These include rabbits, rats, mice, chipmunks, gophers and many others. They also feed extensively on insects and to a lesser extent on other birds. Three species alone may be classed as detrimental to the interests of the forester and agriculturist. These three, namely, the Coopers Hawk, Sharp Skinned Hawk, and Goshawk prey to a large extent on game and insectivorous birds. The Coopers and Sharp Skinned are common throughout the United States, while the Goshawk is a winter invader from across the northern boundary. All other of our hawks must be considered most beneficial if the destruction of rodents and insects is to be considered a beneficial influence.

Order Galliformes

The gallinaceous birds include such forest loving species as the wild turkey, quail and grouse. To the sportsman and recreationist these birds are of great value. They are a great attraction to our forested areas and demand the protection of the forester during the breeding season and winter months. Their food consists of wild seeds, ground beetles, vegetation such as ceanothus leaves, buds, and wild berries.

Order Columbiformes

The doves and pigeons belong to this order. The Pacific Northwest is fortunate in having the band-tailed pigeon as an inhabitant of its forested area. This bird is interesting from and aesthetic and historical background as being closely related to the famous passenger pigeon which once clouded the skies of the Mississippi and Ohio River Valleys and finally passed out of

existence in the latter part of the 19th century. The band-tailed pigeon lives chiefly on wild seeds and berries and if it ever became common enough would undoubtedly take its place among the game birds.

Order Strigiformes

This order includes all of the owls. They are true birds of prey and the hawks and owls are usually classified together when speaking of our birds of prey. The hawks prey in the daytime, while the owls are chiefly nocturnal hunters. Only one species, the great horned owl, is considered detrimental to our forest because of its habit of feeding on game birds. All of the other species feed on rodents and insects to a large extent.

Order Caprimulgiformes

The poorwills, nighthawks, and swifts belong to this order of large mouthed birds. They secure all of their food while in flight, devouring many of the myriads of insects found over our forests and in the forest glades. The poorwills are nocturnal feeders, while the swifts are diurnal. The nighthawk may be found feeding either day or night.

Order Piciformes

With the exception of the crow no bird is subject to more adverse criticism than the woodpeckers. Great wrong is done in referring to many of these birds as sapsuckers. The sapsucker family is very limited and contains only three species in the United States. These species are limited in number and cannot be classified as common. Their method of attack is as follows:

With their sharp chisel-shaped bills, they sink a series of wells into the bark, penetrating the cambium layer. These wells are made to collect the sap, which will be an attraction to insects. The tongues of these sapsuckers vary from the barb pointed tongues of the true larvae seeking woodpeckers in

that they are brush like for collecting insects from the sap wells.

The damage done may be realized from a report in U. S. D. A. Bulletin 506, "It has been found that sapsuckers' work unfits for use such important ornamental woods as mahogany, black walnut, white oak, yellow poplar, chestnut, cherry, sweet gum and hard maple; that it seriously blemishes woods prized for particular qualities, such as ash, basswood, cypress, red cedar, holly, buckeye, dogwood, and hickory. Defects due to sapsucker work have been found in wood of one hundred seventy-four species of trees. The Avillianisous sapsucker, on account of its preference for higher mountainous regions, takes little or no part in the damage above detailed."

U. S. D. A. recommends death to these birds. From the foresters' standpoint, it might be a profitable plan in certain areas where they are marking a large number of trees. The two injurious species command a great deal of respect from the person who admires their beauty, as both the eastern yellow-bellied sapsucker and the western red-breasted sapsucker are extremely attractive birds. The thing to bear in mind is that of the twenty-three species of woodpeckers found in the United States, twenty are true woodpeckers as far as the forester is concerned although the agriculturist defies some species as injurious to fruit.

It can be said of the true larvae sucking woodpeckers: "It is thus evident that woodpeckers are great conservators of forests. To them more than to other agency, we owe the preservation of timber from hordes of destructive insects. Woodpeckers are apparently the only agents which can cope with certain insect enemies of the forest; for this reason, if for no other, they should be protected in every possible way. Excepting for a single species these birds rarely leave any conspicuous mark on a healthy tree except when it is affected by wood boring larvae, which are accurately

located, speared and devoured by the woodpecker."

Order Passeriformes

This order of the perching bird is the largest and most highly developed of all the orders of the class Aves. This order contains sixty-four families in the world and twenty-two in the United States/ Thirteen of these families contain species inhabiting the forests and woodlands.

Flycatchers

This family gets its popular name flycatcher from its insect eating habits. An average of ninety-five percent of the food of these birds has been found to consist of insects. These birds take most of their food from the air by dashing from a perch on a pole or stick.

Swallows

The swallows have little variation in their ranks, whether found on the east coast or west. Perhaps the two species who enjoy the forest most are, the tree swallow, and the northern violet-green swallow. The former is a transcontinental species while the latter makes its summer home in the Pacific Northwest. All other members seem to enjoy the lower farming country with its flat fields and bogs and ocean shores to the higher timbered areas. These birds feed while in flight the same as the nighthawks and swifts. Their food, therefore, consists entirely of insects found in the air. They fit into the foresters' conception of useful economic factors by searching the air over the forests for food.

The Crows

The jays, ravens, nutcrackers, and crows belong to this group. Many ~~are~~ is the hunter who have sworn at the members of this family for giving away his presence by their loud noisy calls. These birds will take a great variety of food, including fruit, insects, grain, seeds, and the eggs and young of

PERCENTAGE OF FOOD OF EIGHT SPECIES OF WOODPECKERS Chart No. 1.

NAME OF SPECIES	No. of Stomachs Examined	Percentage of Stomach Content			Percentage of different insects						
		Animal	Vegetable	Mineral	Hymenoptera (Ants)	Coleoptera (Beetles)	Lepidoptera (Caterpillar)	Orthoptera Grasshoppers	Hemiptera (Bugs & Lice)	Diptera (Flies)	Spiders & Myriopods
Arctic Three-toed Woodpecker	28	89	11		6.35	64.25	12.28	Less than one percent			
American Three-toed Woodpecker	23	94	6		8.29	60.66	14.45	Less than one percent			
Downy Woodpecker	140	74	25	1	23.00	24.00	16.00	3	4	1	3
Hairy Woodpecker	82	68	31	1	17.00	24.00	21.00	Trace	2		4
Flicker	230	56	39	5	43.00	10.00	1.00	1	Trace	Trace	1
Red-headed Woodpecker	101	50	47	3	11.00	31.00	1.00	5	1		1
Pileated Woodpecker	23	51	49		30.00	15.00	2.00	Trace	4	Trace	Trace
Yellow Bellied Sapsucker	81	50	50		36.00	5.00	2.00	1	1	3	2

smaller birds. From seventeen to twenty-six percent of their food has been found to consist of insects. They also destroy young of mice and rats. Their economic influence to the forest is a study for the forest biologist. It is evident that they do much good and much harm and play in well with nature and its balance.

The Chickadees, Nuthatches, Creepers, Wrens, Kinglets and Vireas.

The members of these families are invaluable in the protection of our forests. They cover the trees from the highest bud to the lowest scale of bark. They, along with the vast numbers of members of the warbler family, are the greatest asset the bird world has to offer the forester. Their food is practically all animal food and consists of eggs, larvae, and mature insects. Their exceptional ability as singers and their aesthetic beauty place them on a high plane with the nature lover and recreationist.

The Warblers

Henry W. Henshaw says of our warblers: "From the aesthetic point of view, our warblers, as a group, occupy a high and unique position. They also occupy no uncertain place in the list of our useful birds. Preeminently insectivorous, they spend their lives in the active pursuit of insects. They begin with the eggs, preying upon them whenever and wherever found and continue the good work when the egg becomes larvae, and when the larvae becomes the perfect insect.

They are especially valuable in this respect because of the protection they lend to forest trees, the trunk, bark and foliage of which they search with tireless energy.

Their efficiency is vastly increased because the many different species pursue the quest for food in very different ways. While some confine their

search chiefly to the trunks and large branches and examine each crack and crevice in the bark for eggs or larvae, others devote their energies to the twigs and foliage, scanning each leaf and stem with eager eyes. Still others descend to the ground and examine the litter and grass for hidden prey, while nearly all are adept at catching insects on the wing.

Each species, however, has a method of its own more or less unlike that of its fellows, and each excels in some specialty. Not only does the group as a whole specialize on insects, but each individual member of the group still specializes so this leaves no loophole for the escape of the enemy.

The quantity of animal food required to drive the avian engine is so great that it is no exaggeration to say that practically all the waking hours of our warblers from daylight to dark, are devoted to food getting. What this never-ceasing industry means when translated in tons-weight of insects, it is impossible even to guess, but the practical result of the work of our warblers and other insectivorous birds is that we still have our forests and shall continue to have them so long as we encourage and protect the birds."

Edward H. Forbush writes: "Warblers never receive credit for the good they do, because the insects that they eat are mainly of small size, and the majority of larger species eaten by them are taken in infancy and before they have had a chance to work noticeable injury. Warblers destroy many of the young larvae of such great and destructive insects as the Cecropia and Polyphemus moths while these insects are still too small to attract attention. These larvae which were so injurious on the "tree claims" of the prairie States before arboreal birds became abundant there, are almost never numerous enough to be destructive where such birds are plentiful. The fact that Warblers do away with these insects while the caterpillars are still very small and before they have had a chance to do any real injury, is of great

economic significance. It may yet place them on a par, as regards usefulness, with the Cuckoo and other larger birds, which are considered to be among the most useful caterpillar hunters, but which probably prefer the larger caterpillars; for the warbler, notwithstanding its small size, may be able to destroy more individual caterpillars in their infancy than even the cuckoo can devour after the same caterpillars have increased several hundred times in size.

"Warblers are mainly insectivorous and most species cannot live long without insect food. Hence their economic position is quite different from that of the vireos, thrushes, or sparrows, for example, for these can live either largely or entirely for considerable periods on vegetable food.

"Warblers are obliged to spend a great part of their time in a continual hunt for insects. Digestion in most small birds is continuous and the stomach is filled many times each day. It is sometimes so packed with food that when one is dissected the contents will expand to twice , or, as Professor F. E. L. Beal tells me, nearly three times, the size of that organ.

"It would seem impossible for digestion to go on under such circumstances, but it nevertheless progresses so rapidly that, unless the food supply is constantly replenished, the stomach is soon empty. The capacity of warblers for consuming the smaller insects may be shown by the statement of a few facts. According to Dr. S. D. Judd, Mr. Robert H. Coleman stated in a letter to the Biological Survey, that he counted the number of insects caught by a Palm warbler and found that it varied from forty to sixty per minute. He says 'the bird spent at least four hours on our piazza, and in that time must have gathered in about nine thousand, five hundred insects.'

"Among the favorite caterpillars eaten by warblers are those of the Tortricidae, or leave rollers, which birds are very expert in taking from their places of concealment in the rolled-up leaves. The little case-bearing cater-

pillars, which are at times so injurious to fruit, shade, and forest trees, also are eaten by the warblers. The larvae of the night-flying owlet moths (Noctuidae), which include the army worm and the various cut worms, are not so often eaten by warblers, but such spcies as climb trees are attacked by these birds while the ground warblers probably feed on cutworms to some extent.

"There are some caterpillars that are supposed to have a certain immunity from the attacks of birds, either because they are protected by spines, covered with hair, or secrete acrid or other distasteful or poisonous matter whichrenders them unfit for food. The families of silk-spinning moths, formerly collectively known as the Bombycidae, but now subdivided into many groups, include a number of the insects most injurious to fruit, shade, and forest trees. The larvae of these insects are hairy. It is widely believed that such caterpillars are never troubled by more than a very few species of birds. But I have learned by observation that in these cases, as in many others, protection fails sometimes to protect. I now believe that when these caterpillars are very young and small, most warblers eat them with avidity, for they can do so with impunity at this time when the hairs or spines have not developd sufficient strength to be disagreeable.

"The forest tent-caterpillar and the apple-tree tent-caterpillar are two hairy native species, while the caterpillars of the brown-tail moth and the gipsy moth, previously mentioned, are two very destructive introduced spcies. All of these are eaten by most of the commoner warblers of New England. The two imported species were fought for years by the Massachusetts State Government, which expended more than a million dollars and then gave up the fight. These two pests are now beyond the bounds of Massachusetts and may be expected to spread over a great part of the United States, in spite of the fact that the fight against them has been renewed in Massachusetts and taken

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OREGON STATE COLLEGE
CORVALLIS, OREGON

up in other states. These insects have now become pests of the orchard, garden and forest, feeding on nearly all kinds of trees and vegetation.

"They are even more destructive here than they ever were in Europe, for here they have escaped most of their native enemies. Hence those American birds that have learned to eat them may prove of great economic value. It happens that the browntail larvae emerge from the egg in the fall, at a time when the warblers that breed in the Canadian Provinces and the northern tier of states are returning southward in migration, while the gipsy larvae begin to hatch as the spring migration begins. The warblers, in both cases, appear at just the right time and destroy the small larvae by thousands. The tent-caterpillar and the forest caterpillar also are attacked by them during the spring, and eaten in considerable numbers. The larvae of butterflies as well as the pupae and imagoes of many Lepidoptera. Warblers, however, in their selection of food are not confined to any one order of insects. They are well fitted to pursue and capture any of the smaller insects, except those that hide in the ground or in the solid wood, and even they are in danger if they ever show themselves in daylight outside their chosen retreats.

"Another family belonging to this order (Hemiptera), which is often prominent among the food of warblers, is the Aphididae or plant-lice, previously mentioned. Most warblers probably eat certain of these insects or their eggs. Each of these eggs may represent the future form of plant-louse known as the stem mother which, no mishap occurring to shorten the natural life of her descendants, would, according to Huxley, produce in ten generations a mass of plant-lice equal in bulk to that of five hundred million human beings, or the population of the Chinese Empire. A few species of warblers eat bark lice and scale insects.

Many of the injurious bark beetles and other boring beetles are greedily eaten. Bark beetles (Scolytidae) are among the most insidious and deadly enemies of trees. They often complete the destruction of trees that have been defoliated by caterpillars. Unable, as they usually are, to live in the most thrifty and vigorous trees, a tree is no sooner weakened by the loss of its leaves, than these beetles are attracted to it. Their eggs soon deposited and the resulting larvae bore away among the vital tissues of the tree along the inner surface of the bark. If their increase is not checked, a year or two of their work is sufficient to destroy the noblest trees of the forest. The warblers, however, attack these borers as they mature and emerge from their burrows in the pairing season. The Black and White Warbler, which in summer takes the place so well filled in winter by the Brown Creeper, probably leads in the destruction of bark beetles, but many other spcies eat them, and thus the warblers again come to the rescue of the trees.

The Thrushes

The members of the thrush family include such well known species as the bluebirds and robins. The most delightful song of the deep forest is that of the hermit thrush. Its associates, the olive-backed, russet-backed, gray-cheeked, Wilsons, wood, and willow thrushes all make the human remark on the bell like beauty of their songs. They are typical forest birds, spending most of their time on the ground, seeking their food beneath the litter of leaves and twigs. They are truly a factor well worth the study of the forester.

CONCLUSION

We have seen in the foregoing review how some of the most important bird families tie in with the interests of the recreationist, sportsman, entomologist and forester.

The forest biologist, if he ever becomes a reality, as he most assuredly will in the future, will have many things to note. First he will study more carefully the manner in which our wild birds influence the life of the forest.

The most drastic move in the maintenance of birds in the forest has already been made; that is the protection of the forest from fire. A devastating fire not only destroys the forest itself, but during the breeding season kills game birds and animals in excess and truly reduces life to a zero quantity. Fires in slashing at the wrong time of year would destroy a high percentage of terrestial nesting species as birds require protection and naturally take to the best protection afforded. Just as the farmer who cleans out his berry and brush patches, the forester can overdo forest sanitation by light burning and ornithologically speaking destroy the desired protection for the wild birds nesting on or near the ground.

May it be borne in mind that birds do play a tremendous part in the interest of man and may the study of their habits be ever carried on to obtain a still deeper understanding of their influence. May the forester learn to appreciate more deeply that birds are interesting biotics which affect him not only silviculturally but spiritually as a part of the great forest which he so enjoys.

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