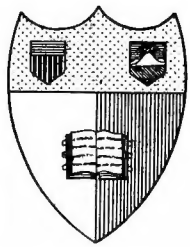
CONSERVATION READER

FAIRBANKS

IN CONSERVATION SERIES



Nat'l Ass'n Audubon Societies

The passenger pigeon, an extinct species.

CONSERVATION SERIES

CONSERVATION READER

BY

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AUTHOR OF "HOME GEOGRAPHY, STORIES OF OUR MOTHER EARTH," "ROCKS AND MINERALS," "THE WESTERN UNITED STATES," "PRACTICAL PHYSIOGRAPHY," "GEOGRAPHY OF CALIFORNIA," ETC.

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The need for education in the principles of conservation is imperative. As Henry Fairfield Osborn states the matter, "We are yet far from the point where the momentum of conservation is strong enough to arrest and roll back the tide of destruction." The movement for the preservation of natural resources can succeed only with the establishment of an enlightened public sentiment on the subject. To create and maintain such a sentiment is the proper work of the schools. In making this *Conservation Reader* available for school use, author and publishers have had in mind the great and lasting service that such a text might render. The publishers believe that this little volume and others forthcoming in the Conservation Series will rank high among "Books That Apply the World's Knowledge to the World's Needs"

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INTRODUCTION

THE wave of enthusiasm for the conservation of our national resources must reach the children or it will expend much of its force uselessly.

It is from the education of the children in right ways of looking at Nature that everything is to be expected in the years to come. If they learn to understand the value of the things about them, as well as to appreciate their beauties, the carrying on and enlarging of the conservation program which is now so well under way can be safely left to their care.

The West, although it has already been ruthlessly exploited, has lost less of its natural wealth than have the longer-settled Eastern states.

In the newer parts of our country we can reasonably hope to save most of the forests and most of the wild life, and pass them on down to our children and grandchildren in something of their primeval beauty and richness.

In the East we can hope to arouse a stronger sentiment for preserving what remains of the forests as well as for extending their areas, for proper forestation will lessen the danger of erosion of the soil and of floods, and will encourage the return of the wild creatures that are of so much economic importance and add so much to the joy of life.

A book bringing out in a simple and interesting manner the principles of conservation has long been needed, for there has been little that could be placed in the hands of pupils. It is with the earnest hope of furnishing something which will answer in part the present need that this *Conservation Reader* has been prepared.

Acknowledgments are due the publishers of *American Forestry* and the *Century Magazine* for courteous permission to reprint poems taken from those publications. For their help in supplying photographic subjects to illustrate the book, thanks are extended to the persons to whom the various illustrations are accredited in immediate connection with their use in the text. The reproductions in color of two bird subjects have been secured through the friendly coöperation of Mr. T. Gilbert Pearson, Secretary of the National Association of Audubon Societies.

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CONSERVATION READER

CHAPTER ONE

HOW OUR FIRST ANCESTORS LIVED

Before these fields were shorn and tilled
Full to the brim our rivers flowed;
The melody of waters filled
The fresh and boundless woods;
And torrents dashed, and rivulets play'd,
The fountains spouted in the shade.

WILLIAM CULLEN BRYANT,
quoted in *American Forestry*, XIV. 520

THE earth is our home. It is a great treasure house filled with the most wonderful things. Although people have lived on the earth for many thousands of years, they have been very slow in learning the secrets of their treasure house. This is because early men were much like the lower animals. During all these years their minds have been slowly growing. Now we can learn and understand many things which our ancestors of long ago could not.

In habits and appearance the first men that roamed the earth were little different from the other animals except that they walked upright. When they had enough to eat and a home safe from enemies, they seemed perfectly happy and contented.

These early men lived in the same wonderful treasure house as we do, but they did not know how to make use of its riches. In truth, their wants were so few that they would have had no use for the things that now seem so necessary to us. The rich fields about them lay untilled. The gold, silver, copper, and iron in the earth remained

undiscovered; and the animals and birds that we now use in so many ways then served them mainly for food.

Since they had no furry coats to keep them warm as do the animals of the cold regions, and had not learned to make clothing, their homes must have been in the warm parts of the earth. While they were without weapons to defend themselves against the lion and tiger, yet they were sharp witted and very quick in their movements and thus were usually able to escape their more powerful enemies.

Although these early ancestors of ours seemed so much like the other animals, they were in reality very different. They had the same keen senses of sight, hearing, and smell, but they were more intelligent.

When the dog and cat have had enough to eat, they lie down perfectly happy and contented. But when early men had had enough to eat, they were often not satisfied. They had other longings which finally led them to make discoveries about the uses of things around them and how to make their lives more comfortable.

The little bear cub, for example, as it grows up learns from its mother just what it should do on all occasions. It learns what its mother knows and that is all. But among the early people of whom we are speaking the children not only learned all that their parents knew, but a little more. In this way each generation of children came to know more about the world.

Thus after many years had passed people came to understand something of the wonderful world in which they lived. They were no longer at the mercy of wild animals, storms, heat, cold, hunger, and disease.

The first people, like the other animals, used only their

hands and teeth in hunting and in fighting their enemies. Finally some of the brighter ones discovered that a stick or club served better than the bare hands.

The use of flint knives may have been brought about through some one cutting himself accidentally upon a piece of flint sticking out of the ground. If he happened to be very bright, he would at once see the value of such a piece of stone tied on the end of an arrow or club. By such means, perhaps, implements of wood, bone, and stone came into use.

We have discovered the sites of many of the villages as well as the caves in which the ancient inhabitants of the earth lived. The implements of bone and stone which we have dug up in such places enable us to learn a great deal about their lives.

There was a time when people did not know the use of fire. What a fearful thing fire must have seemed to them, at first. Their knowledge of it probably came from lightning or from hot lava flowing from a volcano. After they had learned to control fire, and to make it by rubbing two sticks together, they must have felt rich indeed. The discovery of fire was one of their greatest triumphs. It kept the cold, damp cave warm and dry, even though it filled their eyes with smoke. It was a means of keeping them safe from the dangerous wild beasts when they had to sleep out in the open. It was useful in cooking their food, and by and by it was to prove valuable in still other ways, when they began to *make* things as well as to *find* things.

They began, by and by, to build rude shelters, — huts and wigwams, low houses of dried mud, and dugouts in the hillside. They learned to weave simple coverings out of

American Forestry Association

The Laplander of the far North uses the reindeer to pull his sled, its flesh for food, its skin for clothing, and its horns for various purposes.

the fibers of certain plants, or hair or wool, to protect their bodies against the cold and the wet. They learned, somehow, to tan the skins of animals, so that they would not first stretch and grow slippery. They learned to hold things together by sewing, using sharp bones for needles and the sinews of animals or fibers of plants for thread.

How did men discover that they could travel on the water? Some one may at first have made use of a log to cross a river and, afterwards, have tied several logs together, making a raft. When they had learned how to make a canoe out of a log, by burning or hewing it out with rude axes, they could then take long journeys on the water to new lands. Since paddling was very tiresome, some one, brighter than the rest, probably thought of making a sail of bark or skins and so letting the wind push the canoe along.

We do not know how the metals were discovered. Per-

haps fire melted some of the copper in a vein of ore. Perhaps pure copper was found, for Nature sometimes leaves it in this form. Copper could be easily hammered into various useful articles, but it was too soft for many needs. After tin was discovered, it was learned that by melting it and copper together a new and very hard metal, known as *bronze*, was formed. Next, we think, came the discovery of iron, which has become so important that we could not get along without it. Think what this must have meant for them! To get firewood, to make rude boats and simple houses, to fight wild animals, now became easier. After iron they discovered gold and silver, and began to take an interest in making beautiful as well as useful things.

It is easy to see how, once these new ways of using the earth were found, men could move into other regions than the belt where it was always warm. They could store up food for the winter, they could build warm shelters and get warm clothing, and they could sit by a fire.

Sometimes when the first people were out hunting, instead of killing the young animals that they caught, they took them home and cared for them. So the little creatures became quite tame and grew up about the camps. The wild jungle fowls were the ancestors of the domestic hens which we find so useful. The wild cow was tamed in like manner, and made to supply milk in addition to food and clothing. The colts of wild horses and donkeys were captured and used for carrying loads. Sheep and goats were tamed in the same manner, and became the most valued possessions of some of the ancient peoples as they are of some peoples today. When they had learned to weave the wool of these animals into clothing and blankets, they had taken another

step upon the long road which leads from ancient times down to us.

Did these early people live entirely upon meat? If they had done so, we should never have had the wonderful variety of fruits and vegetables that we now enjoy so much. We must not suppose that Nature grew these things wild just as they are found in our gardens today. Our ancestors grew them for many generations, gradually improving their size and flavor. By selecting the best and carefully cultivating them, we are still continuing to make them better.

The horse, donkey, cow, and camel proved valuable in another way to the people who were learning to cultivate the ground. When harnessed to a crooked and sharpened stick they aided in breaking up the ground in which the young plants were growing.

And so the long years passed while the early people were discovering and making use of the things around them. They came to building better and more permanent homes, because they did not have to move from place to place in search of food. Where there were forests, wood served for their buildings. Where there were few trees, stone or mud bricks were used.

The brighter people learned to understand Nature more quickly than those who were dull. Each discovery of some new way of doing things aided them in making others, and in this way people finally came to have all the comforts of today. Those people less quick to learn the secrets of Nature, or those who lived in countries to which Nature had given little, gained few comforts and even now remain savage.

After our ancestors had learned to cultivate the soil, to

use the minerals and the forests, and had tamed the animals and birds, they were still unsatisfied. They attempted to make the forces of Nature work for them. For a long time people made flour by crushing grain in a mortar. Next, two flat stones were used, one being made to turn upon the other by a handle. After that some animal, such as an ox or a horse, was harnessed to larger stones which, as they slowly turned, ground the grain. This was a great deal of work, and so some one thought of making the water tumbling over a ledge of rock grind the grain for them. The water was made to go over a water wheel. This wheel then made the millstones go around. It was a great deal easier.

Where there was no water power, wind was made to do the same work. A crude windmill gathered the power of

H. W. Fairbanks

The wild home of early men.

the rapidly moving air. After wind and water had been forced to serve them, some one who had seen the lid of a tea kettle dancing up and down, thought of using steam. Then electricity, which in the form of jagged lightning had seemed so fearful a thing to the early people, was harnessed and made the greatest servant of all the forces of Nature.

The discovery of powder led to the making of guns so destructive that dozens of birds could be killed at one shot.

Some people became greedy and used all these wonderful discoveries to rob Nature. It seemed as if in some places all the wild life would be destroyed. Fires were allowed to burn the forest unhindered. The soil was made to produce crops until it grew poor.

If we become selfish and indifferent and neglect to care for the treasures which Nature has placed in our hands, very serious things will happen to us, as they have happened to other people. How to use the storehouse of Nature without wasting or destroying these treasures is what we mean by *conservation.*

CHAPTER TWO

HOW OUR NEEDS DIFFER FROM THOSE OF THE FIRST MEN

We have seen that the first men, like the other animals, depended upon the food that Nature supplied them, and when this was lacking they went hungry. When men had learned the use of fire they took the first step in making Nature serve them better than she did the lower animals. Today she works for us in so many ways that we can hardly name them all.

After the use of fire the next thing that men learned was to make better homes, to tame some of the wild animals, and to raise a part of their food supplies, instead of depending entirely upon what they could pick up here and there.

As the number of people increased, the question of securing food became more and more important. Would it not seem pretty hard to have to go out and hunt for your breakfast in the woods, or fields, or along the water? If you were alone you might find enough to eat, but if there were thousands of other people doing the same thing, you would probably go hungry. For this reason people began to cultivate berries, fruits, roots, and grains, and to take better care of their herds.

Living as they did, in those parts of the world where the climate was warm, they usually found an abundance of food. But when these places became too crowded, and some of them had to move to new regions, they often found less food and a climate not always comfortable.

In this way people spread into the colder and drier parts of the earth. The need for things which they did not have

there sharpened the wits of these people. It led to one discovery after another. New needs were felt and new ways of satisfying them were sought. They kept finding out more about Nature and how she works. After many years they knew much more and were also far more comfortable than those people who continued to live where Nature supplied everything.

There are now so many more people on the earth than there were long ago that to furnish them all with food is a very great task. Besides, there are now many people engaged in work other than farming, hunting, and fishing. All such people have to be provided for by those whose business it is to get food. People of the great cities are dependent upon those in the country for all that they eat! We can picture to ourselves the suffering that would follow if for only one week every one had to get his own food.

We need many things that the first people thought nothing about, because their manner of life was so much simpler than ours. Let us see now what they are.

We live in tightly closed houses, and so have less trouble in keeping warm and dry. But we do not always get the supply of fresh air that we need. Many of us are sickly and weak because of this. Our ancestors lived in the open air, which is always pure and fresh. A supply of pure air, then, is one of the things that we must now provide for.

People once gave no thought to the purity of the water that they drank. When there were few people, water did not easily become impure. One could drink water wherever one found it and there was small risk of harm. Now in many places there are so many thousands of people

gathered together that they have to take the greatest care about drinking water, in order to keep in good health. To get pure water it is often necessary to bring it many miles from mountainous regions where no one lives.

Clothing is another thing that concerns us very much. Our ancestors were not troubled about their clothing. In the warm countries they went almost naked. Where it was cold the skins of animals served very well. Changes of fashion did not disturb them and cause them to throw away warm covering. To supply ourselves now with clothing we call upon Nature for many things. As she cannot, without our help, furnish what we need, we have to keep a great number of flocks, for their wool and skins, and cultivate vast fields of cotton and flax.

When Nature raised in her own way the berries, grains, and roots that the first men ate, no thought was given to the soil in which these things grew. In truth, it was not necessary to pay any attention to the soil. Nature is very careful in her way and never makes the soil poor by growing more plants than it can support. In her own gardens she always renews the foods in the soil which the plants require as fast as they take them away.

The needs of men have increased so fast that the soil has often been forced to grow more than it ought. Men have been a long time in learning that they cannot keep on growing the same crops on the same soil year after year without supplying to the soil extra foods, or *fertilizers*, as we call them. The care of the soil is another thing to which we have to give attention, but which did not worry our ancestors.

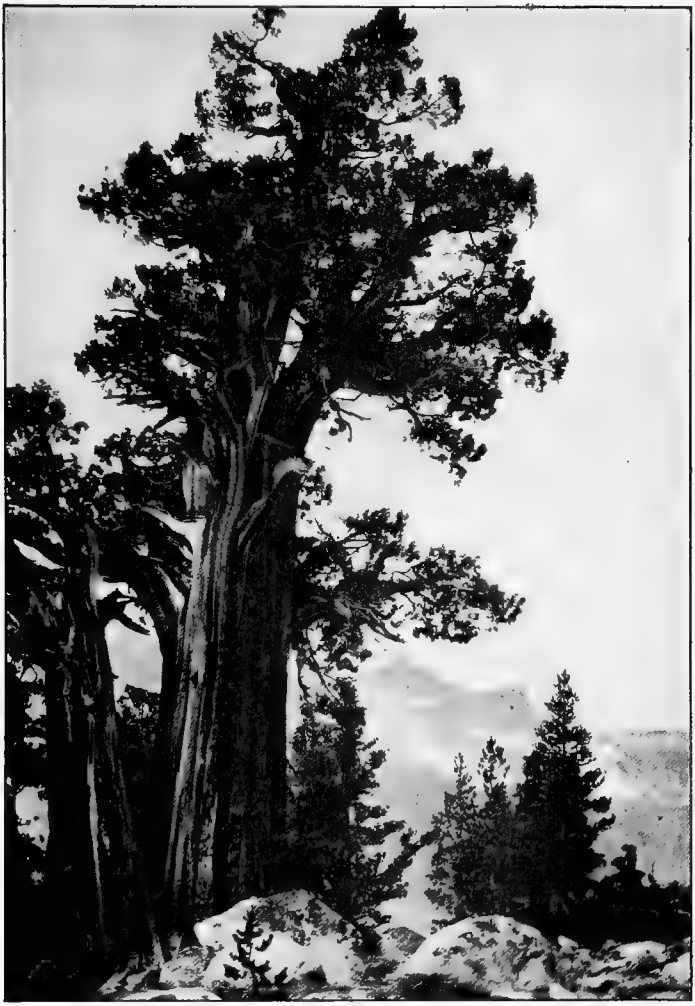
Nature clothes the earth with a carpet of grasses, bushes,

or trees. When the rain falls on the ground, their roots hold the soil so firmly that it usually washes away only very slowly. When men first began to cultivate the soil, they paid no attention to the fact that water washes away the loose earth very easily. In this loose earth at the top of the ground is stored most of the food which the plants require. Care of the surface of the ground is, then, another thing which we have to keep in mind.

Men at first made shelters for themselves from anything that was at hand, such as bark, skins, rock, or earth. When they learned to make sharp-edged tools, they began to use trees. Where it is cold, much wood is required to build warm houses. As the numbers of men increased, they used greater and greater quantities of wood. Wood also proved to be most useful for many other purposes than house building. In order to plant larger fields the trees were cut down or burned off, without thought of doing any harm. In time trees became scarce in many parts of the world and men began to realize that care must be used or the supply of wood might fail them.

Coal was finally discovered and men said, "Now we have something that will last always, for there must be an inexhaustible amount in the earth beneath our feet. All that we shall have to do is to dig it out." When men grew wiser they learned that coal must not be used carelessly any more than the other gifts of Nature; otherwise the supply may give out and leave them with nothing to take its place.

Hunting and fishing continued to be the business of many. They invented destructive weapons with which they were able to kill such large numbers of wild creatures that some kinds disappeared entirely. Fish, also, of which people



George J. Young

Sierra junipers above Tuolumne Meadows, near the Yosemite Valley, showing how roots will force their way in apparently most unfavorable places.

thought the sea and the rivers contained a never failing supply, became scarcer. They did not know that fish live mostly in the shallow waters along shores, and that the great ocean depths contain very few.

Thus, as the earth became thickly settled with men and their wants increased, they discovered that they had to treat Nature in a very different way from that of their early ancestors.

Because of our great numbers we have to be careful not to use the earth in such a way as to lessen its fertility and productiveness. Where people have been careless, famine has often resulted. Poverty and suffering have come to many parts of the earth, as we shall learn farther along in this little book.

THE CITY ON THE PLAIN

Strange indeed were the sounds I heard
One day, on the side of the mountain:
Hushed was the stream and silent the bird,
The restless wind seemed to hold its breath,
And all things there were as still as death,
Save the hoarse-voiced god of the mountain.

Through the tangled growth, with a hurried stride,
I saw him pass on the mountain,
Thrusting the briers and bushes aside,
Crackling the sticks and spurning the stones,
And talking in loud and angry tones
On the side of the ancient mountain.

The tips of his goatlike ears were red,
Though the day was cool on the mountain,
And they lay close-drawn to his horned head;
His bushy brows o'er his small eyes curled,
And he stamped his hoofs, — for all the world
Like Pan in a rage on the mountain.

"Where are my beautiful trees," he cried,
"That grew on the side of the mountain?
The stately pines that were once my pride,
My shadowy, droop-limbed junipers:
And my dewy, softly whispering firs,
'Mid their emerald glooms on the mountain?

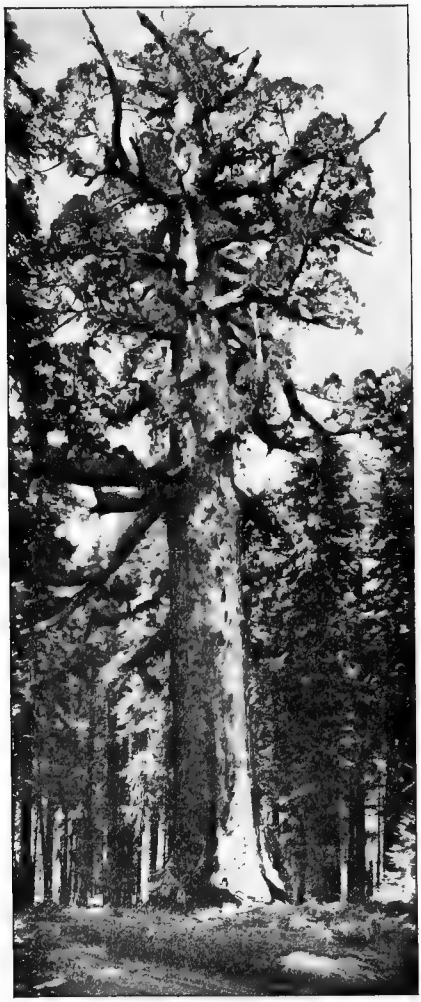
"They are all ravished away," he said,
"And torn from the arms of the mountain,
Away from the haunts of cooling shade,
From the cloisters green which flourished here —
My lodging for many a joyous year
On the side of the pleasant mountain.

"The songbird is bereft of its nest,
And voiceless now is the mountain.
My murmurous bees once took their rest,
At shut of day, and knew no fear,
In the trees whose trunks lie rotting here
On the side of the ruined mountain.

"Man has let in the passionate sun
To suck the life-blood of the mountain,
And drink up its fountains one by one:
And out of the immortal freshness made
A thing of barter, and sold in trade
The sons of the mother mountain.

"Down in the valley I see a town,
Built of his spoils from my mountain —
A jewel torn from a monarch's crown,
A grave for the lordly groves of Pan:
And for this, on the head of vandal man,
I hurl a curse from the mountain.

"His palpitant streams shall all go dry
Henceforth on the side of the mountain,
And his verdant plains as a desert lie
Until he plants again the forest fold
And restores to me my kingdom old,
As in former days on the mountain.



Pillsbury's Pictures, Inc.

"'Where are my beautiful trees,' he cried,
'That grew on the side of the mountain?'"

"Long shall the spirit of silence brood
On the side of the wasted mountain,
E'er out of the sylvan solitude
To lift the curse from off the plain,
The crystal streams pour forth again
From the gladdened heart of the mountain."

MILLARD F. HUDSON,
in *American Forestry*, XIV. 42

CHAPTER THREE

THE EARTH AS IT WAS BEFORE THE COMING OF CIVILIZED MEN

For ages, on the silent forest here,
Thy beams did fall before the red man came
To dwell beneath them; in their shade the deer
Fed, and feared not the arrow's deadly aim.
Nor tree was felled, in all that world of woods,
Save by the beaver's tooth, or winds, or rush of floods.

WILLIAM CULLEN BRYANT,
A Walk at Sunset

THE earth has not always been as it is now. Those parts now possessed by the more civilized peoples have been very greatly changed. If we could look back and see some of the countries as they were long ago, we should hardly know them. In certain lands the forests have been cut down, the wild creatures driven away, and the soil so carelessly cultivated that it has become poor. In other lands Nature's gifts have been carefully used; even the barren deserts have been turned into green fields and blooming gardens for hundreds of miles.

Let us try to picture to ourselves how our own country looked when white men first found and explored it. A few hundred years ago it was the home of wild animals and Indians only. We have been given our freedom in one of the richest of Nature's gardens, and, like so many children, have tried to see who could gather the most treasures from it. We have given little attention to keeping up the garden.

If you have been in some part of the country that is still wild and unsettled, it will help you to form a picture of how the entire land once looked. If you have been in one of our

great natural parks, this will be a better help. In these parks everything remains just as Nature made it. There the animals, birds, and plants are free to live their lives unmolested. Is it not a good thing that our government has been wise enough to have large tracts of land left in just the condition in which the whole country was when our ancestors first came?

We will think of our whole land, then, as a great wild park, rich in all kinds of animal and plant life. It was not an altogether happy family that lived in this park, for all were struggling for food, drink, and sunshine. But as none were possessed of such deadly weapons as those of civilized man, no one kind of animal was able to kill off all of any other kind.

Neither the Indians in their wigwams, nor the wild animals in their lairs, nor the birds singing in the trees, nor the ducks quacking in the marshes dreamed of the change that was coming to their homes. They did not dream of civilized man with his terrible weapons and his many needs, who was to change the whole appearance of the country and nearly or quite exterminate many of them.

The life of the Indians was almost as simple as that of the lower animals. Their clothing required little care. Their homes were easily made. Some of them had learned to cultivate the soil, but they depended mainly upon food obtained by hunting, and such roots, berries, and nuts as the women could collect. If we could have looked down on our land as the bird does, we should have seen little sign of human inhabitants. There were no roads or bridges, and only indistinct trails led from one village to another.

In the far Southwest there were people quite different

from those of whom we have been speaking. They were called the Pueblo Indians. In Mexico there were similar people called the Aztecs. All these Indians still live in permanent stone villages, as they did a thousand years ago. They learned more about Nature than the wandering Indians, but we do not believe they would ever become civilized if left to themselves.

The only animal that the Indians had tamed was the wolf. They made little use of the wolf-dog except in the far North, where it drew their sleds over the snow.

Some of the Indians of our country once knew of the use of copper, but it had been forgotten when white men first came.

All about the Indians was the same world that surrounds us. In truth, it was a richer world in some ways, for since then many of its treasures have been lost through greed and waste.

The rich soil of the valleys was almost undisturbed. The forests were uncut save for an occasional tree used in making a canoe or a rude cabin. The forests suffered only at the hands of the insects, storms, and fires. The flowers that covered the ground in spring went ungathered. The vast grassy prairies were disturbed only by the feeding of such animals as the buffalo, elk, deer, and antelope.

A single great forest spread over all the mountains and valleys of the eastern part of our country. Now you can travel for many miles in the more thickly settled portions of this region and see not a single tree of the original forest.

To the west of the forest came the prairies and plains. Still farther west came lofty mountains and desert valleys. On these Western mountains were other forests with trees of wonderful size.

American Forestry Association

The elk once roamed the valleys.

This great natural park, with its long seacoasts, rivers, lakes, marshes, dense woods, and open plains, was a paradise for wild creatures of every description, and the Indian was contented to leave it so.

Grizzly and black bears roamed the thickets. Elk wandered through the mountains and valleys. Deer were abundant everywhere. The antelope raced over the plains, mountain goats and sheep lived among the rocks, and moose filled the Northern woods. Great herds of buffalo darkened the surface of the plains. When the first railroad was built across the plains, less than fifty years ago, the trains were sometimes stopped by herds of buffalo crossing the track.

Most of the songbirds that filled the country then are still with us, for they were of little commercial value to the hunter. No other land has richer bird music than ours.

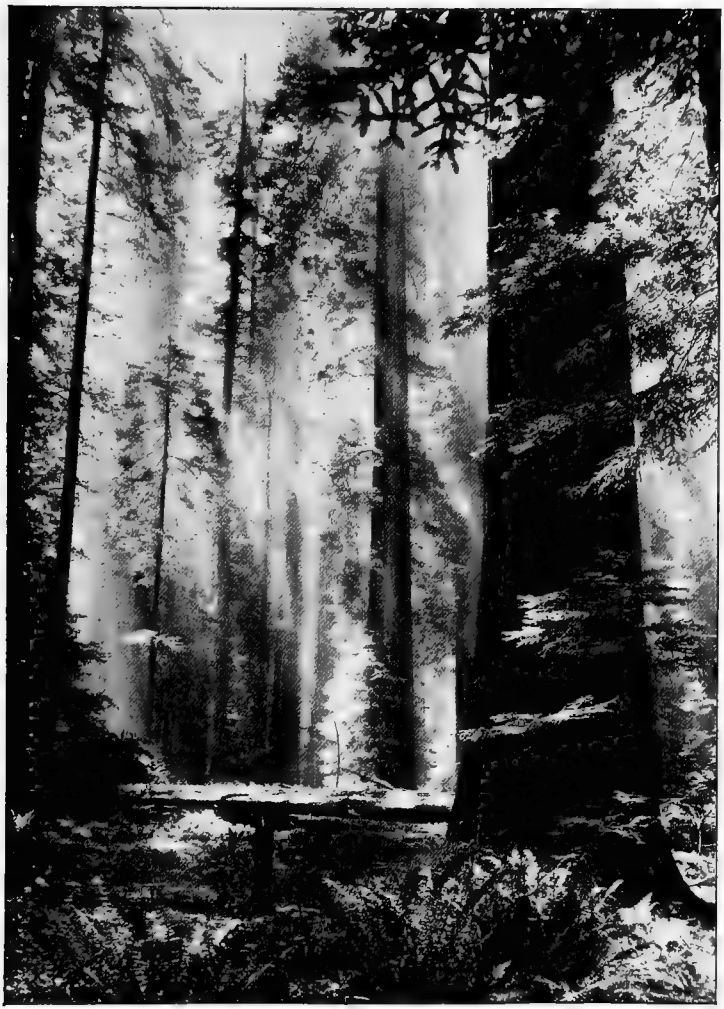
Many of the birds that are valuable for food are, however, nearly extinct. Now we have laws for their protection, but these laws went into effect too late to save some species. The passenger pigeon is one of our greatest losses.

The cutting down of the vast forests that once covered the Eastern states, and the cultivation of fields, has helped to drive many of the wild creatures away. We are just beginning to learn how poor our country would be if we lost them all. Refuges are being established in many places, where those birds and animals most in danger of extinction may live safe from the hunter.

The coast waters, lakes, and streams of our country were once alive with fish. The Indians made use of them, but their rude traps did not catch enough to affect the number seriously. We have fished with every kind of trap that the brightest fisherman could think of. Many important food fishes are now very much reduced in numbers. The fur seal and sea otter are so nearly gone that only the most watchful protection will save them from extinction.

The land, as the Indian knew it, was beautiful, and was filled with everything that one could wish. But the Indian did not know how to use it. He lived a poor life, suffering from cold and hunger.

We came into the possession of a land unspoiled by its primitive inhabitants. It was just as Nature made it. In a few short years we have almost exterminated the Indian. We have swept away a large part of the forests. We have almost destroyed many of the species of animals and birds. We have robbed the soil and injured the flow of the rivers. Some of this loss we could not help, for when many millions of people occupy a land there must be many changes. But



Pillsbury's Pictures, Inc.

"Such beautiful things in the heart of the woods!
Flowers and ferns and the soft green moss."

for the losses that we have needlessly and carelessly caused we shall sometime be sorry.

Do you not think we are wise in seeking how to take better care of this land of ours?

IN THE HEART OF THE WOODS

Such beautiful things in the heart of the woods!
Flowers and ferns and the soft green moss;
Such love of the birds in the solitudes,
Where the swift winds glance and the treetops toss;
Spaces of silence swept with song,
Which nobody hears but the God above;
Spaces where myriad creatures throng,
Sunning themselves in his guarding love.

Such safety and peace in the heart of the woods!
Far from the city's dust and din,
Where passion nor hate nor man intrudes,
Nor fashion nor folly has entered in.
Deeper than hunter's trail hath gone
Glimmers the tarn where the wild deer drink;
And fearless and free comes the gentle fawn,
To peep at herself o'er the grassy brink.

Such pledges of love in the heart of the woods!
For the Maker of all things keeps the feast,
And over the tiny flowers broods
With care that for ages has never ceased.
If he cares for this, will he not for thee —
Thee, wherever thou art today?
Child of an infinite Father, see;
And safe in such gentlest keeping stay.

MARGARET E. SANGSTER,
in *American Forestry*, XIV

CHAPTER FOUR

NATURE'S UNEQUAL DISTRIBUTION OF HER GIFTS

PURE, fresh air is free to all of us, for, like an ocean, it surrounds the whole earth. We need pure water just as much as we do pure air, but it is not always easy to get. A large part of the earth is buried beneath water so salt that we cannot use it. Other parts of the earth are so dry that if we venture into them we may die of thirst. The solid land on which we make our homes is not all of the same value. Thousands of square miles are so rocky or so cold or so dry that they support no living thing. Other thousands of miles of the earth have been so favored by Nature that they are fairly alive with every sort of creature.

We say that a country is rich in natural resources when it has an abundance of those things that men need or can make use of for their pleasure and comfort. A country is poor when it has few of these things.

The first men were poor, although they lived in a rich part of the earth. They did not know how to make use of what lay around them. If civilized men are poor now, it is because they have wasted Nature's gifts or because they live in a country upon which she has bestowed little.

When we say that the far North where the Eskimos live is a dreary, desolate region, we mean that it lacks most of those things necessary to make men comfortable and happy. When we read of the life of the wandering Arabs in the desert of Arabia, we think of a country to which Nature has not given its share.

When we speak of Spain as poor, we have in mind a country once favored by Nature, but no longer prosperous

H. W. Fairbanks

Where Nature has supplied little rain; desert sand dunes.

because its resources have been wasted. Our own land is now rich and prosperous because of the abundance of its natural resources. We should guard these well lest we meet a fate similar to that of the people of Spain.

If we journey over our own land, we shall discover that Nature has been very partial to certain parts, giving them more than they need. Other parts have been left with little. We shall also discover what wonderful things men are doing to make up for the failures of Nature, and to make habitable many of those places which she left uninhabitable.

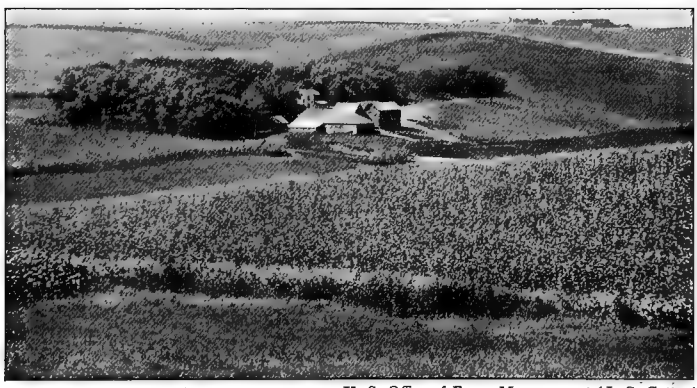
The forests of the eastern half of the country have been thinned out. West of the Mississippi River there are thousands of square miles of prairies where there are almost no trees. In such places the first settlers had difficulty in getting firewood, and had to build their houses of earth or stone.

Upon the northwest coast there is fog and rain and little sunshine. There the forests grow so dense that it is difficult to travel through them. In the deserts of the Southwest the sun shines out of a cloudless sky almost every day in the year. The ground becomes very dry and the living things found there have strange and curious habits.

In the Central and Eastern states there is much coal; and because of this, millions of people have gathered there to engage in manufacturing. In California coal is scarce and has to be brought from other parts of the earth.

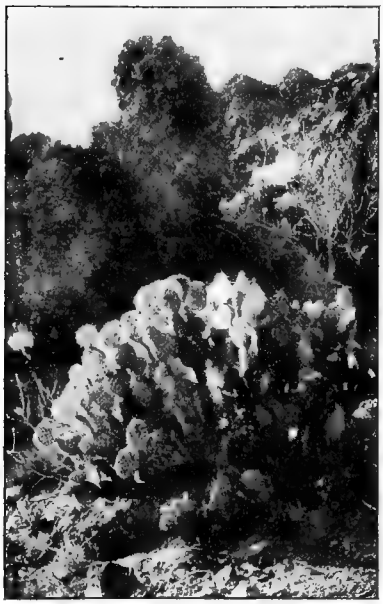
The vast prairies of the Mississippi Valley are covered with fields of waving grain, much of which is shipped to distant regions. In New England much of the soil is rocky and not enough grain is raised there to supply the needs of the population.

The work that people do in different places is determined by the way in which Nature has distributed her resources. The farmers are mostly found in the valleys where the soil



U. S. Office of Farm Management (J. S. Cotton)

A farming scene in the fertile valley of the Missouri River.



H. W. Fairbanks

The prickly pear in its desert home.

is best. Cattle are pastured on those lands not suited to farming. The miners go to the mountains, where they can more easily find the minerals they are after. The lumberman finds his work where the climate favors the growth of forest trees. The manufacturer seeks the waterfalls, where there is power to turn his mills.

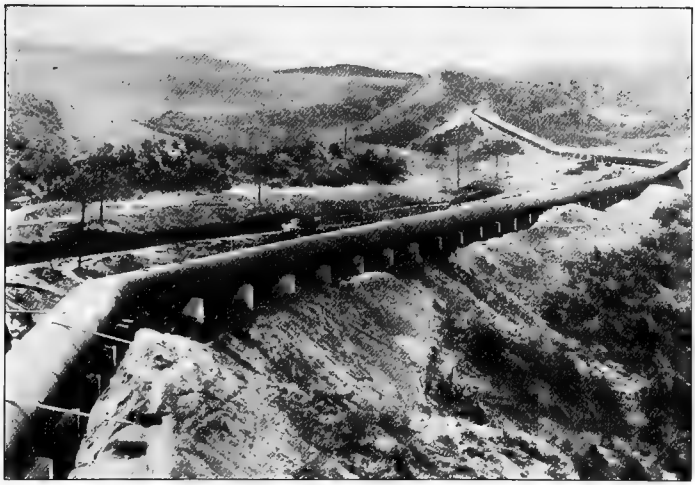
Now let us try to discover in how far we can change Nature's plan and make habitable those places which she left uninhabitable. There are some things which we cannot do. We cannot make the air warmer or colder. We cannot cause rain to fall even though the fields are parched with drought. We cannot stop the rain falling, and we cannot stop the winds blowing.

While we cannot stop the water falling from the clouds, we can drain the lowlands and marshes and so make them fit for the farmer. We can raise great dikes or embankments along the rivers and so shut out the flood waters. The people of Holland have saved thousands of acres from the sea by building dikes and pumping out the water from the inclosed fields.

While we cannot make it rain where not enough rain falls, we can do that which is just as good or better: we can carry water by ditches and pipes to the land that needs it. Much of the soil of the great deserts in the southwestern part of our country is rich in plant food. All that it lacks is water.

The Indian roamed over the rich lands of the great delta of the Colorado River. He often went hungry and thirsty. He did not think of taking the water out of the river in a ditch and allowing it to flow over and wet the rich soil. The white man came and turned the river out of its channel and spread the water over hundreds of square miles of the richest land on the earth. Now, where once you would have died of thirst and hunger, there are green fields and growing crops as far as you can see.

The city of Los Angeles is situated in a dry region where



The Owens River aqueduct, through which water is carried to Los Angeles from a source more than two hundred miles distant.

there is not water enough for the needs of a great city. There has now been completed a great aqueduct which brings a river of water through deserts and mountains from the Sierra Nevada Mountains, over two hundred miles away. There is now sufficient water for hundreds of thousands of people.

When it rains too much, many rivers rise and overflow their banks. The farmer's crops are destroyed, his cattle drowned, and his buildings washed away. We can lessen the danger from these floods, which are very bad in such river basins as those of the Ohio and Mississippi, by building reservoirs in the highlands where the rivers take their start. If when summer comes these rivers are too shallow for safe navigation, the reservoirs can be opened and the streams supplied with this stored water.

The lack of trees upon the prairies was once a serious matter for the settler. We must not think, however, that because Nature placed no trees on the prairies that trees will not grow there. She may not have had handy the seed of the kind suitable for such dry lands. Our government has found in the dry regions of other countries trees that will grow upon our prairies. In their own home these trees had become used to a dry climate like that of our prairies.

Steep cañons and cliffs of rock once kept people, living on the opposite sides of mountain ranges, from becoming acquainted with one another. Our ancestors were afraid to venture out on the boundless oceans with their small, frail boats. Because of this the continent that we live on long remained unknown. Those who first found it, the ancestors of the present Indians, came here by accident. Storms probably blew their boats across the North Pacific Ocean,

and thus they found a new home. Now railroads enable us to cross the deserts in perfect comfort. Tunnels have been made through the mountains, so that we can go easily from one valley to another. Boats of giant size carry us safely and quickly across the stormy oceans. Nature did not intend us to fly through the air or swim beneath the water, but we are learning so much about her laws that we shall soon be almost as much at home in the air and the sea as the birds and fish are.

CHAPTER FIVE

THE LAND OF THE POOR PEOPLE

My squandered forests, hacked and hewed,
  Are gone; my rivers fail;
My stricken hillsides, stark and nude,
  Stand shivering in the gale.
Down to the sea my teeming soil
  In yellow torrents goes;
The guerdon of the farmer's toil
  With each year lesser grows.

ROBERT M. REESE, *The Spendthrift;* quoted in *American Forestry*, XIV. 269

THIS is the story of a land of plenty that became almost a desert. Long ago there dwelt in this land a people wise in all the things that concerned their home. Through many hard years of toil and struggle they had learned to take the very best care of what Nature had given them. Although Nature seemed to them to be wasteful, she punished waste in her children. As long as they obeyed, they had comfortable homes, fertile fields, and sleek herds.

The country of which we are speaking was very beautiful. There were lofty mountains and broad, fertile valleys. Many streams, fed by clear, cool springs, flowed through the land. There were also green meadows and deep, dark forests.

The forests contained many wild animals, for in the forests the animals found both food and protection. Birds of every sort abounded, and their music filled the air. Trees overhung the streams, shading them from the hot sun, so that they did not dry up in the summer. The springs never failed, for the carpet of leaves and decaying vegetation underneath the trees of the forests held much of the rain-

water from running away, so that it sank into the ground. Instead of making floods in the rivers, it fed the springs gradually and steadily through the long, dry summers.

The people of this land had learned the secrets of the growing plants and how these plants could be made better by cultivation. They had also learned to tame the wild animals and make them useful. The farms were managed with great care so that they never grew poor. The soil never refused to grow their crops. The people had learned during their earlier years of struggle that they must not clear the forests from the hillsides, for, if they did, the soil would begin to wash away. They had learned that they must leave the forests on the mountains in order to save the springs.

Rain did not always come when it was needed for the crops, and at other times it rained too much. Reservoirs were built to hold the surplus water for use in time of drought. Canals were dug to carry it to the fields.

The wild animals and birds bothered the crops, and the first thought of the people was to kill them. But it was soon discovered that this was not wise. Those who destroyed the wild creatures about their farms began to suffer from rats, mice, rabbits, and a multitude of little insects that all but devoured the crops.

It did not take these people long to learn that Nature was not to be trifled with. If they took too much from the earth one year, she made them pay for it the next. They not only became wise enough to take care of every good thing that Nature had given them, but improved upon many things that she had left unsuited to their use.

Thus the land was kept beautiful and fertile. The in-

habitants became rich, and, instead of fearing Nature as they once did, they came to love the rocks, the woods, the streams, and the wild creatures.

Let us now leave this rich and fertile land and come back to it after hundreds of years have passed. We find a new people living there and the country so changed that we can hardly believe it is the same land.

Yet it must be the same, for there are the very mountains that were there long ago. To be sure, they do not look just as they did. When we last saw them they were covered with forests, but now they are barren and scarred with many gulches. Here is the same river, but it also looks different. While it was once overhung with trees and its waters were so clear that we could see the fish in the bottom, it now has a broad, sandy bed; the trees are gone, and the water is shallow and muddy.

The new inhabitants of this land have a tired and discouraged appearance. They have a hard struggle to get enough to eat. The soil is rocky, and it takes much labor to raise the scanty crops. They never seem able to gather all the rocks from the fields, for the soil washes away and new ones are constantly uncovered.

Where are the forests that once grew here? We find in their stead only a few stunted trees and bushes. There is little grass and almost no flowers, even in spring. Sheep and cattle wander far for their forage and do not have the sleek appearance they once did.

There are few wild creatures of any sort, for since there are no woods there are few hiding places. Neither do we see any birds, and we listen in vain for a song or note of any kind.

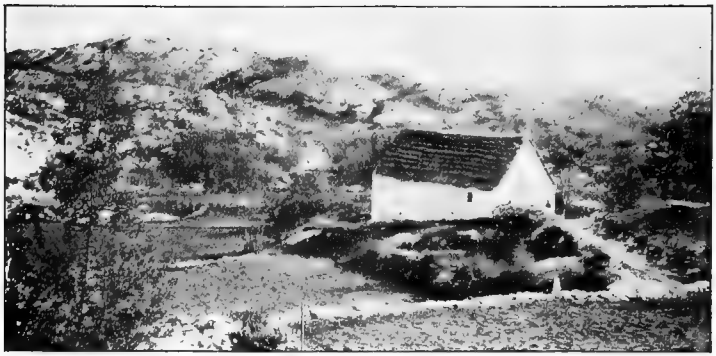
H. W. Fairbanks

The women carry home the fuel.

The houses are made of mud or stone and look cold and cheerless. The people must suffer from cold in winter. The only wood they have is small brush which the women and children gather upon the far hills and bring home in huge bundles upon their backs.

In the towns of this country the only fuel now to be had is charcoal. This is brought upon the backs of burros from the distant mountains, where the few remaining trees give work to charcoal burners. The charcoal is peddled through the streets and sold in tiny quantities at each door. The people are too poor to buy much at a time and are very careful in its use. It is burned in a metal or earthen dish called a brazier, and a double handful may last a family a whole day.

Rains still fall in this country of the Poor People, as they did long ago. But the waters gather quickly upon the un-



H. W. Fairbanks

The rocky land of the poor people.

protected slopes and run off in muddy torrents, taking along some of the soil. Thus each succeeding year there is less plant food for the crops.

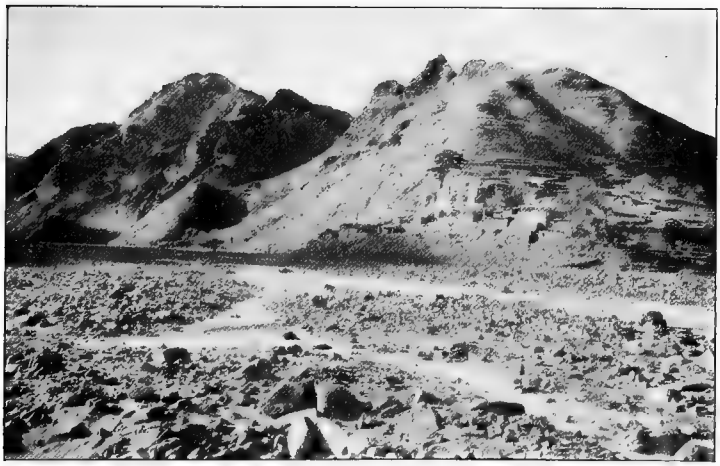
How did this country, once rich and fruitful, become so barren? We are sure from what we know of Nature's ways that she is not the cause of the trouble. Through greed and ignorance of how to take care of their land the present inhabitants have wasted and squandered its wealth until it has become almost a desert.

We can do things with Nature, and direct many of her forces so that they will work for our good. We cannot, however, as we have learned, change the amount of rain that falls, nor can we make it warmer or colder.

How, then, are these poor people to blame for the condition of their country? The troubles which overtook them came from two things. In the first place they did not know how to take care of their rich land, and in the second place they were greedy and wanted to become wealthy faster than they ought.

Why does the rain, which once made this country fruitful, now wash away the soil and make it barren? It is because in those earlier times much of the land was covered with cool forests. The rain then fell more gently because of the forests. More of it soaked into the ground and the springs were larger. Now the rains are delayed by the hot air of the thirsty land until, when they finally do come, the water falls in torrents. Such rains or cloudbursts, as we often call them, carry away the unprotected soil faster than Nature can renew it.

The strangers in the land, under whose rule it became poor, thought they knew better than Nature. They did not look upon her as the great wise mother of them all. Soon after these people came into possession of the land, they found that in other places there was a demand for



Bailey Willis

The shallow, rock-filled river along whose banks the trees have been destroyed.

their grain, cattle, and wool. They began to increase their fields and herds. To do this it was necessary to cut down the forests which had stood so long. It seemed to them too bad to leave valuable land covered only with trees.

The people began to look askance at the birds, for they thought they were eating too much grain. Because they did not know what good the little creatures were doing, they killed them. Since most of the birds nested in trees, they got rid of them faster by cutting down the trees.

The steep hillsides were finally cleared of trees and the soil began to wash, and the rocks soon appeared. No plant food was given to the soil to replace that taken by the growing plants, and the crops soon began to show the effect of starvation. The cattle began to suffer for lack of food. They ate the grass down so closely that much of it was killed.

The rainwater, instead of feeding the springs, now ran swiftly away. The clear, steady rivers turned to muddy floods during the rainy season. They swept through the valleys, washing away houses and crops. In the summer they dried up so that the fish died.

When these people at last discovered their mistake, they strove by hard labor to repair the damage which they had done through years of ignorance and greed. This was such slow, difficult work that the land still remains a dreary place in which to live. It is known as the Land of the Poor People.

CHAPTER SIX

WHAT THE MUDDY RIVULET HAS TO SAY

WOULD you like to know something about what I am doing? Would you like to know why my waters are yellow with mud? I am accused of being a noisy, roistering fellow, of robbing people of their wealth and of doing all sorts of wicked deeds. But, worst of all, I am accused of carrying away the tiny particles of soil in which the plants find their food and of dropping them in the depths of the sea.

Perhaps, when you really understand my work, you will say that I have no evil intentions at all. I am only one of Nature's servants. Each one of us has a work to do. Sometimes we have to do things that seem to be bad, but that is because some one on the earth has broken Nature's laws.

Nature has many servants. To each one of us is given a different kind of work. I am the great leveler of the land. No mountain is too great or too high for me to tear down. I can carry it all away grain by grain and leave it in the lowlands or in the sea. Many mountains I have destroyed so completely that you would hardly believe they ever existed. Long before there were any animals and men on the earth I was busy, and I shall be busy when they are all gone.

The farmer believes me his enemy, but if I do injure his fields it is because I cannot help it. The work that has been given me to do is the carrying away of the loose earth wherever I can find it. If the farmer does not want his hillsides made poor, he should take care of them.

The farmer does not know that he has me to thank for

H. W. Fairbanks

Because some farmer was careless, a rivulet has nearly destroyed this rich valley.

the richest of his lands, those lands where the soil is deep and dark and filled with plant food. I and my brother rivulets have been thousands of years in collecting the soil which forms the fertile lowlands in the valleys through which we flow. We all unite to form the mighty river which finally ends in the sea.

Upon all the slopes which drain toward the river we rivulets are at work. Other servants of Nature are working here. Some of them are making the rocks soften and fall apart. Others are bringing seeds of the grasses and trees that they may take root in the crumbling rock. It is their business to make a carpet of plants over the earth and thus stop my work. But wherever the slopes are steep we rivulets have our way. We pick up and carry away the particles of sand and clay so that only the bare, hard rocks remain.

When the steep slopes become gentle, and we can no longer carry away all the particles of crumbled rock, then the carpet of plants spreads over the surface. Now our

waters become clear. We seem like different beings. Once in a while, when the rains fall very heavily, some of us break through the protecting carpet and dig great hollows and gullies into the earth.

Would you like to know how we rivulets get rid of the load we carry from the mountain slopes? When we are muddy and swollen with the heavy rains, we turn the river into a flood. The river then breaks its banks and spreads out over all the lowlands along its course. Now the river flows more slowly and drops a part of the sand and mud which we rivulets brought to it. Finally, when the storm is over and the river goes back into its channel, there is left on the surface of the valleys a layer of earth rich in plant food. We brought the river the finest of the rock particles, together with the leaves and stems of plants that lay in our way.

As year after year we made the river overflow, the soil of the lowlands grew deeper and deeper until it became as

H. W. Fairbanks

The rivulets have united to form the broad, shallow river loaded with the soil from the farms along its upper course.

U. S. Office of Farm Management

The soil of this valley has been washed to its present location by flood waters.

you see it today. Now the slopes about the head of the river are not so steep as they were once. Our waters do not run away so rapidly and the river seldom overflows. Thus the farmer can use the land for his crops, which grow so luxuriantly that he is envied by his less fortunate neighbors who live upon the hills.

Upon the slopes about the valleys we rivulets did not leave so much soil. The farther one goes up the slopes the thinner one finds the soil, until at the top the bare rock may appear.

But our work, says the muddy rivulet, was not finished with the making of the fertile valley lands. We carried a part of our load of sand and mud on to the mouth of the river. Here in the bay into which the river empties we began another great task. It seemed hopeless at first to try to turn the bay into dry land, but year after year we kept at work, through a time so long that I have forgotten when we began. At last we succeeded in bringing so much material to the bay that the waters became

shallow. Then the soft mud began to show itself when the water was low. At last the water was replaced by dry land, which appeared much like the lowlands which we had made along the river.

Now you who think we muddy rivulets do only harm see what we have accomplished. We have built a great delta of the richest land that extends away on every hand as level as a floor and almost as far as you can see. The soil of the delta is hundreds of feet deep and the richest to be found on the whole earth. It is on such river deltas that the first civilized men made their homes, and became rich and powerful.

Now I have told you what Nature has appointed the muddy rivulets to do. Is not the good that we do far greater than the harm? When we do harm it is because people have not learned how, or have not tried, to obey Nature's laws. If we make people poor, it is their own fault.

We still find much to do upon the earth. Nature is still making mountains which we have to tear down. We are still building deltas which will sometime be inhabited by rich and prosperous people. We do not willingly spoil the lands of the farmers on the hills and make them labor hard for a living.

In those happy lands where people understand Nature we rivulets have a different kind of work to do. We become pure and clear. We furnish a home for the fish, drink for the thirsty flocks, and a never-failing power to turn the mill wheels. Our waters are of service to every living thing.

CHAPTER SEVEN

HOW FAR WILL NATURE RESTORE HER WASTED GIFTS?

THE natural wealth of our country is its soil, water, forests, minerals, animal and bird life, and, finally, its climate and scenery.

Of all these, *climate* and *scenery* are the only ones which we can use and enjoy as much as we like without any danger of their ever failing us. The sun will shine through the blue sky, the winds will blow, and the storms will come just the same, no matter what we may do.

Did you ever think how long a time it has taken to make the wonderful world in which we live, and place upon it the mountains and valleys, lakes and oceans? Did you ever think how long a time it has taken to make the rocks and store away in them gold, silver, copper, and iron? Did you ever think how long a time it has taken to cover the rocks with soil, and spread over the surface the flowers and trees and to stock it with uncounted numbers of animals and birds?

Nature usually works very slowly, but she never rests. The earth and all things on its surface have always been changing, but changing so slowly that we do not ordinarily notice what is going on. When there is an earthquake, or a slide of rock on a mountain side, or an eruption of a volcano, we are astonished and often terrified.

Stories that have come down to us from the distant past tell us that the earth looked then much the same as it does now. If we could look away back to a time long before the first men lived, when even the animals and plants were

different from those around us, we should discover that the surface of the earth was quite different from that of today. We should then see mountains and hills where now we find valleys, and dry land where now lies the blue ocean.

Nature has been such a long time making the beautiful world in which we live, that we ought to treat it with great consideration. It is also a wise thing for us to be heedful of her requests, for, if we will work with her, the earth with all its treasures will be at our command.

Shall we not now seek to learn which of the natural resources of our land will never be replaced if we squander them? Let us also learn which may be made good again by Nature, if we are willing to wait long enough, as well as to assist her in her slow work.

Each year the growing plants take certain substances from the soil. It is necessary for us to put back like substances if we would keep up the fertility of the soil. If we are neglectful of this law, or allow water to wash the soil away until only the bare rocks remain, poverty will be our lot for many years.

Nature will, however, if we give her a chance, renew the soil. The rocks will crumble and, by and by, seeds will sprout and tiny plants obtain a foothold. But it may take a whole lifetime, or hundreds of years, even, for a new and fertile soil to come again.

During the early years of placer mining in California thousands of acres of rich lands in the foothills were destroyed. Only boulders were left. Now fifty years have passed and a new soil is being formed, but it will be a long time yet before it will be as good as it was in the first place.

Upon the Western prairies only grain has been raised for

H. W. Fairbanks

The miner in his search for gold ruins the beautiful valley, leaving it a mass of boulders.

so many years that in many places the soil will scarcely grow a crop worth gathering. Many farmers have never thought of this, but the wise ones understand that they must frequently add plant food to the soil to replace that taken by crops. They understand also that it is a good thing to change the crops grown upon any particular field from year to year, since different plants take different substances from the soil.

Water goes through a ceaseless round. It rises from the sea and lakes to form the clouds, falls as rain or snow, and then flows back down the slopes to the sea. Although we have learned that we cannot change the quantity of rain that falls in any place, we can influence the way in which it runs back to the sea. This in turn affects the lives of people. We can store water in reservoirs, and by building canals have it to use on the land during the summer. We

can also keep it from flowing back to the sea as rapidly as it otherwise would, by leaving uninjured the covering of vegetation which has been spread over the mountain slopes. The water will run from bare rocks and bare soil much more quickly than it will from soil that is covered with leaf mold and held by plant roots. Do you not see, then, that we have almost as much control over water and its distribution as though we could increase or decrease the rainfall?

What about the forests? If we cut them down, will they ever come back? All through the eastern part of our country and in the mountains of the West are lands once forested which have been cleared and turned into farms. Many of these farms, when abandoned, have in a few years been covered with a growth of young trees. The scattering trees that had been left in the vicinity of the clearings furnished the seed. The winds and the birds carried the seed to the open fields and so the forests began again.

It will be hundreds of years before the trees are as large

H. W. Fairbanks

But Nature, after a lapse of fifty years, has spread a new carpet of soil over the valley.

George J. Young

Uncle Sam has preserved both forests and water power.

and valuable as those of the first forest. The "big trees" of the Sierra Nevada Mountains are found nowhere else in the world, for they are the last of their race. Some of these trees are more than 4000 years old. They stood here when our forefathers were still savages and lived in trees or caves. Much of the region where these trees are found has now been reserved as a park. If the lumberman had been allowed to get at them, they would have soon been gone forever.

It is far more difficult to destroy completely most of the species of forest trees than it is to destroy the species of animals and birds. We can cut down the trees and in some cases they will grow again from sprouts. Many will hide away in remote places and furnish seed for new forests.

The animals as well as the plants have had a long history. They have had a harder struggle than the plants, because many of them prey upon one another. We often dig up the skeletons of strange animals unlike any now living. These must have all been killed long ago. Each species or kind of animal now living must have come off victorious in the struggle with its enemies.

Does it not seem a heartless thing for us, who call ourselves civilized, to destroy so completely any species of animal or plant that not one of its kind remains alive? No species which we destroy will ever come back again, and its place will always remain empty. There are a few predatory animals and birds that destroy vast numbers of useful ones. We should keep these in check by every means in our power, but for our thoughtless destruction of the valuable ones the world will always be poorer.

What of the mineral treasures hidden away in the earth?

Will these be replaced when once they have all been used up? It took Nature a very long time to make coal out of the vegetation which had gathered in some ancient swamp. It took her fully as long to make the oil and gas from the bodies of the little organisms that once lived in the sea.

The bodies of the little creatures from which oil is made are still gathering upon the bottom of the sea, and there are many swamps where we find vegetation and peat accumulating. But it is a long story from these substances to oil and coal. I am afraid we should get tired of waiting for Nature to make a new supply.

Gold, silver, copper, and other minerals, so useful to us, are found in very small quantities scattered throughout most of the solid rocks of the earth. It would be impossible for us to obtain these from rocks, because there is so little in any one place. But Nature has collected a part of them in veins in the rocks. We sink shafts upon these veins and mine the ores. It will be a long time before we shall have mined all there is of these minerals. Because they are so hard to get we are not likely to waste them. But it is quite certain that there is a limit to the supply of mineral treasures, and equally certain that they can be renewed either very, very slowly, or not at all. Shall we cause our remote descendants to suffer for our carelessness?

CHAPTER EIGHT

THE SOIL — THE MOST IMPORTANT GIFT OF NATURE

An ancient story tells us that men were made from the dust of the earth. This dust under our feet, which soils our shoes, this dust which the wind sometimes sweeps along in blinding clouds, is indeed precious. The delicate tissues of our bodies are made from the food we eat. If it be plant food, it comes directly from the soil. If it be meat or eggs or milk, it comes from animals which live upon the plants, that in turn got their nourishment from the soil.

This soft, dark substance which covers the rocky skeleton of the earth we call the *soil*. How common and cheap it looks when it is placed by the side of a piece of gold! But how much more wonderful it would seem if we could know all about it. The soil is far more necessary to our comfort and prosperity than gold. Gold, silver, or precious stones cannot keep us alive. They are of little worth to us compared with food and clothing. The soil, then, is the real wealth of the world. The farmer, who tills the soil, is the one worker we could not possibly do without. All the wealth of the world, all the comforts which we have, all the luxuries brought from far corners of the earth, come in the first place from the soil.

We do not have to journey far over the earth to learn that there are many lands where the fields are not fruitful, and yet such lands are often rich and prosperous. How can this be if the soil is so necessary? Let us go to New England and ask the people living there if they can tell us why rich people sometimes inhabit lands which do not raise enough for them to eat.

H. W. Fairbanks

These jagged rocks are formed of once molten lava. By and by they will crumble and be covered with a layer of soil.

Much of New England is hilly and has a poor, rocky soil. The farmers who first settled there toiled hard, working early and late, and yet got few of the comforts of life. Most of the farmers did not know how to improve the soil or even to keep it in as good condition as it was when they first cleared away the forests and began cultivating it; so many left their farms to seek a living elsewhere. There are now many abandoned farms that are growing up to forests again.

In spite of this poor land, the New England states form one of the most wealthy and prosperous parts of our country. There are many great cities containing hundreds of thousands of people in this territory. The inhabitants enjoy luxuries of every kind sent from all parts of the world. The farmers of New England certainly do not produce this wealth from their rocky soil. Where, then, does it come from?

Industries of almost every sort except farming are carried on in the cities of New England. All these people have to be fed and the farms of this region would hardly support

them even if the soil were very productive. So much food is needed every day that if the supply were cut off for only a short time, there would be great suffering.

Somewhere there must be farmers at work raising food supplies for the people of the great cities. The many beautiful and wonderful things made by the workers in the cities must be exchanged with the farmers for the real necessities of life.

Somewhere there must be vast fertile fields which produce much more than their owners require. We will journey westward to the prairies of the Mississippi Valley. Here for hundreds of miles we can see hardly anything but fields of waving wheat and corn. Here are hundreds of granaries and flour mills. Upon the rivers and lakes there are many boats, and upon the land railroads, all carrying flour and other farm products to feed the people of New England. Here are great stock ranches with thousands of cattle and hogs, which, when fattened upon the grain, are also shipped to New England to help feed the people there.

A field of wheat on one of the Western prairies.

We must conclude, then, that if it were not for the vast fields with their deep, rich soil, where the farmers are able to grow much more than they need for themselves, it would not be possible for the people of New England to become wealthy by working at other things than farming. The articles which they are making add to their own comfort and pleasure as well as to that of the farmers, but they have to have the products of the soil to keep alive.

If the farmers of the Mississippi Valley and of all the other valleys that help support the city people are careful of their soil and keep up its fertility, our country will remain prosperous. But we are sorry to say that the farmers have not always been careful. Many have wanted to make more than they should from their lands. The plant food with which Nature has filled the soil has been taken away year after year faster than she has been able to renew it. Many fields do not produce the crops they once did. The smaller the yield becomes, the higher the prices the produce brings. This makes it more difficult for the workers in the cities to live comfortably. The less abundant the supply of food becomes, the less prosperous is the country.

There are countries, such as England, that have neglected agriculture but have, in spite of this, become rich and powerful through devoting their time to manufacturing articles to sell to other people. But those who work in the factories of England have to be fed, and so they must depend upon other countries to supply much of their food. If, for any reason, they were cut off from trade with these countries, not only would their manufacturing be ruined, but they would be in danger of starvation.

To the first men, who lived entirely upon hunting and

H. W. Fairbanks

At the top of the bank we see a layer of dark, rich soil.

fishing, the soil was of little consequence. Now things are different. The wild game has mostly gone and we have to depend upon the products of the soil.

The people of those lands where the climate is unfavorable and the soil poor and rocky lack most of the comforts of life, unless they are able to obtain them through trade. It does not follow, however, that people living in lands favored by Nature are always happy and prosperous.

You must remember that when the first men increased in numbers over the earth, the soil was fresh from the hand of Nature. Although they had everything about them that could be asked for, yet they were poor. There are men living today on the rich deltas that we have learned about who have few of the comforts that we have. This is because they are lazy and ignorant, and do not make proper use of this valuable gift, the rich soil.

We conclude, then, that the soil forms the real wealth of the world. All our comforts and luxuries come in the first place, as we have seen, from the soil. The more crowded people become upon the earth, and the greater the number that engage in manufacturing and trade, the more important becomes the care and cultivation of the soil. If we do not take the best of care of the soil, there may come a time when there will not be food enough for us all.

CHAPTER NINE

THINGS OF WHICH SOIL IS MADE

LET us take a spadeful of soft, dark earth from the garden and see if we can find of what it is made.

We will first put the earth in a dish of water and stir it thoroughly. We notice that the water at once becomes muddy and that little particles of a dark substance rise to the surface. These particles appear to be pieces of stems and leaves.

This crumbling vegetation is *peat*, a substance which fills many swamps and, when cut into blocks and dried, is used for fuel. When scattered through the earth peat has a very different use. As the leaves and stems of plants die and slowly mingle with the earth, they give it the dark color, which usually extends down for two or three feet. As this vegetation changes, or decays, as we usually say, it furnishes a number of substances which supply food to the roots of growing plants. One of the most important of these is *nitrogen*, an invisible gas.

The decaying vegetation which we find mixed with the soil has other uses. It holds water and so helps to keep the soil moist. It makes the soil loose and more easy to cultivate. It absorbs heat from the sun and so helps to warm the soil. This vegetable matter, when it is completely decayed, we call *humus*. Soils that are rich in humus are usually very fertile.

We will now turn the muddy water into another dish, pour more clear water upon the material that remains in the bottom of the dish, and wash it again, repeating the work until the water is no longer muddied. We will set

aside the dish containing the muddy water and examine what remains in the bottom of the dish that once contained the earth or soil. This is mostly sand, but with it are rough fragments of rock which can be crumbled in the hand. The greater number of the little sand grains are *quartz.* Some of them are clear like glass, others are reddish. In this quartz sand are a few grains of *iron* which the magnet picks out, and a number of scales of yellow *mica.*

After standing a few hours the muddy water has become clear, and a deposit of a yellowish substance has collected in the bottom of the dish. We will carefully pour off the water and examine what remains. This fine soft mud we call *clay.* As it dries and becomes hard it shrinks and cracks, and thus breaks up into little pieces. Clay forms a greater or lesser part of all soil. Clay soil is very sticky when it is wet, as you will be sure to remember if you have tried to walk over it. When soil is formed largely of clay we speak of it as a *heavy soil.* In the West it is called *adobe* and is sometimes used in making houses. When adobe soil dries, great cracks form in it. These cracks are sometimes large enough for small animals to fall into. When there is a large amount of sand, we speak of the soil as *light* or *sandy.* A soil composed of sand and clay is sometimes called *loam.* If it is nearly all clay it is a *clay loam;* if there is much sand it is a *sandy loam.*

Soils found in low, swampy places are sometimes formed almost wholly of decaying vegetable matter. Such soils are known as *peat soils.* They are usually very fertile.

We have now learned about three things that the soil contains that are bulky and easy to discover: decaying vegetation, sand, and clay. These are, however, far from

being all that compose the soil. There are still many other things, some of which are invisible to the unaided eye and difficult to find.

We will next take the clear water that remained after the mud settled. We will pour it into a dish, place the dish over a fire, and let the water boil slowly until it has all evaporated. There will remain in the bottom of the dish a thin white coating. Moisten this with a drop of vinegar or other weak acid and it will disappear in a mass of little bubbles. Such behavior teaches us that the white substance is probably a mixture of *lime* and *soda*. Besides these there are tiny particles of *potash* and *phosphorus*, which we cannot distinguish by the means we have used.

Some soils contain a great deal of lime, and because they have been formed from limestone, are called *limestone soils*. Plants need a little soda, but when there is much in the soil it will kill them. Soils rich in soda are known as *alkali soils*. They were formed in the bottom of lakes the waters of which contained soda. Salt is another harmful thing found in the soil. You can sometimes see faint whitish deposits of soda and other salts on the soil in flower pots.

There is one more thing that the soil contains that we must not forget, for it is one of the most important of them all. This is a living organism so small that we cannot see it with the unaided eye. Many thousands of these organisms are contained in a bit of earth such as you could take up on the point of a small knife blade. We have named them *bacteria*.

Plants cannot make use of most of the substances in the soil without the aid of these organisms. The bacteria live

upon the materials of the soil and change them into such form that plants can digest them.

Soil may be supplied with all kinds of plant food in just the right amount and yet, if it is packed hard and is not watered, no living thing can take root in it and grow. Plants drink their food and so we must supply water. They also require oxygen, as do other living things. For this reason we must leave the soil loose, so that the air can enter it and the roots get the oxygen which it contains.

Thus we learn how wonderfully the soil is made. We learn that it contains many things required by plants. In order that the plants may be thrifty, there must be enough but not too much of these different things.

CHAPTER TEN

HOW THE SOIL IS MADE

THE substances which we found in the soil teach us that it was formed from the rocks. If we could take the sand, clay, potash, soda, lime, and iron that we found in the soil and put them together as Nature knows how to do, we should have rock again.

But if we should take a piece of rock and crush it to a fine sand, that would not be soil, because soil cannot be made in that way. It takes Nature many, many years, as the rocks slowly crumble and decay, to change the materials of which they are composed into true soil with its swarms of bacteria and its plant food.

If we should dig down through the soft earth under our feet, we would at last come to solid rock. This is the rough and jagged crust of the earth on which rests the carpet of soil. In the mountains where the slopes are steep the rocks stick up through the soil. The outer parts of this solid rock are, however, always crumbling. Little particles, as soon as they become loosened, either fall by their own weight or are washed away. Some of the rock fragments collect upon the gentler slopes and finally turn to soil. This soil is not rich and it dries out quickly, because it is shallow. The soil in the valleys, as we have already learned from the muddy rivulet, is deep and rich.

Nature is slowly spreading her mantle of soil over the earth. In some parts of the earth one can travel for hundreds of miles and see no rocks. One might think that in time Nature's work would be finished. But before the mountains in one place have crumbled and been washed

H. W. Fairbanks

Little by little the great rocks break in pieces and crumble finally to form soil.

away, she raises up new ones somewhere else so that the tearing-down work begins again.

Let us, in imagination, sit down by the side of a rock, prepared to stay there many years, that we may learn just how Nature makes the soil. It will be a long, long time before we can see any change in the rock. Each bright day the sun warms the cold rock and makes it expand a very little. At night the rock grows cold and shrinks. In this way minute crevices are finally formed between the grains of the different minerals that make up the rock.

When it rains, water creeps into the tiny crevices. The water carries with it a little carbonic acid which the raindrops took from the air. This substance aids in dissolving some of the rock materials. If the nights are very cold, the water in the crevices freezes and opens them a little wider, for ice, as you know, takes up a little more room than it did when it was water.

Plants also aid in breaking the rock. Often seeds are dropped by the wind, and the rootlets of some of these seeds, when they sprout, may find a crevice large enough and deep enough for them to push their way into the rock. In these crevices they find a little food and slowly grow larger and stronger. By and by some of the roots are strong enough to push apart large pieces of rock.

If the rock which we are studying is granite, we shall after a time be able to pick out the different minerals of which it is composed. We can tell the grains of quartz, because they look glassy and remain very hard. Other grains, which we call *feldspar*, soften and change into clay, which makes the water muddy as it runs over the rocks. We see also little scales of yellow mica, sometimes called "fool's gold," and a few grains of iron. There are tiny quantities of other things which we shall not be able to see, for the rainwater dissolves them and carries them away.

As the rock slowly crumbles to sand and clay, the bacteria begin to make their home in it. Hardy plants, that are not particular about what they grow in, get a foothold, and when they die their stems and leaves decay and mix with the rock particles until at last this material begins to look like soil. It has become dark in color and rich in plant food. Then, many other plants that require a good soil take root there. The rock has at last completely disappeared under the layer of soil and its carpet of vegetation.

Suppose, now, that we dig down and find how deep the soil is and what lies below it. When we have gone down two feet the soil is harder and of a lighter color, for there are

fewer plant remains in it. This poorer, lighter-colored soil we call *subsoil.* If we dig a little deeper, we shall find pieces of rock in the subsoil. Below these we come to soft, crumbling rock and last of all the solid rock.

The soil that is found resting on the rocks from which it was formed is known as *residual soil.* This name is given to such soil, because it is what remains after long years of rock decay during which the rains have washed away a part of the finer material.

What has become of the soft earth that the water washed away? The muddy rivulet has already told us its interesting story. We have learned that a part of this earth (or soil) is borne to the distant ocean. There it is forever lost unless the sea bottom should some day become dry land. Stranger things than that have happened on this ancient earth of ours. The part of the soil which the water carried away to form the rich valley lands and deltas is known as *alluvial soil.*

Long ago the northern part of our country was covered

U. S. Department of Agriculture

A flood plain, where alluvial soil has been deposited by the river.

U. S. Geological Survey

Soil brought by a glacier and deposited as the ice melted.

with a sheet of ice. This ice crept slowly southward, and as it moved along it tore off all the soil and loose rocks on the surface of the earth over which it passed. When it melted it left them spread roughly over the country. Such material forms *glacial soil.* It is often deep but not very rich.

There is another kind of soil, formed by the wind. If you have ever been in a dust storm you have seen the fine, powdery substance that settles over everything and creeps into the smallest cracks. In some countries where there are strong winds and not much rain there is little vegetation on the surface to hold the soil. Year after year the winds pick up particles of the dusty soil, whirl them high in the air, and do not let them down again until they have been carried many miles. In some far-off land where the winds go down the dust particles settle again to the earth. After a long, long time, enough dust collects to form a thick

layer of the richest soil. This is called *æolian soil*, from the word *Æolus*, meaning the "wind."

There is one more kind of soil which we ought to know about; that is *peat soil*. It is found in marshy or swampy lowlands and is formed largely of plant remains. When lands with such soil are drained, they prove very rich.

CHAPTER ELEVEN

HOW VEGETATION HOLDS THE SOIL

H. W. Fairbanks

What the rivulets did to the hillside pastures where the grass was destroyed.

A WALK up the mountains on a rainy day is not a pleasant one. There are mud and water under our feet, and overhead are the dripping branches which, if touched, send down a shower of drops. But if we keep our eyes open we shall learn something which will be of great value to us. We shall learn how it is that Nature holds the soil on the slopes — the wonderful soil which it takes her so long a time to make and which is the source of all our wealth.

Our way up the mountains is by a winding road. We first pass the foothills upon which there are scattered oaks. The rain is steadily pouring down and rivulets loaded with mud are eating little gullies all over the slopes. Along the roadside, where they have united, the rivulets form a torrent which is making a deep ditch that threatens to render the road impassable.

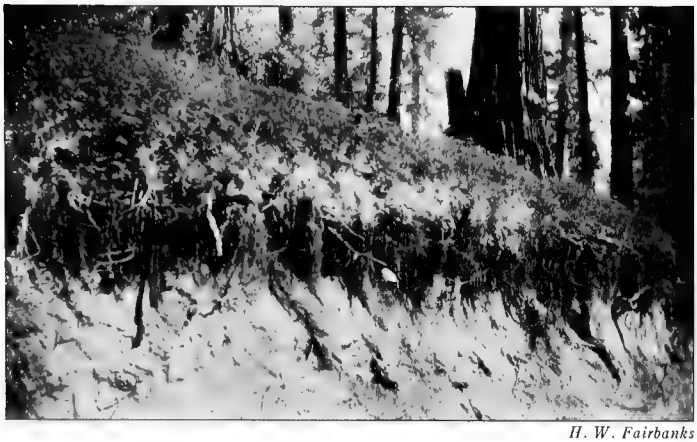
These slopes were once covered with grass and the rivulets ran down them without doing any harm. But so many sheep were pastured here that the grass was killed. The roots, which once formed a thick protecting sod, are now decaying. How quickly the rivulets have taken advantage of the unprotected slopes!

The road leads still upward until it brings us to where there were once pine forests. The lumbermen cut off all the trees, and then fire came and burned the decaying vegetation which once lay spread over the ground. Now all that remains is bare earth and blackened stumps.

What are the raindrops doing here? They gather in rivulets just as they do on the once grassy hillside; but because there are so many roots still remaining in the ground they have not done much work. They are not loitering, however, and by and by, when the roots have rotted, they will seize their chance and begin tearing away the soil from the mountain side.

But this is not the end of the road. Farther up we come to the primeval forests, where the giant trees stand just as they did before men came. Here we can see how the slopes are protected, for in making the road the workmen cut deep into the hillside. They first removed a layer of pine needles and decaying branches. Then they cut through a layer of soil about two feet thick which was completely filled with little roots of trees and bushes. Below this they came to the soft subsoil, which contained only a few roots, and at the bottom they reached the solid rock.

The layer of roots and soil at the top of the bank, you can see from the picture, now overhangs the road, because the raindrops which beat against the bank have washed away



H. W. Fairbanks

The layer of roots holds the soil on the mountain side.

all that they could reach of the unprotected earth at the bottom. How plainly we can see the network of roots. What a hard task it must be for the water to get at the soil in which these roots are growing.

We will now leave the road and, although it is still raining hard, we will walk a distance through the forest and see if there is anything more that we can learn. We are soon in the deep woods where, perhaps, no one has ever been before. Around us are trees of all ages and sizes, from little seedlings to great giants six feet through. Among them are the crumbling stumps of trees long dead. Their trunks lie on the ground, and many are so soft and rotten that we can kick them to pieces with our feet.

As we walk our feet never touch the real earth. It is always on the soft, yielding leaves and crumbling branches that we step. These leaves and branches form a thick layer completely hiding the soil. But the strangest thing

H. W. Fairbanks

The roots of the tree grip the soil like the fingers of a great hand.

is that, although the rain is still falling, we can discover no rivulets. What, then, becomes of the water? The soft, decaying vegetation on which we are walking and the rotting stumps and logs act like a great sponge. As long as this sponge can take up the falling drops, none have a chance to run away. If it rains a very long time and the sponge becomes saturated, the drops that creep away and finally unite in rivulets in the hollows do no harm to the soil, for they cannot get at it.

Long after the storm has passed, the earth underneath the trees remains wet, while the ground out in the open has become dry. A part of the water held by the decaying vegetation evaporates. Another part creeps down through the earth to the crevices in the rocks and feeds the springs.

Let us now put aside our storm clothes and journey, in imagination, far away to where it seldom rains — to that land which we call the desert. Here the bare rocks of the mountain slopes are burned brown by the hot sun. Here there is little soil and only a few little bushes that somehow manage to live. Why does not the soil gather over the rocks as it does in other places? The rocks are surely crumbling, for we can crush some of the pieces in our hands.

Once in a long time it rains in this desert. Then the drops descend furiously. The water gathers in rivulets and these turn to torrents which sweep down the slopes.

They carry away the particles of sand and clay which would in time, if there were plant roots to hold them, turn to soil.

The winds also help keep the desert rocks bare and free of soil. Have you ever been in a dust storm or have you read of caravans caught in such storms in the Sahara Desert? The fierce wind picks up the particles of sand and clay from the bare earth and sweeps them along as it does the snow in winter, or it whirls them in clouds high in the air. The dust clouds are often so dense that they hide the sun and all landmarks by which the traveler can guide his way. But have any of us ever seen the winds pick up much dust from the green fields where the vegetation protects the surface?

If we turn now to a very wet country, such as that upon our northwest coast, where often nearly eight feet of rain falls in a year, we shall find the vegetation so dense that it hides both soil and rocks. Here water can do little in

H. W. Fairbanks

The vegetation prevents the wind from blowing the sand away, so that wherever the roots obtain a hold there a little mound is formed.

wearing away the soil, even upon the steepest slopes, while the wind cannot get a peep at the earth.

Does it not seem strange that where little rain falls the earth washes a great deal faster than where it rains very heavily? The reason is that the more it rains the more dense becomes the carpet of vegetation. If we wish to preserve the soil, we must preserve the natural growth on the hillsides.

CHAPTER TWELVE

WHAT HAPPENS WHERE THERE IS NO PROTECTING CARPET OF VEGETATION

Not all of the muddy streams are due to the carelessness of men. It is the business of some of the servants of Nature, as we have already learned, to tear down the mountains and fill up the hollows in the earth. It is the business of others to spread a carpet of vegetation over the surface, and wherever they have already succeeded in their work the waters run clear most of the time.

Where it is dry so much of the time that few plants can live, the destructive servants have their own way when the occasional rains come. Where there is a warm sun and frequent rains, a green carpet is spread over all the slopes. But when men destroy the carpet and take no care of the soil underneath, the raindrops are able to do as much damage as they do during the cloudbursts in the deserts.

The Colorado is one of those rivers in the basin of which few people live. Much of its journey is through a land in which there is little vegetation. Here, the waters from the melting snows upon the lofty mountains about the basin and those of the occasional heavy rains have things their own way. They are always yellow with mud. The amount of mud which this river carries has been measured. You will hardly believe me when I tell you that it amounts to sixty-one million tons every year. This is enough to cover 164 square miles one foot deep. We might call this the cream of the soil from all the slopes of the great basin of the Colorado River.

In other parts of our land, where abundant rains fall,

H. W. Fairbanks

The roots of the tree form a wonderful network underground from which the water cannot tear the soil.

the streams tell a different story. Before men came the water of these streams was clear throughout the greater part of the year. It was only when the rains were very heavy that the soil washed away, for the vegetation held it well. Now the gullies on the hillsides and along the roads tell us as plainly as though they could speak that our country is losing wealth here.

The soil is our most valuable possession. The people of many lands are suffering from poverty today because their forefathers did not take care of the soil as they should. In such lands the people who live on the mountain sides are poor, because the best of their soil has been washed away. Those who live in the valleys are often poor because of the sands and gravels which floods have spread over their fertile fields.

While it is raining, let us fill a bottle from some muddy

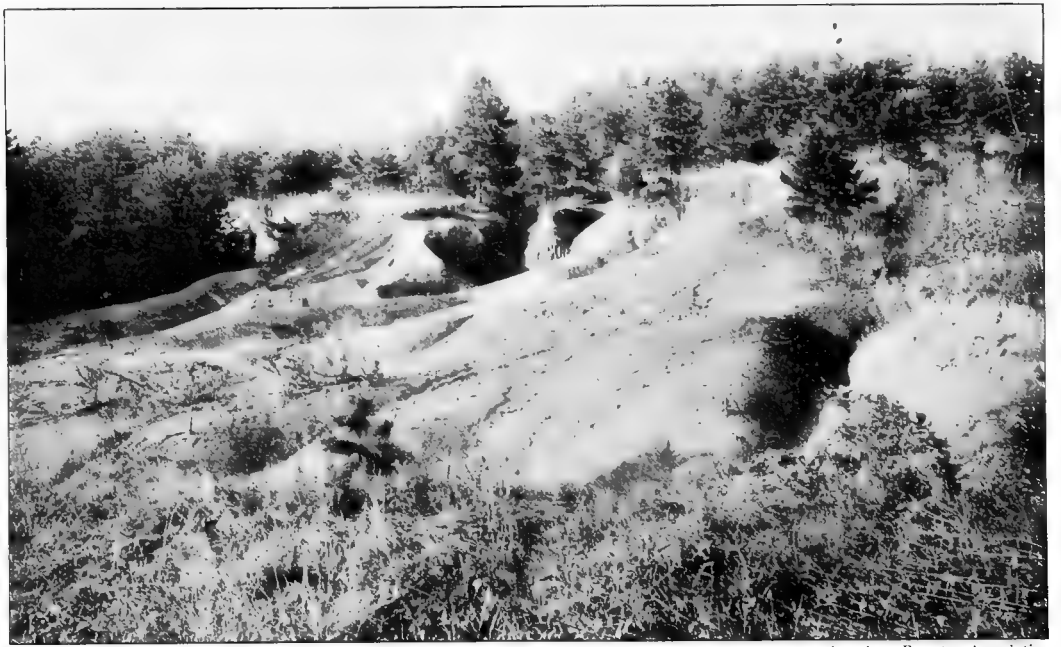
stream and allow it to stand until the water settles. In the bottom will then appear a layer of fine mud, or *silt* as it is usually called. How much soil do you suppose the rivulets washed from my garden and from yours during the last severe storm? How much do you suppose all the rivulets which make up the rivers of your state washed from all the gardens and fields during the same storm? Make a guess and then multiply your answer by the number of storms in one year and that by fifty years, and you will get a quantity greater than you would believe possible.

This is the way Nature takes her toll for our carelessness. So quietly does she do it that often the farmer does not have any idea of what is happening. She is like a thief that comes and steals his goods while he is sleeping.

When the farmer finally awakes and begins to wonder why his crops grow smaller each year, he has already lost

Bailey Willis

The soil on the hillsides of China is being washed away because of the thoughtlessness of the people.



American Forestry Association

The farmer who owns this land will soon be made poor because of his carelessness in destroying the covering of the soil.

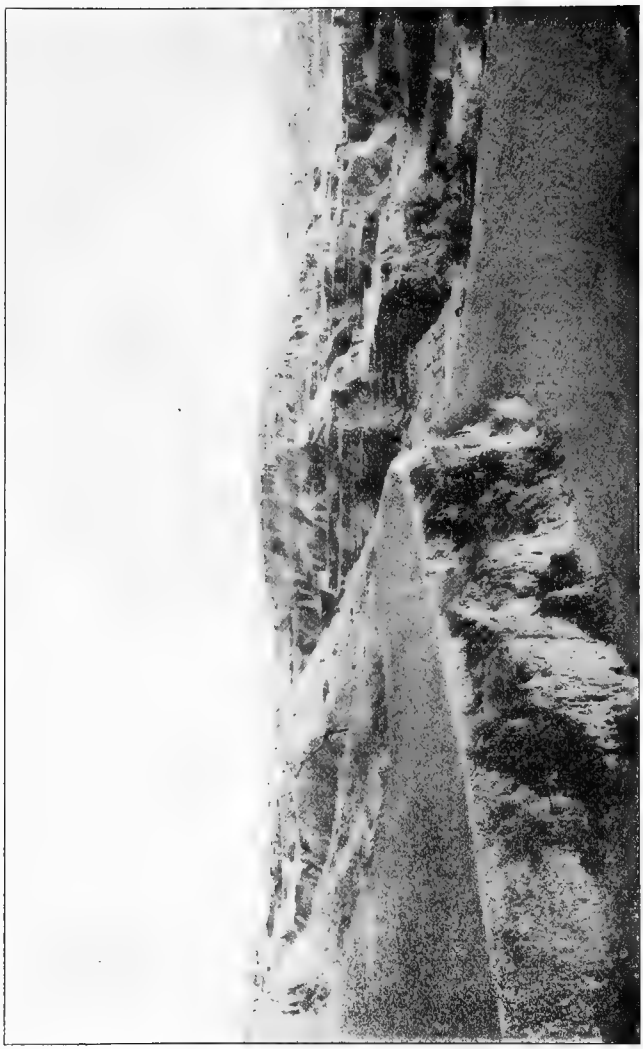
the cream of his soil. He must at once stop plowing the steep hillsides and leaving the ground bare for the winter rains to wash it away. To save the slopes he can either terrace them or he can sow grass or clover, which will form a sod and hold the soil. If the farmer can get peas, beans, alfalfa, or clover to grow upon his wasted lands, they will make it fertile again, for these plants have the wonderful power of taking nitrogen from the air and storing it in the soil.

More earth has been washed from the hillsides of our country during the last fifty years than during thousands of years before white people came. The farm lands have been injured, the bays have been made shallower, and many river channels have been so filled up that it is more difficult to navigate them now than it was in the early days.

The farmer, the stockman, the lumberman, and the miner has each been selfishly doing his share in the destruction of the soil. Each one has thought only of how he could make the most money in the shortest time. It has not occurred to them that they are making it difficult for their children and grandchildren to live.

In the Southern states thousands of acres are being gullied by the rains, and the soil destroyed. The floods of spring have become worse in late years, because of the destruction of the forest cover in the Appalachian Mountains. Buildings and bridges are frequently carried away, and gravel and boulders are washed over the rich bottom lands.

In the mountains of far-away Italy the soil is poor, and so are the people. They have cut down nearly all the trees and for hundreds of years the brush and grass have been eaten so closely by the sheep and goats that few roots



U. S. Forest Service

Terraces of rock built by natives of China to aid in holding the soil.

remain to hold the soil. It does not need to rain heavily there to cause the rivers to become muddy and swollen. The soil which once covered the slopes has been carried to the bays, and now there is land where ships floated two thousand years ago.

In Spain so much of the best soil has been lost that the people now do not raise enough food to support themselves, and much has to be imported from other lands.

France is a rich country still, in spite of the cutting of so much of the forest and the careless pasturing of the mountain slopes. The people are industrious and hard working and thus make a living in spite of the loss which they are suffering.

The Montenegrins are among the bravest people of Europe, but their land is barren and they enjoy few luxuries. Their country consists largely of limestone mountains, from which they have been cutting the trees for hundreds of years. There is but little soil and that is to be found in the hollows of the rocks. This soil is so precious that every bit, be it ever so small, is carefully cultivated.

In the mountains of Palestine and Syria the people have so completely destroyed the trees and grasses which Nature once planted there that it is difficult for them to raise enough to live upon. The rivers are muddy after every rain, and even the water from the melting snows picks up some of the soil and flows away with a dirty, yellow color.

When we reach China and Korea, we find that there the people have been most severely punished for their carelessness. The mountain sides have been torn by the rains and deeply gullied. The once smooth slopes upon which grew trees and grasses are now a mass of sharp ridges and

deep hollows of bare earth. The water falling upon these mountains runs off in torrents, carrying even large boulders as it does in our Western deserts. Here and there the natives have built terraces of rock to aid in holding the soil, but many parts of the country are almost wholly deserted. The waters run off the mountains so quickly that they often form vast floods which spread over the lower valleys and plains. The floods destroy the crops and drown the people.

Eastward of China there is an arm of the Pacific Ocean known as the Yellow Sea. Why do you suppose this name was given to the sea? One of the great rivers of China, the Yangste-kiang, empties into it. The river rises in the barren mountains of which we have just been speaking, and it is continually bringing so much mud and sand that a whole sea is being filled. Long before a ship comes within sight of the land the waters are seen to be of a muddy, yellow color.

In the smaller valleys of Korea the natives build dikes along the rivers to keep the mountain floods from spreading sand and gravel over their rice fields. Every year they have to make the dikes higher as the river beds fill up.

Thus we see that all over the world people are suffering because they have not obeyed the laws which Nature has made for the protection of the soil.

CHAPTER THIRTEEN

THE USE AND CARE OF WATER

THE ocean is the home of the water. The water would always remain in the ocean if it could, but the sun and air are continually at work stealing little particles away and sending them on long journeys.

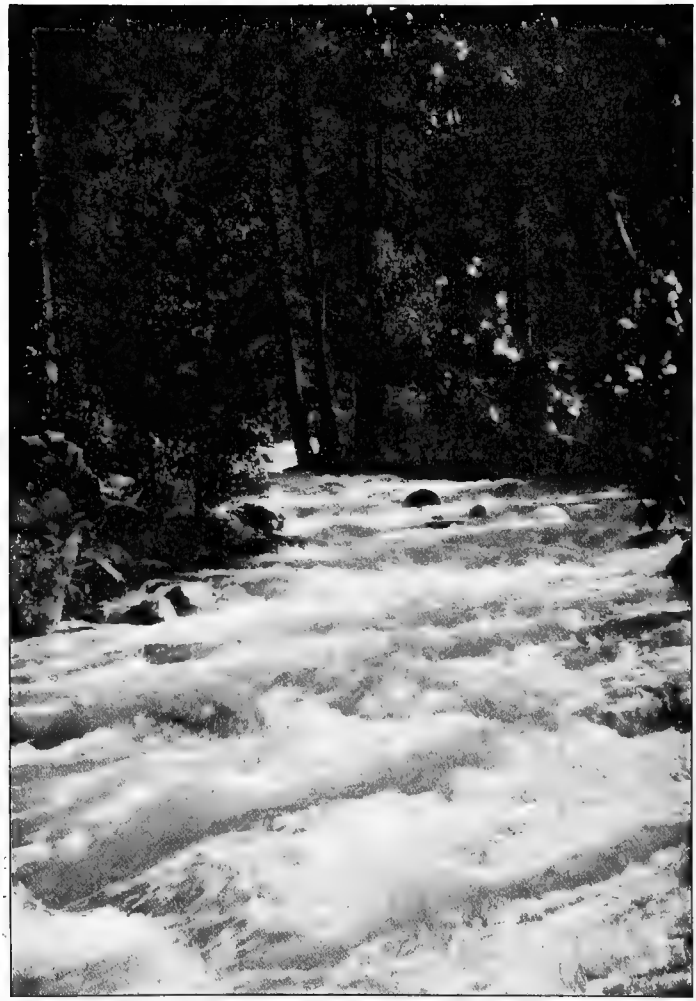
The water particles are so small as they rise from the ocean that we cannot see them. By and by they crowd together and make the clouds that float across the sky. As soon as the clouds meet colder air, the little water particles rush together and thus become larger and larger until they grow so heavy that they can no longer float in the air, but must fall. Some of them fall into the ocean again, but others drop upon the land.

The raindrops that reach the land have many sorts of stories to tell before they again get back to the ocean. Some of them are at once snatched up again and are started upon another journey. The thirsty air, whether over the ocean or over the land, is ever in search of water particles.

If the air is very cold, the clouds turn to snow instead of rain. The feathery flakes fall slowly through the air and form a soft white mantle over the earth. Those that fall on lofty mountains form great banks which may not entirely melt and turn to water until late in the summer.

The raindrops that fall where the slopes are steep, where Nature has grown little vegetation, or where men have destroyed the earth cover, have little to detain them and are soon on their way back to their home. In their hasty journey they do much damage to the unprotected soil.

If the drops fall upon gentle slopes, or where there are



George J. Young

The cool and shady stream before men came and cut the trees away so that the hot sun could get at it.

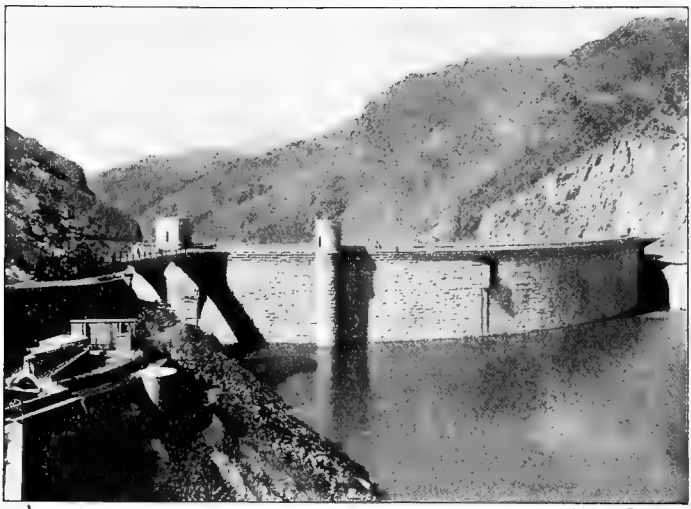
marshes and lakes, or upon the forest with its decaying vegetation, or upon deep beds of gravel and sand, they are a long time getting back to the ocean.

We can in no way change the amount of rain that falls upon any part of the earth. We cannot call up a storm when we wish it, nor can we send it away when there has been rain enough. But there are many ways in which we can hasten or delay the return of the water to the ocean. Nature shows us some of these. The spongelike carpet underneath the forest holds the water until it has had time to soak into the earth from which it later emerges as springs. Nature forms basins on the heads of the rivers where a part of the water, instead of immediately flowing away, collects in the form of lakes. From these lakes the water runs away slowly instead of in torrential floods.

Only a few places in our country have more rain than is really needed. One of these is the region about the mouth

H. W. Fairbanks

The rotting tree trunks take up the rainwater like a sponge.



Brown Brothers

The great Roosevelt Dam, in the Salt River irrigation project, Arizona.

of the Mississippi River upon the Gulf of Mexico. Another is upon the Northwest coast. Throughout the central part of the country the summer rains are sometimes too light to afford a full harvest. The rainfall upon the plains and valleys of the Southwest is so small that the only plants that can live there are those strange and curious forms that have become used to desert conditions. The only way in which these lands can be made useful to the farmer is by means of irrigation. To obtain water for irrigation we have either to go to the distant mountains and build reservoirs to collect the rains which fall there and then dig canals to carry the water to the desert valleys, or to make use of some river flowing through them, if they are fortunate enough to have such a river. Can you think of any rivers that are used in this way?

Although water sometimes seems the greatest blessing that we have, yet it may prove a curse if it is not looked after. If you give the water a chance to make gullies in your fields, you lose not only the water but the best of the soil also. If you cultivate your fields with care, most of the water will soak into the ground. If you are a wise farmer you know also that cultivation of the soil helps to hold the water, for it cannot escape through loose soil as it can through compact soil. Thus if you know how to handle both the water and the soil, you can, with only a little rain, accomplish a great deal.

We can, then, hold or *conserve* the water, first, by leaving the steeper slopes covered with vegetation; second, by keeping the soil loose; and, third, by building reservoirs to hold the floods. We can make use of the conserved water

Scene below an irrigation reservoir near Richfield, Idaho, showing a field irrigated by means of canals and ditches.

by carrying it in pipes or ditches to those regions where it is needed. We can get rid of too much water by draining the swamps, and building dikes to protect lowlands from river floods.

Let us now learn something of the different uses of water. Every one of our homes has its water supply. In the city the water comes through pipes from some distant reservoir. In the country the homes are so far apart that it is difficult to supply them in this way. The water in the streams is often not suitable for drinking, and if there are no springs near by it has to be obtained by some other means. Nearly everywhere in the earth under our feet water can be found by digging or boring a well. Sometimes we have to go only a few feet, at other times many hundreds of feet. This water in the earth, or *ground water*, is of very great importance. It enables us to build our homes where we wish. Spring water is that which finds its way to the surface through some tiny crack or fissure in the rocks. How delicious is the pure, cold water that comes out of the shady hollow in the hills! You can form in your minds a picture of the rain falling on some distant mountain, of its soaking into the ground and finally reaching the little crevices in the rocks. Along these crevices it may have crept for days and perhaps years until at last it found an outlet in some spring.

The great river flows by so quietly that we often forget in how many ways it is serving us. It serves not only those upon its banks but those who live hundreds of miles away and who, perhaps, have never seen it. It was the first and easiest means of travel used by our forefathers before there were any roads or railroads through the wilderness.

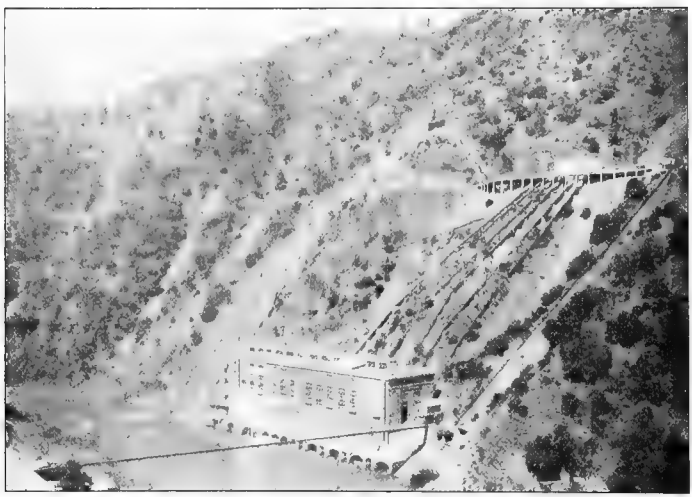
It now aids in carrying on trade between different regions. If large and deep enough, it permits boats from all parts of the world to reach the very heart of our country.

Canals might be called artificial rivers. They serve an important purpose in nearly level countries where Nature has placed no navigable river. Although canal boats usually move slowly, yet they can carry goods cheaper than railroads can. The Erie Canal, in connection with the Great Lakes and the Hudson River, makes it possible for us to go all the way by water from the heart of the continent to New York City. The Erie Canal has helped make New York City the greatest city in our country. The canal across the Isthmus of Panama saves ships a journey of many thousand miles around South America.

Rivers serve us in yet another way by affording water for irrigation. A great river like the Colorado flows through regions of many different climates. Some rivers become so small in the summer that it is necessary to build great reservoirs at their headwaters in order to insure a supply when the crops need it. But in the case of the Colorado this is not necessary. The headwaters of this river are among lofty mountains, where the melting snows and summer showers make the waters of the river higher in the early summer than at any other season of the year. Thus its great delta, the Colorado Desert, has become the home of many thousands of people.

Another use which we make of rivers is by putting the water to turning mill wheels. If you will turn to your geographies, you will find that nearly all the great manufacturing cities of our country have grown up around rapids or waterfalls, where some river tumbles over a ledge of rocks.

Once we had to build our mills close to the rivers to use the water power, but this is no longer necessary. Now we build electric-power plants by the rivers and carry electric energy more than a hundred miles to any place where we wish to use it. Electricity made from the distant mountain waterfall will do any kind of work for us wherever we carry it. Thus we see that the river works for us in more than one way. After it has created power for our factories, it can be turned on to the thirsty fields, where it will serve us equally well.



Great Western Power Company of California

Electric-power plant on north fork of the Feather River, California, for generating electricity which is carried to distant places.

CHAPTER FOURTEEN

COULD WE GET ALONG WITHOUT THE TREES?

We have come to depend upon trees to supply so many of our wants that we could not possibly do without them. We can no more spare the trees than Nature can. She needs them in her work of protecting the soil on the steep slopes and of holding back the raindrops that they may keep the springs alive. She needs them to form nesting places for the birds, and she needs the dark forest so that the wild creatures may find shelter and a home.

It would be strange if we did not love the trees; for they are not only useful, but add so much to the beauty of our homes. Our early ancestors may at times have made their homes in the trees, as some of the wild people do now. They certainly lived among the trees, for the myth stories that they have given us speak of the deep, dark forests and of the mysterious people supposed to inhabit them.

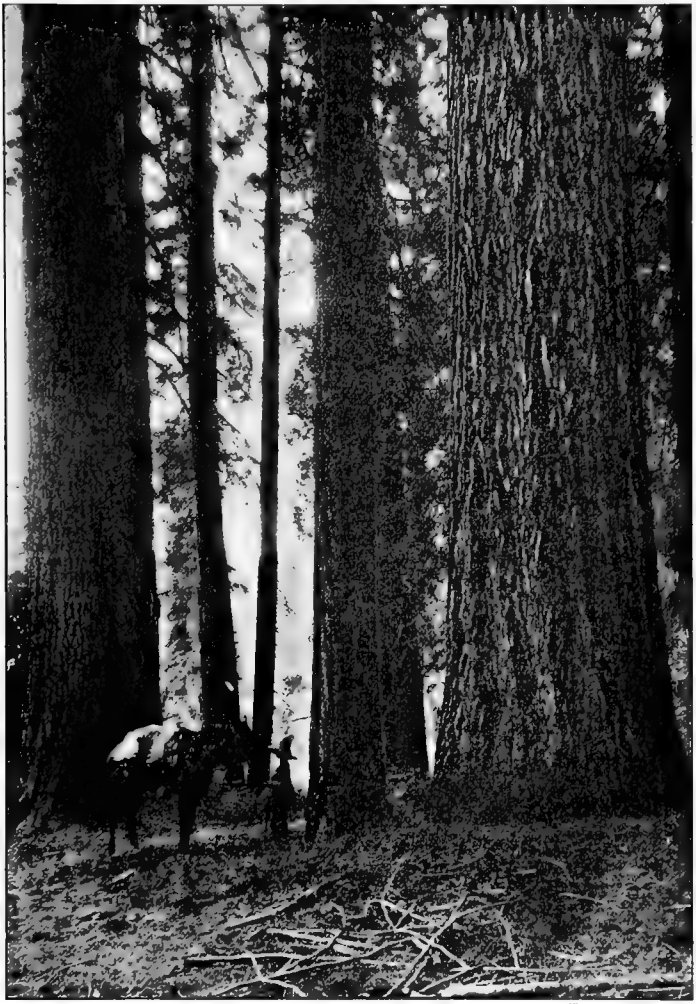
We feel pity for the people who live in treeless deserts. The few articles of wood which they possess have to be brought a long distance at great cost. The Eskimos of the frozen North are more helpless than the desert people, for before the coming of explorers they had no communication with forested regions. They were not wholly without wood, however, for the ocean waves occasionally washed pieces upon their shores.

From the time when the earliest man found a club a better weapon than his bare fists, wood has been used for an ever-increasing number of purposes. Wood fires kept the early people warm. Wood was used in making their bows and spears; bark and pieces of branches served to make their rude homes.

The inner bark of the cedar and birch was used by the Indians in weaving baskets and mats. From the inner bark of the birch tree they made canoes that were so light that they could be carried from one stream to another. Where there were no birch trees, great cedars were cut or burned down and made into canoes, for traveling by water was much easier than over rocky ground or through dense forests. Some tribes of Indians learned to split the cedar logs into rude boards which they used in making their houses. The Indians also learned to boil down the sweet sap of the maple until it turned to sugar.

The eating of nuts and fruits furnished by certain kinds of trees came as natural to early men as it does to the other animals. They shared with the birds the wild fruits, and divided with the squirrels the many kinds of nuts. So highly do the Italians still value the wild chestnut that this tree, almost alone of all the forest trees that once covered their country, has been saved.

The most important uses of trees in our country are for lumber, for fuel, and for the edible fruits and nuts which they bear. There are several purposes to which logs are put without being sawed into lumber, such as for telegraph poles and for piling for the support of great buildings and for wharves. Long ago nearly all our houses were made of logs. There was then an abundance of clear, straight trees but very few sawmills. It was easy to cut the logs, peel and notch them at the ends, and then lay them up in a house of just the size that was wanted. From the logs that split easily rough boards and shingles were made, as well as chairs and tables. Blocks of wood were set in the openings cut for windows, because of the scarcity of glass.



H. W. Fairbanks

A giant sugar pine in a National Forest in the Sierra Nevada Mountains.

Our forefathers had all the wood they wanted just for the cutting, and so they warmed their houses by means of fireplaces large enough to hold great logs. They made of wood every tool and household convenience for which this substance could be used. Indeed, they had more wood than they wanted. Trees covered so much of the land that the ground could not be cultivated until they had been cut away. Now we wish that we had the oak, hickory, black walnut, and other kinds of trees, that the pioneers of our country burned in order to get them out of the way, for they have become very valuable.

Now, partly because wood is becoming scarce, and partly because our large buildings must be made very strong and safe from fire, we are using other materials for them. Stone, brick, and concrete, when tied together with iron beams, are more suitable material for great buildings. Our land now contains so many people, and so many new homes are needed every year, that the lumber required for houses alone is almost more than we can believe.

The forests are now disappearing so fast that unless we use wood more carefully we may have to give up our attractive wooden homes and cheery fireplaces and live in houses of stone or concrete. In many parts of the world people have so completely destroyed the forests that they have not only to make their homes of mud bricks or stone, but have little wood left for fuel and other purposes.

We cannot mention all the purposes to which wood is put in our homes and in our industries. It would take a whole page in this book merely to make a list of them. What we ought to remember, however, is that it is not so much the amount of wood that we actually *use* as it is the

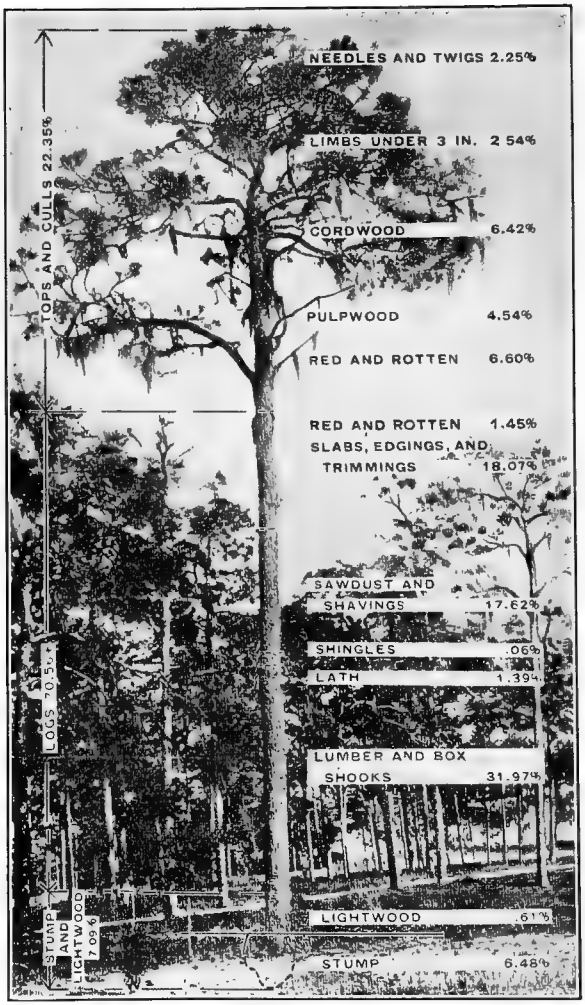
wood that is *wasted* that is likely to bring us to want. Two thirds of the wood of the trees cut throughout our country is wasted in its manufacture into lumber and other objects. Besides this, as much wood is burned every year in needless forest fires as is cut by the lumberman. The waste of trees that are cut merely for their bark which is used in tanning leather is a wrong for which Nature will sometime call us to account.

In Switzerland, where the forests are given the care that we bestow upon a garden, not a particle of wood is allowed to go to waste. The branches are all picked up and saved. Even the sawdust is made use of in the manufacture of wood alcohol, which has an important use as fuel.

There are many kinds of trees the sap of which has great value. If care is used in tapping the trees, they are not greatly injured and will live for years. Sap of the maple affords delicious maple sugar. The sticky sap of the coniferous trees is obtained by making a cut in the bark. Canada balsam, thus obtained, is a clear liquid from a fir tree of the same name. It is the finest of all the turpentines and is used for many purposes in the arts. Enormous quantities of turpentine are obtained from the yellow pines. The pine forests of the Southern states supply nearly all our turpentine. From this by a process of distillation is obtained resin and spirits of turpentine.

The rubber tree found in the tropical forests has become one of the most necessary of trees. Rubber made from the sap of this tree is now used for many purposes for which we have been able to find no other material.

We sometimes forget how valuable trees are for various substances used in medicine. Our lives may depend on



Arthur D. Little, Inc., "The Little Journal"

When this beautiful long-leaf pine tree is cut we manage to save only about one third of it. From the wasted two thirds of this and other pine trees we could obtain many thousand tons of paper, great quantities of resin, and other products.

having such medicines within reach. Quinine made from the bark of the cinchona tree is perhaps the most important. Camphor gum is furnished by another tropical tree. The acacia supplies gum arabic. The poison, strychna, comes from a nut tree. The eucalyptus, birch, and other trees too numerous to name, supply various other medicinal products.

While we are trying to find other substances to replace wood as far as is possible, so as to keep the forests from being used up, we are requiring more and more for the manufacture of paper. The spruce forests are fast disappearing in pulp mills, from which the blocks of wood emerge as sheets of paper. Perhaps after a time we shall find something to take the place of wood in the manufacture of paper.

The one use to which we put the trees, which does not destroy or injure them in the slightest, is growing them for their fruit and nuts. We take great care of such trees, selecting the best varieties and cultivating, trimming, and spraying them in order to keep them healthy and strong. The better the care that we give them, the finer and larger become their fruits.

Trees are valuable to us in so many ways and appeal so deeply to our love of the beautiful things in Nature that we should all be interested in them. If we give the trees a chance, they will do their share toward making our lives comfortable and happy.

CHAPTER FIFTEEN

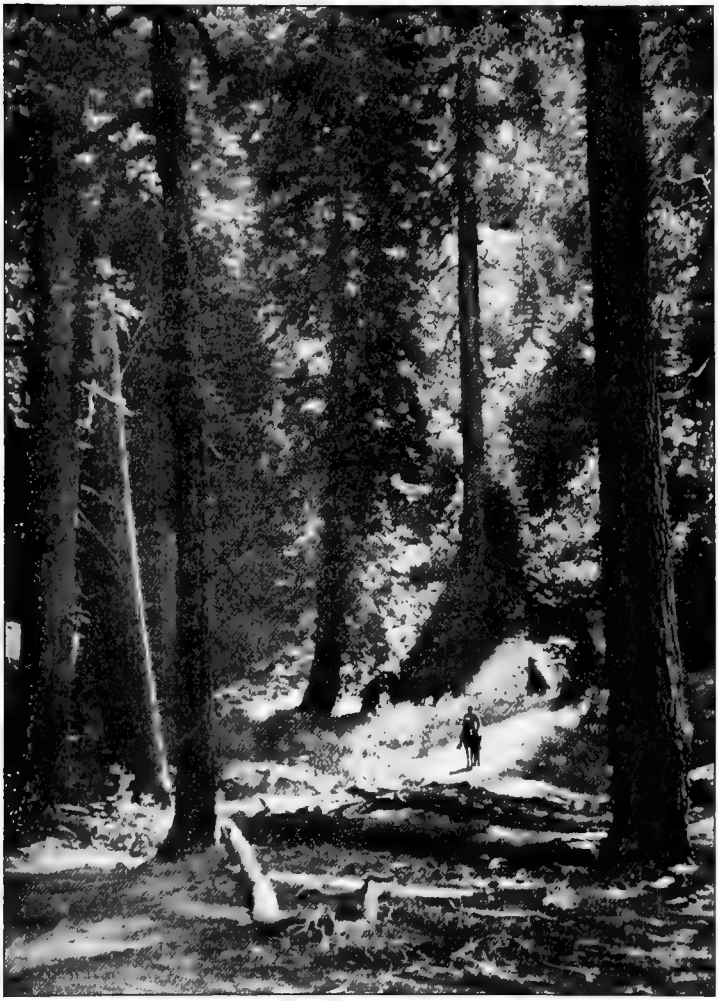
WHERE HAS NATURE SPREAD THE FOREST?

Our forefathers who came across the water to America found forests stretching away from the water's edge into an unknown wilderness. The settlements spread very slowly into the pathless woods, for there lurked danger from the Indians and wild animals. The Allegheny Mountains also held the settlers back for a long time.

The pioneers found the country, as far as the Ohio River and beyond, still forest covered; but by and by openings or *prairies* began to appear. By the time they had crossed the Great River the forests had been left behind, except for fringes of trees upon the lowlands along the streams.

From this point westward the open prairies stretched away to the horizon. Antelope, deer, and buffalo were often seen feeding on the rich grasses. The adventurous pioneers pushed on across the fertile prairies, coming at last to a drier and higher region which we have called the *Great Plains*. On these plains the Rocky Mountains came in sight. These mountains gradually became higher as the travelers approached, until they rose before them like a mighty wall. Here they again met vast forests, which covered all the higher slopes.

Beyond the Rocky Mountains they crossed a broad land of deserts where little rain fell. The vegetation was so scanty and springs so far apart that many of their horses and cattle died. The dreary and barren deserts were followed by another lofty range of mountains. Entering these mountains, the pioneers came upon the most magnificent forest that had yet been seen upon our continent.



A forest of great trees in the Sierras, near the Yosemite Valley.

After traveling for some days over rugged mountains, they at last emerged from the forests upon the Great Valley of California.

Scattered over portions of the valley were oak trees, giving it the appearance of a park. When the valley had been passed the pioneers climbed the last mountain range, and from this range looked down upon the waters of the Pacific Ocean. Here they found forests again, some of the trees being of enormous size. Thus we see that the eastern part of the continent was nearly all forested, but that in the West the forests grew chiefly on the mountains, because there is not enough rainfall upon the plains and in the valleys.

The trees that make up most of the forests of our country are of two very different kinds. There is one kind that has narrow or needle-like leaves which they keep through the winter. These we commonly call *narrow-leaved* trees or *conifers*. The most important of the narrow-leaved trees are the pines, firs, spruces, and hemlock. Such trees form the forests of the greater part of the highlands of the northern and northeastern parts of our country. The pines also find a congenial home upon the lowlands of the Southern states. Trees of the second kind have broad leaves, and usually their wood is rather hard. Hence we call them *broad-leaved* or *hardwood* trees. Since most of these trees drop their leaves in winter, we often speak of them as *deciduous* trees. By far the larger part of the lands of the Eastern states that are now cultivated were found by the first settlers to be covered with hardwood trees. We are familiar with many of the hardwoods through their use in furniture and various household utensils and farm imple-

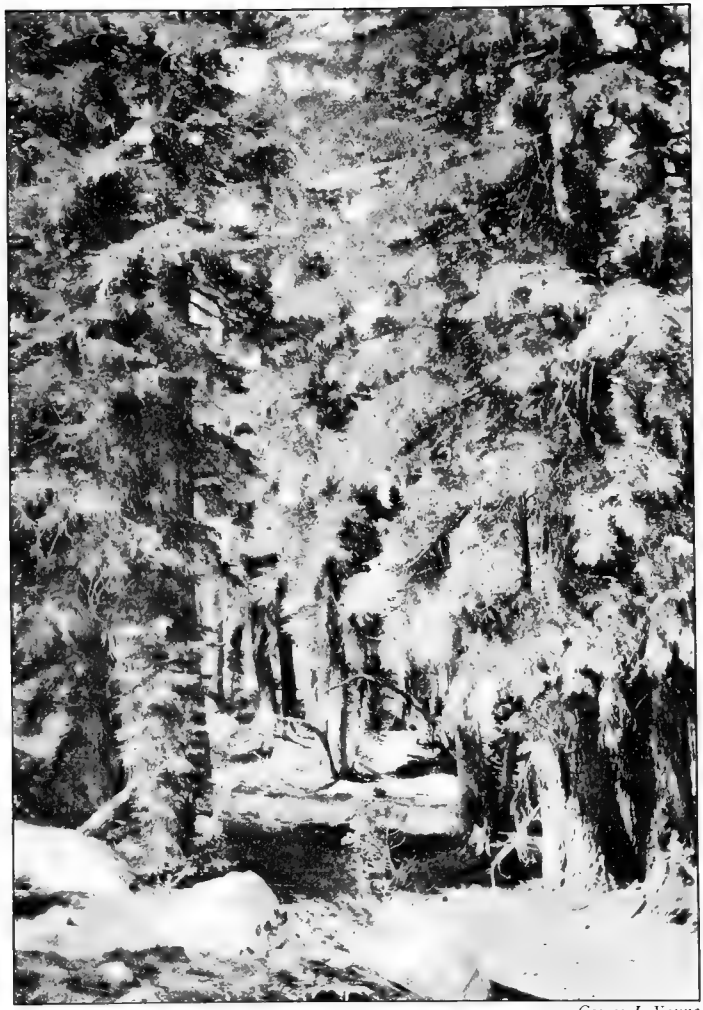
ments. The most important varieties are the walnut, hickory, chestnut, beech, maple, ash, oak, elm, locust, and linden.

There are not many broad-leaved trees in the forests of the West. The children of the West miss all the nut trees that the boys and girls of the East enjoy. But to make up for this lack there are some in the West that are not found in the East. The sugar pine, the piñon pine, and the digger pine afford delicious nuts which once formed an important article of food for the Indians. In the West the broad-leaved trees do not form dense forests. They are scattered among the pines on the lower mountain slopes, in the valleys, and along the streams. The most important of these trees are oaks of many kinds, soft maple, alder, cottonwood, sycamore, and laurel.

The dense forests of the Western mountains consist almost wholly of narrow-leaved trees. Among them are the pines and firs of different kinds, spruce, cedar, redwood, and "big trees." The redwoods and "big trees" are both known as sequoias; they grow to an immense size upon the mountains of California. The coniferous forests of which these trees form a part are among the most wonderful and interesting ones on the earth.

If you will take a forest map of our country and place it beside a rainfall map, you will quickly discover why the forests are found where they are. You will see that the forests are found where there is more than thirty inches of rain each year, except in the far North, where it is very cold. You can say, then, that the climate is the chief thing that determines where the forests shall grow.

If the climate is warm and the rainfall heavy, the forest



George J. Young

Mountain hemlocks, which John Muir considered the most beautiful of all conifers.

vegetation is so dense and rank that you can hardly travel through it. Such forests are found in the tropical parts of the country. Where little rain falls there is scanty vegetation, as upon the deserts of the Southwest. But where it is very cold, even if there is much snow or rain, you will find no trees.

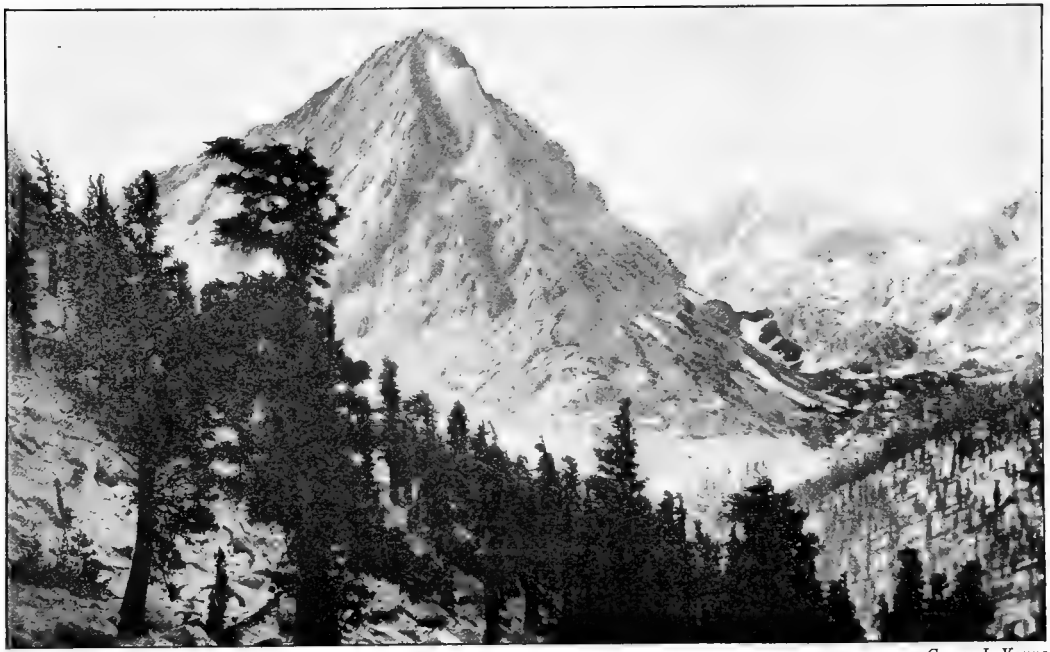
We must not forget that there is another thing that affects the growth of trees, and that is the soil. Pines like a sandy soil, while most other trees do not. Certain cedars and cypresses like swampy places where no other trees will grow. Many beautiful meadows and prairies have no trees, because the soil is not well drained.

It is very easy to understand why trees cannot grow where it is dry, but how shall we learn of the effect of cold upon them? Shall we have to take a journey of thousands of miles into the far North, until we finally come to the land called the *Barren Lands* or *tundras*, where the trees become stunted and at last disappear — a land where they cannot longer fight against the cold and live?

Fortunately such a long journey is not necessary. All we have to do is to climb a great mountain range, like the Sierra Nevadas, to pass through all the different climates which we would experience on a long journey to the arctic regions.

It is only a few miles from the hot San Joaquin Valley, at the base of the Sierras, where it is so dry that irrigation is necessary, to the summit of the range, where the winter climate is as cold as it is in the arctic regions.

In going up the mountains we first come to the foothills, where there is a little more rain than in the valley. Here we find oak trees growing. Farther up there is still more



George J. Young

East Vidette, King's River Country, California, showing how, as we approach the summit of the mountains, the trees become smaller.

rain and we come to the pines. Soon we reach the most wonderful coniferous forest in all the world. Here not only is there a great variety of trees, but because of the favorable climate they grow to a great size. As we approach the summit of the mountains the trees become smaller, and at an elevation of about two miles they shrink to the size of little bushes and finally disappear. They can no longer stand the fierce winds and cold storms of this arctic region.

We have learned now that the trees do not grow haphazard over our country, but that the rain, the temperature, and the soil determine where they can live.

Within the heart of the forest the trees will come again if we cut them down, but upon its borders, where the air is drier, it is more difficult for them to spring up anew. If we cut them down carelessly and allow fires to burn over the surface, and the water to wash away the soil, they may never come back.

It is important, then, that we understand why trees grow in some places and not in others, in order that we may know how to take care of them.

CHAPTER SIXTEEN

WHAT ARE THE ENEMIES OF THE TREES?

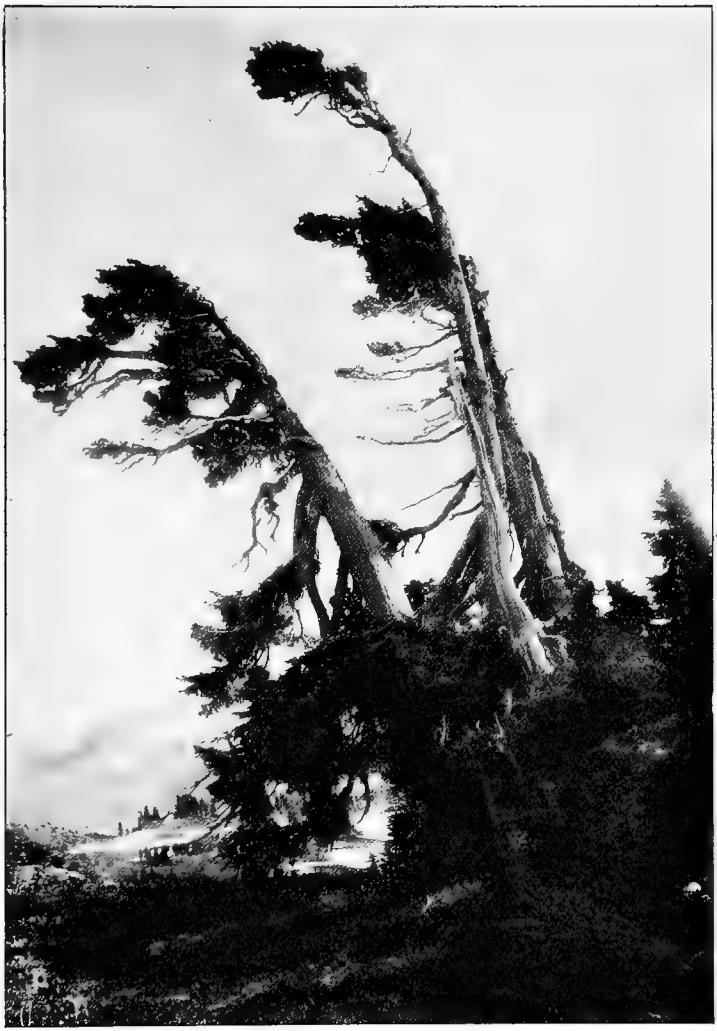
EVERY living thing is engaged in a struggle for air to breathe and for something to eat. Those that make their homes on the land also have to struggle for water. The stronger rob the weaker; for, among all of them except man, might always makes right. Men are learning that unselfishness is the better way, although they do not always practice it.

In this struggle the animals have an advantage over the plants, for if food fails in one place they can move to another. Among the animals also the mother tries to protect her children; and, in the case of some, — the wolf, for example, — a number will hunt together for the common good.

It is quite different with the plants. They must grow where the seeds take root. If there is little sunlight or water or the soil is poor, they must make the best of what they have.

The plants have to struggle not only with such enemies as insects, winds, fire, and browsing animals, but with each other, for every tree is the real or possible enemy of every other tree. Brother seeds sprouting under the same parent maple struggle with each other for the food and moisture in the soil and for the best place in the sunlight. The one that gets the most of these will grow the faster and choke some of its weaker brothers.

In yonder grove of pines there are trees of all ages and sizes. The older ones have much the advantage and take a part of the food and sunlight that the smaller ones require.



Edward S. Curtis

Trees that struggle with cold and storm.

How the little ones stretch up and grow tall and slender in their attempt to get the sunlight! But in spite of all their efforts some of them must die.

Some kinds of trees grow faster than others. Where a number are springing up together, the slow-growing ones will stand less chance of ever becoming great trees. In this way the yellow pine sometimes chokes out the cedar, and the fir gets the advantage of the sugar pine.

The bright, warm sun is the enemy of the tree that loves the shady hillsides. The swamp is the enemy of the tree that must have loose, dry soil. The cold is the enemy of the tree that is used to a hot climate. Is it not strange that what is good for one tree is an enemy of another?

Many kinds of trees have their own particular insect enemies which attack them and no others. Some of these insects live upon the leaves, others eat the sapwood under the bark, while a few attack the roots. Certain insects burrow in and eat the heartwood. Although this does not always kill the tree, it weakens it and makes the wood unfit for use. The cedar and the hickory are among the trees injured in this manner.

The foliage of the broad-leaved trees is the delight of many insects. They sometimes eat the leaves so closely that the tree is killed; for the trees breathe through their leaves and can no more do without them than they can without their roots.

The gypsy moth, which did no great harm in its European home, was brought to this country and accidentally set free. It at once began to attack the leaves of the elm, that beautiful tree of the old New England villages. Now it is destroying other trees and, notwithstanding the fight which

American Forestry Association

Insects are destroying the trees of this forest.

we have made against it, we have not yet been able to exterminate it.

The chestnut tree, which every Eastern child loves for its nuts, is now being destroyed by a fungus which may kill every one of these trees in the country.

The white-pine blister, also brought over from Europe, is now threatening all the white pines and the related trees of our country. This disease has already such a start in the East that we may not be able to stop it.

The dainty mistletoe, about which there are so many pretty Christmas legends, is a deadly enemy of many trees. The seed of this fungus is carried, by the birds or by the wind, from one tree to another. When it sprouts, tiny roots go down through the bark to the sap, on which it feeds until the tree is killed.

All our fruit trees have their deadly enemies which cause

Pillsbury's Pictures, Inc.

A dwarf white pine which has found a foothold in the rocks on a mountain top.

a loss of many millions of dollars every year. Among the worst of these is the San José scale, which was carelessly brought into the country from China.

The pear blight has destroyed whole orchards of pear trees in the Western states. The citrus canker is now threatening the orange orchards of the Southern states.

For years we have been searching over the world for new and better varieties of fruit trees. With the shipments of such trees we have brought some of the worst of the diseases that we have just mentioned. We should have all foreign trees most carefully inspected before admitting them to the country. We should also be very careful about shipping fruit or other trees from one part of our country to another. Diseases are often carried in this way into places which otherwise they could not reach.

Field mice, gophers, and rabbits eat the bark of young fruit trees and kill those which are not carefully protected. In some parts of our country the apple and peach tree borers are a serious menace to young orchards. Grasshoppers occasionally come in dense swarms and eat the leaves from every tree or plant in their path.

The valuable sugar pine of the Western mountains is not seeding itself as rapidly as it should, and we fear it will become extinct. The beautiful silver-gray squirrel loves the nuts of this pine, and it is said that he eats so many that few are left to sprout and make new trees. For this reason some people would like to make it lawful to kill all the gray squirrels that one wished. This would be too bad, for we do not believe the gray squirrel is the cause of the trouble. It is more likely that the lack of young sugar pines is due partly to its struggle in the forest with more rapidly grow-

H. W. Fairbanks

An avalanche has passed through this forest.

ing trees and partly to the less frequent occurrence of forest fires to burn off the humus on the ground. We know that the seeds of certain trees find difficulty in sending their roots down through the humus to the soil beneath.

The narrow-leaved or cone-bearing trees, which are the main source of our lumber, also have other enemies. The most destructive of these are the little pine beetles which lay their eggs in the bark of the yellow pine, sugar pine, and tamarack pine. From these eggs there hatch worms which burrow under the bark until they cut off the flow of the sap. This kills the trees. The trees that are young and strong are sometimes able to pour out enough sap into the wounds to drown the insects, but many thousands of trees in the Western mountains are destroyed every year by these insects.

Wind and lightning are both enemies of the forests.

Hundreds of forest fires are set every summer by thunder storms, but the rangers usually discover such fires soon enough to put them out before they have done much harm.

The pasturing of forests by stock does great injury, because of the browsing and trampling underfoot of the young trees. Sheep and goats are the worst of all the animals and should be kept out of those forests where the surface particularly needs protection and where the young trees require all the encouragement that Nature can give them in order to make a successful start in life.

We have learned something about the many enemies of the trees, but the worst one has not yet been mentioned. Can you guess what it is? This terrible enemy is man,—not savage man or Indian, but civilized man. Although man has more need for forest trees than has any other animal, he is at the same time more ruthless in his treatment of them. Man destroys more trees every year, as a result of fires which he sets and of his wasteful methods of lumbering, than all the other enemies of the trees put together.

The forest area of the world is constantly growing smaller, and we must soon learn to treat the trees with more care or they may, like many of the wild creatures, nearly disappear from parts of the earth where they are most needed.

CHAPTER SEVENTEEN

HOW THE FORESTS ARE WASTED

O forest home in which the songbirds dwell!
The squirrel and the stag shall miss the spell
Of thy cool depths when summer's sun assails,
Nor more find shelter in thy shadowed vales.

. . . . . .

All will be silent; echo will be dead;
A field will lie where shifting shadows fled
Across the ground. The mattock and the plow
Will take the place of Pan and Satyr now.
The timid deer, the spotted fawns at play,
From thy retreats will all be driven away.

Farewell, old forest; sacred crowns, farewell!
Revered in letters and in art as well;
Thy place becomes the scorn of every one,
Doomed now to burn beneath the summer sun.
All cry out insults as they pass thee by,
Upon the men who caused thee thus to die!

Farewell, old oaks that once were wont to crown
Our deeds of valor and of great renown!
O trees of Jupiter, Dordona's grove,
How ingrate man repays thy treasure trove
That first gave food that humankind might eat,
And furnished shelter from the storm and heat.

PIERRE DE RONSARD,
translated by BRISTOW ADAMS; *American Forestry*, XVI. 244

WHEN our grandfathers came to America they found the country so covered with forests that they had to cut and burn the trees in order to obtain the ground on which to raise their crops. The Eastern states could not have been settled without clearing the land, and we cannot blame the pioneers for doing under those circumstances that which today would be very wrong.

H. W. Fairbanks

The farmer wastes the trees by girdling them and then allowing them to rot.

There is now enough land so that it is no longer necessary to destroy the trees in order to raise our food supplies. The forests constitute one of the great natural resources of our country and men should not be allowed to waste them for private gain.

Although the need for more land has long passed, the habit of reckless tree cutting still continues. There are now parts of the East where none of the primeval forest remains and very little of the second growth. Firewood is expensive and many a farmer has to buy coal, who, if he and his ancestors had been careful, might have a woodlot to supply not only fuel, but lumber for his buildings.

Many of the lands once cleared were found not suited to farming and have been left to grow up to brush. If the farmer were wise he would replant some of these lands with such trees as spruce, hickory, walnut, or maple. Although his ancestors toiled early and late to get these

trees out of the way, a few acres of them now would be a fortune.

There are parts of our country, particularly in the South and West, where the settlers are still cutting the trees to get them out of their way. In distant mountain valleys where there is no market for lumber, men are chopping down the great pines. They would make fine lumber, for they are tall and straight, but instead of being put to some useful end their fate is the bonfire. It makes no difference to these men that they are wasting what it has taken Nature hundreds of years to produce nor that in other parts of the country timber is scarce and expensive.

In Germany and Switzerland the forest resources are carefully looked after. As fast as the grown trees are cut from a field, young trees are planted in their places. The keeping of a certain part of the land in forest is held to be of advantage to all the people. For this reason men are not allowed to cut trees upon their own land without permission from the forest officer.

Many years ago, when lumbering became an important industry and the mills began to turn out immense quantities of boards and beams of every sort needed by the growing population of our new country, it was believed that the supply would never be used up. Only the best and clearest logs were sawed into lumber, and a large part of each tree was left on the ground to rot or to feed the first fire that occurred. Now lumber is scarce and expensive; and the poorer grades also are in much demand.

Have you ever seen the giant sugar pines on the slopes of the Western mountains? Next to the sequoias they are the largest of our American trees. A single tree has fur-

nished lumber enough for a house. Sugar pine has now become so valuable that it is used only for such purposes as window sash, doors, and similar articles. We have taken no care of these wonderful trees until recently, but have allowed them to be cut and wasted in the most reckless fashion.

If you could go through the sugar-pine forests, you would find hundreds and even thousands of these mighty trees lying on the ground rotting. This is the work of the shake or shingle maker. He has been as thoughtless in his cutting of these giants which have been hundreds of years growing as is the farmer of the stalks of grain that springs up and ripens its seed in one season. The shingle maker must have material which splits well. He hunts for the straightest and cleanest trees. At most he does not use over fifty feet of the trunk, and if the tree does not split to suit him, then all, or nearly all, of the tree is left to rot.

H. W. Fairbanks

In turning this giant sequoia into lumber more than half the tree is wasted.

The waste of the lumberman is not so great, but it is enough to open our eyes to one of the reasons for the rapid disappearance of our forests. On the average only about one third of the wood of every tree cut is actually used. The rest is lost in the logging operations and during the various processes through which it passes before it reaches our hands.

In addition to the waste of the trees actually cut, there is the loss of the young trees due to careless logging. Too often the lumbermen do not care in what condition the logs leave the forest. They want only the trees now fit for lumber, and they want to get them in the easiest way possible.

Instead of going through the forest and picking out only the ripe or mature trees and leaving the rest for a later cutting, the lumbermen usually take everything that has any present worth. Trees that are less valuable for lumber, such as the firs, are used for skidways and bridges, and when no longer needed for these purposes are left on the ground. No care is taken to see that the great trees fall with the least possible damage to the young growth. Upon the preservation of the young trees, which almost everywhere occupy the open spaces between the large ones, rests our hope of a future forest.

When the work of lumbering in any particular region is finished, the sight is such as must make Nature weep, for it almost brings tears to our eyes. The young trees are broken and crushed to the ground, branches and fragments of the trunks lie scattered about, while above the ruin rise those trees not considered worth cutting. The once beautiful and majestic forest is now ready for fire. Some

H. W. Fairbanks

The shake maker wastes the larger part of a great sugar pine that has been a thousand years in growing.

passer-by may drop a lighted match or cigarette, and you can easily form a picture in your mind of what happens.

In the countries of Europe lumbermen are very careful; not a particle of the cut tree goes to waste. The logs are sawed without removing what we call "slabs." The sawdust is saved and used in the manufacture of wood alcohol. If we saved all the present waste in the logging and milling of our pines, we could make all the turpentine needed in our country. If we saved what is now wasted of the poplar and spruce, we should have material enough to make all the paper we use.

There are still large and valuable forests in the Southern Appalachian Mountains, in the Rocky Mountains, the Sierra Nevada-Cascade Range, and the Coast Ranges.

These regions were settled later than the Eastern states, and parts of them are yet remote from markets.

Our wise lumbermen are beginning to understand that it is better to cut over the forest carefully, so that by and by there will be another crop. Nature is doing all she can to keep up the supply of trees, and, if we give her half a chance, there will be timber enough both for us and for those that come after us. The forest crop is like any other crop, except that it cannot be cut every year.

Every one should understand that he has an interest in the forest. Although he may not own a foot of land, yet his prosperity depends in part on how the forests are managed.

If the forests are not taken care of, there will sometime be a wood famine. If the mountain slopes are stripped of their trees, the streams will no longer run clear and the low streams in summer will lead to a water famine, which in turn might easily cause a bread famine.

CHAPTER EIGHTEEN

HOW THE FORESTS SUFFER FROM FIRES

He who wantonly kills a tree,
All in a night of God-sent dream,
He shall travel a desert waste
Of pitiless glare, and never a stream,
Nor a blade of grass, nor an inch of shade —
All in a wilderness he has made.
O, forlorn without trees!

He who tenderly saves a tree,
All in a night of God-sent dream,
He shall list to a hermit thrush
Deep in the forest by mountain stream,
With friendly branches that lead and shade,
All in a woodland that he has made.
O, the peace of the trees!

He who passionately loves a tree,
Growth and power shall understand;
Everywhere he shall find a friend.
Listen! They greet him from every land,
English Oak and the Ash and Thorn,
Silvery Olive, and Cypress tall,
Spreading Willow, and gnarled old Pine,
Flowering branches by orchard wall —
Sunshine, shadow, and sweetness of glade —
All in a Paradise he has made.
O, the joy of the trees!

The Dryad's Message

HAVE you ever seen a forest fire? It is a terrible sight to see the flames sweep up a mountain side. They run along the ground licking up the leaves and dead branches. They leap from tree to tree, and then with a roar the sheet of flame goes to the top of a tall pine. The air is like the breath from an oven and is filled with sparks and with

American Forestry Association

The forest fire sweeps everything in its path.

suffocating smoke. The birds and animals flee away in every direction.

It is no wonder that those whose homes are in the forest gather quickly to fight the fire, for if they cannot control it, they may lose everything that they possess. If there is a wind blowing, the fire will probably sweep over many miles of country. At night, though, when the air becomes cooler and more quiet, the men can get the advantage of it.

You can understand, of course, that it is impossible to use water against such a fire, for water is not to be had throughout most parts of the forests. Instead of using water, the men fight fire with fire. Taking shovels, hoes, and rakes to a suitable place some distance ahead of the fire, they rake away the dead litter on the ground, making a broad, clean path through the forest. Then they set "back-fires" along that side of this clean path which lies toward the coming fire. These back-fires burn slowly

toward the main fire, and when they meet both must die out for lack of fuel.

For many years forest fires have caused as much damage as the lumbermen; but now most of the forests are patrolled by rangers during the summer, and there are fewer serious fires.

How do the fires start in the forest? It is supposed that long ago the Indians set many fires to keep the woods open for their hunting. Lightning has always been a frequent cause of forest fires. As many as a dozen fires are known to have started during a single thunderstorm. But such fires are not as serious as they once were, because the rangers are on the watch for them and put them out before they get well started.

Aside from those due to lightning, most forest fires are now either set purposely or come from engine sparks or from somebody's carelessness. Many fires are set purposely by stockmen who think by this means to clear away the

H. W. Fairbanks

Fires destroyed the forest that once covered this region and its place is now mostly occupied by small bushes.

brush and thus obtain better feed for their cattle and sheep. These men often care nothing for the forests or for the preservation of the summer water flow. They would, indeed, be pleased to see all the forests burned away if by that means they could increase their feed. If you could travel through some of the mountainous portions of the Southwest, you would see how much harm has been done in this way to the trees, the streams, and the soil.

It is a hot summer day and two men are riding along a mountain road. One of them thoughtlessly throws away a lighted cigarette, which falls upon some dry pine needles. In a few moments the pine needles are ablaze. The fire spreads with incredible rapidity and a great column of smoke rises above the treetops. Before any one can reach it, the fire is sweeping up the mountain side, and it may not be stopped before it has destroyed thousands of acres of valuable timber. All this terrible loss is due to one careless man who, in the first place, should not have been smoking cigarettes, and in the second place should have known better than to throw a spark into the forest powder magazine.

Some campers, enjoying the summer in the mountains, go away leaving their fire burning. By and by a stick burns outward until the fire reaches the leaves, or a gust of wind comes along and carries a spark to them. In the hot sun the leaves and needles are almost as easy to ignite as powder, and in a few moments another fire is making headway into the surrounding forest.

A farmer clearing land thinks he can get rid of the brush and young trees more easily by burning. But the undergrowth is drier than he thought, and, the wind coming up unexpectedly, the fire is soon beyond his control. It may

H. W. Fairbanks

The dead stubs of a once beautiful forest.

destroy his own fences and buildings and, sweeping on, ruin those of his neighbors also.

Few people have perished from fires in the West, for there the forest regions are generally thinly inhabited, but in some of the Eastern and Northern states there have been terrible fires that have destroyed whole villages together with their inhabitants.

In many mountain regions of our country there are large areas now covered with useless brush where there were once valuable forests. In regions where the lumbermen have not utterly destroyed the forests, but have left some seed trees, the forests will come back again, but in these large burned areas conditions are not favorable. The destruction of the humus as well as the trees has been so complete that the seeding of a new forest is slow work. It may be hundreds of years before the trees will spread over and again take possession of the waste land.

A single fire often destroys more timber than would be destroyed by a whole camp of loggers working for years. In the Northwest there are many sad and desolate pictures of the destruction caused by forest fires. We may travel for miles through forests of tall, dead stubs, the remains of once noble trees. Where they have fallen the trunks lie piled many feet high and trails had to be cut through an almost solid mass of timber.

Here is wood enough to supply thousands of people with pleasant winter fires. But there are, alas, no people living near these vast woodpiles and often no road to them. The logs must lie there and rot.

Now let us see if we can state the chief reasons why we should be exceedingly careful about setting fires in the woods:

1. Fires destroy an enormous amount of valuable timber every year.

2. Between fires and lumbermen our forests are disappearing faster than they are growing.

3. Fires destroy the young trees, and if they happen often enough will keep them from growing up to replace the mature trees.

4. Fires do not permanently help the cattle ranges, but injure them by burning the humus and grass seeds.

5. Fires leave the ground bare, so that it will dry out quickly.

6. Fires leave the soil unprotected, so that it will wash away quickly.

7. Fires destroy property and endanger lives.

CHAPTER NINETEEN

EVILS THAT FOLLOW THE DESTRUCTION OF THE FORESTS

We have already learned something about the poverty of the people in those lands where the forests have been destroyed. This poverty is due not so much to lack of wood for fuel and other purposes, but to a whole series of troubles which the removal of the forests has brought upon them.

The burning of the humus, when a fire sweeps the forest, is the next greatest loss to that of the timber itself. Where there has been no fire, the ground under the trees is covered with decaying leaves and stems which are slowly mixing with the soil and becoming a part of it. The more there is of this humus in the soil, the more thriftily plants will grow.

Many people purposely burn over their pasture lands in the fall, believing that this will make the grass better the following year. They should know that every time this is done the soil is made poorer, and that it kills the seeds lying on the ground ready to sprout when the warm spring days come. Instead of a better pasture there is more likely to be a crop of almost worthless weeds. The ground is full of worthless seeds which are always ready to take the place of the grasses when they have a chance.

Before the fire came, the roots of trees, bushes, and grasses kept the earth from washing; and the humus helped to hold the rainwater from running away rapidly, so that more of it had time to soak into the ground. How well this is shown on yonder hills which were once covered with brush. A fire swept over these hills and burned every living thing. What a barren appearance they presented after the heavy

winter storms! The slopes were completely covered with little furrows and gullies where the rainwater had done its work. It will be a long time before vegetation will again gain a foothold there and stop the washing of the earth.

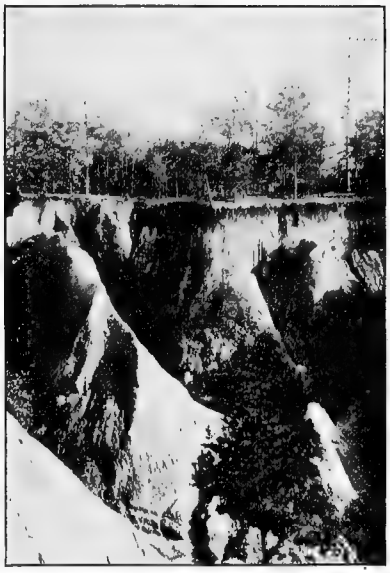
When a fire occurs in the dense forests of the Cascade Range, all the trees are killed and the thick layer of decaying vegetation underneath is burned. The spruce, which is one of the most important lumber trees of this region, does not at once spring up again. Its seeds may be scattered there, but the soil is not now in a condition to nourish them. In its place springs up the tamarack pine, which, because it can grow in poor soil, has the whole burned area to itself.

If we should return to the same place perhaps one hundred years after the fire, we should find that the tamarack pines had formed a thick forest. The lumbermen have little use for the tamarack and so have passed it by. In looking carefully through the tamarack forest, we find that other trees are now springing up. They are already struggling for the food, the moisture, and the sunlight which the tamaracks are making use of.

During the many years that have passed since the fire swept this region, decaying vegetation has been slowly accumulating and forming humus again. Now at last the seeds of the spruce find the soil rich enough again to sprout and grow. Here and there are thrifty young trees which will in a few years grow up and choke out the tamarack. Thus the tamarack, though of so little value itself, has done a great work in preparing the soil for a new growth of the valuable spruce.

Upon the drier slopes of the Western mountains shrubs,

such as the manzanita and chaparral, spring up and cover the surface after a forest fire. Nature does not seem to want the surface left bare and usually has something at hand, even though it be nothing better than brush, with which to clothe it again. As the years pass humus begins to collect upon the ground and finally restores it to much the same condition it had before the fire. Now, if by any means seeds can reach such places, scattering trees will first spring up in favored spots and, after a time, the trees will become thick enough and large enough to shade the ground and the brush will be killed out.

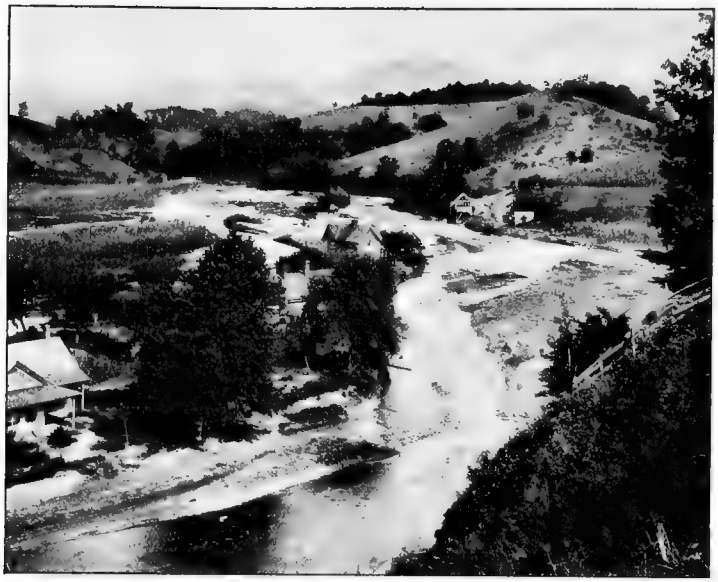


American Forestry

The work of the water where the forest has been cut away.

The cutting of the forests, especially from the steeper mountain slopes, has in many parts of the world changed water, one of Nature's most valuable gifts, into an agent of destruction. Throughout the Eastern and Southern states the floods are higher in spring and lower in summer than they used to be, because of the removal of so large a part of the forests that once covered this whole region.

In the West it is even more necessary that the forest cover be disturbed as little as possible. One reason is that



American Forestry Association

This beautiful valley in the Southern Appalachian Mountains has been ruined by the floods due to cutting off of the forests upon the headwaters of the river.

the greater part of the forests are found upon the lofty mountains in which the streams rise. If we deforest these steep slopes, water is going to injure them much more than it would the gentler slopes of the lower lands, if they had been deforested. Another reason is that since little rain falls in the summer in this region, we must do nothing to lessen the summer flow of the streams, which is so much needed for irrigation.

The more water that can be held back in the mountains of the West for summer use, the more prosperous the farmers are. There is nothing that helps to hold the water

better than the forests. They help to equalize the flow of the streams so that the floods are not so high in the spring nor the water so low in the summer as they would be if there were no forests.

One of the first questions asked by a man who is thinking of buying a farm is about the water supply. He wants to know whether there are wells, springs, or living streams on the place. Almost everything depends upon the water supply. If there is an abundance, the farmer is likely to be prosperous. When he is prosperous all the rest of us are prosperous, no matter what our business is.

Are you not ready now to say that the Swiss are right in not permitting tree cutting upon any land except under the supervision of a forester? The careless removal of the forests from the mountain slopes may affect the farmer in the valley fifty miles away. Do you not think that this farmer is very much interested in the management of the forest, although he does not own a foot of it?

Trouble always follows the destruction of the forests on the headwaters of the streams.

CHAPTER TWENTY

HOW OUR GOVERNMENT IS HELPING TO SAVE THE FORESTS

As long as the forest shall live,
  The streams shall flow onward, still singing
  Sweet songs of the woodland, and bringing
The bright, living waters that give
  New life to all mortals who thirst.
  But the races of men shall be cursed.

Yea, the hour of destruction shall come
  To the children of men in that day
  When the forest shall pass away;
When the low woodland voices are dumb;
  And death's devastation and dearth
  Shall be spread o'er the face of the earth.

Avenging the death of the wood,
  The turbulent streams shall outpour
  Their vials of wrath, and no more
Shall their banks hold back the high flood,
  Which shall rush o'er the harvests of men;
  As swiftly receding again.

Lo! after the flood shall be dearth,
  And the rain no longer shall fall
  On the parching fields; and a pall,
As of ashes, shall cover the earth;
  And dust-clouds shall darken the sky;
  And the deep water wells shall be dry.

And the rivers shall sink in the ground,
  And every man cover his mouth
  From the thickening dust, in that drouth;
Fierce famine shall come; and no sound
  Shall be borne on the desolate air.
  But a murmur of death and despair.

ALEXANDER BLAIR THAW,
The Passing of the Forest; in *Century Magazine*, June, 1907

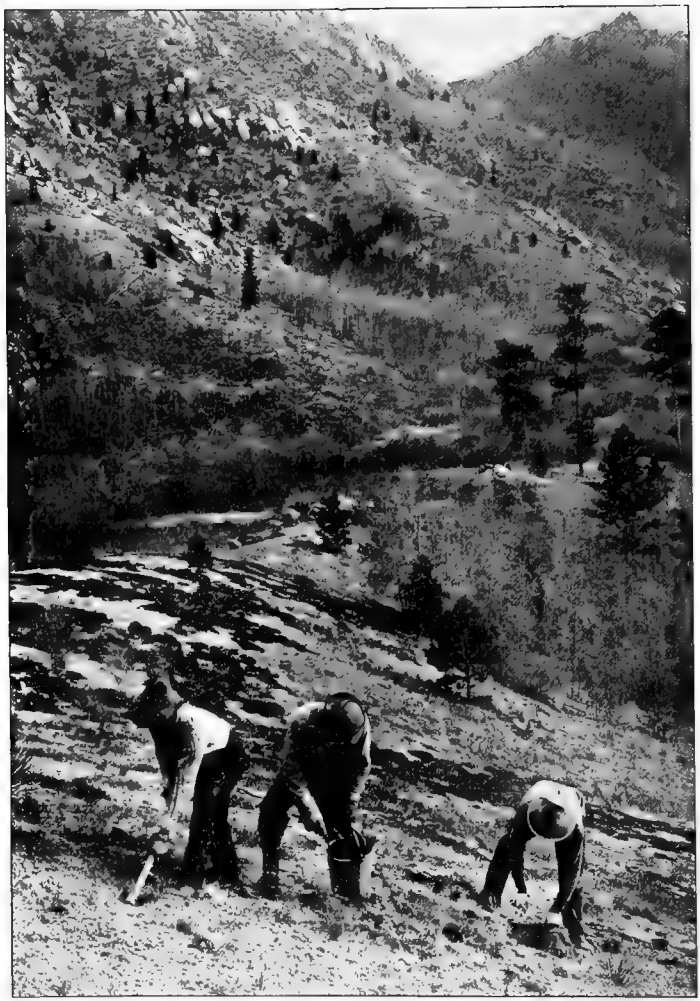
For many years it was thought the forests were inexhaustible and needed no special care. The national government encouraged people to acquire forest land and practically gave away 160 acres to every one who would build a cabin upon the land and live there for a short time.

Suddenly some of the wise people among us awoke to a realization of what was going on. They discovered that the forests were going very fast and that soon we should have none if something were not done. Between the fires that swept them every year and the wasteful lumbering, the forests were in a fair way to leave us as they had the wasteful and careless peoples of other parts of the world.

How fortunate it is that some of us did look ahead before it was too late; for, although the Eastern forests have largely disappeared, there still remain millions of acres of government-owned forests in the West. These forests have now been withdrawn from sale and are to be held for the use and benefit of all. They are not to be permitted to pass into the hands of a few, to be cut and sold for private gain.

Our government is acting like a wise father who is interested in the welfare of his children, and who understands the need of taking care of their treasures until they are wise enough to manage them for themselves.

We are all concerned in many ways in the welfare of the forests. Whether we own any forest land or not, we are affected by the way in which the trees are managed. Because we are all dependent more or less upon the forests, they should be regarded as the property of us all, just as the air and water are. But because some of us do not yet know how, or do not care, to protect them, it is best that the government should do so for us.



American Forestry Association

These men are replanting a mountain slope from which fire once swept the forest.

It may be that you live in a brick or stone house and burn coal in your stoves. You think that it makes no difference to you whether or not there are any forests. But stop and think a moment. Are you sure that you are really independent of them? How many things do you use every day that are made of wood? The list is surely a long one. If wood is rare and expensive, the articles which are made of it add to your cost of living and allow you less money for other things.

Let us suppose for a moment that you have no use for wood in any form. Will this take away all interest that you may have in the forests? In any event you are dependent upon the fertility of your fields for the food that you require. Now, if there is a lumber company stripping the mountains at the head of the river upon which your home is situated, and as a result of clearing the timber from the slopes the floods become worse, your garden is buried beneath gravel and sand, and your orchard washed away, will you not think it *does* make a difference to you in what way the forests are treated?

The timbered lands which the government is holding and caring for are known as National Forests. About two thirds of the forests yet remaining in the West are included in them. These lands are mostly mountainous and not suited to agriculture.

In the East the government has no lands except those which it buys. Because of the great damage which is being done to the streams and valleys of the Appalachian Mountains by careless lumbering, a great tract of land is being acquired by purchase. This is called the Appalachian Forest. The timber in this region will be carefully cut

and those areas from which it has been stripped will be replanted.

In the White Mountains of New Hampshire, with Mt. Washington as the center, is a remnant of a once beautiful forest, which has been acquired by the government. This is known as the White Mountain Forest. It will be enlarged as the years pass and carefully guarded. It will serve for all time as a beautiful pleasure and camping ground.

It is not the government's plan that the National Forests shall remain unused, but they are to be used wisely, so as to be of the greatest permanent good to the greatest number of people. The men who have been placed in charge of these lands are called "forest rangers," and their duties are of many kinds.

The rangers supervise the sale and cutting of the mature or ripe trees as they are needed for lumber, mining timbers, or posts. They see that the waste parts of the cut trees are piled so as to lessen the danger from chance fires.

During the long summers the forests become as dry as tinder and the loss from fire amounts to millions of dollars every year. It is the chief duty of the rangers at this time to patrol the roads and trails leading through the forests and keep a sharp lookout for fires.

Stations have been established upon high points from which there is a view over a wide extent of country. In each of these stations there is a man constantly on watch for columns of smoke which indicate the beginning of a forest fire. When smoke is seen a message is telephoned to the ranger station nearest the fire, and from this station men are sent as quickly as possible with the object of putting

STOP
Forest Fires

They are a Curse to the People of Pennsylvania

FOREST FIRES DESTROY

- Existing Forests
- Possibility of Future Forests
- Possibility of Labor
- Beauty of a Region
- Comfort
- Homes
- Lives
- Prosperity

Protected Forests Increase in Value

They Furnish Labor, Promote Industry, Afford Recreation and Sport, Make a Region Beautiful, Make Homes Safe and Comfortable, Make Life Worth Living, and a Prosperous State Inhabited by a Contented and Industrious People.

Which Would You Rather Have

FOREST FIRES		GREEN FORESTS
FLOODS		PURE WATER
DISEASE	OR	HEALTH
DESTRUCTION		THRIVING INDUSTRIES
DEVASTATION		PROSPERITY

For Information Respecting Pennsylvania Forests and Tree Planting, write to

COMMISSIONER OF FORESTRY,
Harrisburg, Pennsylvania

This large poster, printed on sheets 14 by 22 inches, has been of excellent service in Pennsylvania.

American Forestry

The seed trees left by the lumberman are giving rise to a new forest.

out the fire before it spreads beyond the power of control. The forests are now watched so carefully that hundreds of fires are thus stopped before there has been any serious loss of timber.

In convenient places the rangers store boxes of tools, which include axes, picks, shovels, and rakes to be used in fighting any near-by fire. They also have at hand provisions and camp outfits, so as to be able to live anywhere in the woods.

In some parts where there is a great deal of small timber and brush, "fire lines" are cut along the ridges where it is easiest to stop a fire, should one occur. Our forests are so vast that it is not possible to remove the dead wood as is done in Europe and thus lessen the danger of fire.

The forest rangers also wage a warfare against insect pests. In regions where the bark beetles carry on their

destructive work among the pines, the rangers sometimes cut down and burn thousands of trees. Another duty of the rangers is that of replanting burned or logged-off areas. In this way many thousands of acres which would otherwise remain waste land for years, not being suitable for agriculture, are made in a short time to produce a new forest.

A limited number of cattle and sheep are allowed in those forests which can be pastured without doing injury to the young trees or affecting the flow of the streams. The rangers have charge of this work and collect the rent. A part of the money derived from the sale of timber and for pasturage rights is expended in the improvement of the roads and trails in the forests and in making the forests more safe from fire.

The National Forests are open to all for pleasure and recreation, but under strict regulations about the cutting of trees and the care of camp fires. Violators of these rules

H. W. Fairbank.

A beautiful grassy meadow in the Sierra Nevada Mountains.

are severely punished. Visitors to the forests are expected to take care in the selection of places for their camp fires so that there will be no danger of the fire spreading. When the camp is left, the fire must be put out with water or covered with earth.

Many states have forest services of their own, and some have conservation commissions. It is the business of these organizations to look after various natural resources, including the forests, water, soil, minerals, and wild game. All forest rangers as well as state fire wardens are authorized to aid in the enforcement of the game laws.

We should assist the foresters and wardens in every way possible. Most of these men love the woods, the birds, and the animals. They are doing their best to protect the forest and its wild life for the good and happiness of us all.

CHAPTER TWENTY-ONE

OUR FOREST PLAYGROUNDS

What does he plant who plants a tree?
He plants the friend of sun and sky;
He plants the flag of breezes free;
The shaft of beauty, towering high;
He plants a home to heaven anigh
For song and mother-croon of bird
In hushed and happy twilight heard —
The treble of heaven's harmony —
These things he plants who plants a tree.

What does he plant who plants a tree?
He plants cool shade and tender rain,
And seed and bud of days to be,
And years that fade and flush again;
He plants the glory of the plain;
He plants the forest's heritage;
The harvest of a coming age;
The joy that unborn eyes shall see —
These things he plants who plants a tree.

What does he plant who plants a tree?
He plants, in sap and leaf and wood,
In love of home and loyalty
And far-cast thought of civic good —
His blessing on the neighborhood
Who in the hollow of His hand
Holds all the growth of all our land —
A nation's growth from sea to sea
Stirs in his heart who plants a tree.

H. C. BUNNER,
The Heart of the Tree; in *Century Magazine,* April, 1893

OUR National Parks and Forests form the grandest summer playgrounds that any people have ever had. The National Forests, we have learned, were set aside for the direct purpose of preserving the timber supply and regulating the flow of the mountain streams. The National

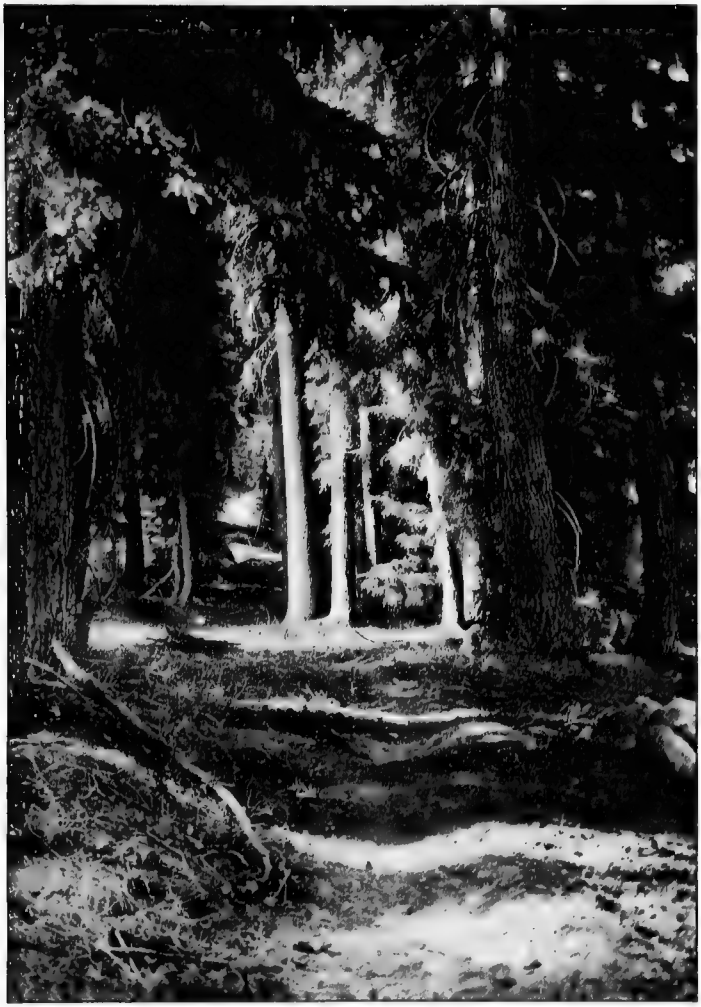
Parks were created for the purpose of preserving for all time the most beautiful and attractive scenic features of our country. Among the most important of these are the Yellowstone, Grand Cañon, Yosemite, Rainier, and Crater Lake parks. They include many thousands of square miles of forested mountains, cliffs, lakes, waterfalls, and rivers, which are open to all of us with no restrictions except that we do not injure them.

How delightful it is to have these wild and picturesque parts of our country left unspoiled and just as Nature made them, and to be able to wander through them at will! In the parks we can become acquainted with the flowers, trees, birds, and animals as they were before the country was discovered and settled by white men. Here the wild creatures are protected from the hunters. The deer no longer fear the sight of men, and the mother grouse can raise her brood in safety from them.

When summer comes we feel a strange and mysterious longing to get out of doors and live in the forests with the wild creatures. The parks offer just the opportunity to satisfy this longing, for in them we can get away from the worries and perplexities of our everyday life.

We feel the "call of the wild," perhaps, because long ago our savage ancestors dwelt in the forests among the hills. They were a part of Nature and lived much as the animals do in caves in the hillsides, or in homes of the rudest sort made of the bark of trees or the skins of animals.

Our ancestors spent nearly all of their time out of doors in the pure, fresh air. Their eyes and ears were trained to every sign of the forest, for upon the sharpness of their senses their very lives depended.



George J. Young

A forest playground on Virginia Creek in the Yosemite country, California, in one of Uncle Sam's forest reserves.

We have lived in houses so long, where the air is often close and impure and where we have no need of sharp senses for protection, that we have lost some of the strength and sturdy self-reliance of our wild ancestors.

We have become partly dulled to the beauty out of doors, because we have been so constantly employed by the business of making a living. But the forest playgrounds are calling us to return for a little time each year to the wilds that were once our home, and to renew our acquaintance with the trees, the streams and the rocks, and with the wild creatures that live among them. To be able to make our beds on the leaves under the trees, and to build a fire of sticks and cook our own food, seems quite natural and like old and familiar times.

The stories and legends that have come down to us about the forests and the imaginary people who lived in them were believed to be true by the people of long ago. The deep, dark woods once covered nearly all Europe where our ancestors lived. To be lost in the woods was to be in danger of meeting the strange and mysterious people who were thought to live in their depths. Among these beings, some of whom were good and others bad, were fairies, nymphs, gnomes, and ogres. When people ceased to believe so much in these stories, they began to lose their fear of the woods. Among some of these people there grew up a love and fascination for the trees which they believed were the dwelling places of spirits or divinities.

If in our great forest playgrounds we can lead this out-of-door life for a few weeks each year, it will make us healthier, stronger, and happier. We no longer fear any mysterious creatures in the woods or the forces of Nature as shown

in the lightning, the winds, and the waterfalls; but year by year we are finding more to love and admire in the wild scenery of the woods and mountains and in their animal and plant inhabitants.

The wild woods call many of us on jaunts and picnics when, if it were not for them, we should stay at home shut up in stuffy rooms. In time may not the love of the forest wilds come back to us all? May not the time come when each one of us shall be able to look at a beautiful tree and not think only of how much lumber it would make? May not the time come when we may hear the grouse drumming its call and not feel the desire to kill and eat it?

If the time does come in which we think as much of our beautiful mountains as the people of Europe do of the Alps, we shall then guard them with far more jealous care than we do today. In spite of the fact that the Alps are wet and cold and that no one thinks of sleeping out of doors there, yet the people of Europe love their mountains almost passionately.

Our mountains are much more attractive summer playgrounds than the Alps. We can wander at will over a far greater number of untrodden ways than Europeans can in the Alps. We can make our beds under the trees with rarely a thought of the weather. The air is always balmy and the skies are almost always blue.

CHAPTER TWENTY-TWO

WHAT IS HAPPENING TO THE WILD FLOWERS

How eagerly we have looked forward to the coming of spring, and now it is here! The sun is shining brighter and warmer each day. The birds are returning from their winter home in the South. The buds on the trees are swelling and, in the warm nooks, some of the wild flowers have already opened their delicate petals. Who will find the first *spring beauty* in the Eastern woods? Who will find the first of the *purple trilliums* that open their dark flowers in the shady groves, or the *golden poppies* on the warm hillsides of the West?

The spring air affects us as it does the plants and wild creatures. We long to get away from school, and taking our lunches, to spend the delightful days wandering through the fields and woods. There is no place like the open country when all Nature is waking. We feel like running and frisking as the young lambs do.

Can it be wrong to gather all that we wish of the beautiful flowers with which the earth is carpeted? Has not Nature grown them in her great garden in such abundance that all we pick will make no difference to her? Let us go with the children on their rambles after flowers and learn if Nature does take any account of their innocent raids on her treasures.

Here is a party of children chasing across the fields. Each one is searching for the flowers that have bloomed since last they were out, and each is trying to get more than his companions. The children have learned that some kinds of flowers grow in the woods, others in the marshy places,

and still others on the dry hillsides. They know where to go for each kind, and not a spot escapes their sharp search.

Here they find a patch of violets, and all are quickly picked. There are some baby-blue-eyes, and yonder dry field is brilliant with the colors of many others. In the gathering of the flowers some of them are pulled up by the roots, but the children do not think of the harm this does. They wander on and on until many have more in their hands than they can carry. Some of those picked first are already wilted, and, to make their burdens lighter, the children throw these away. At last a tired but happy band turns toward home.

H. W. Fairbanks

The wild oxalis loves the moist, shady places.

What will be done with all the flowers that have been picked? In each home the vases are filled and the tables decorated. There is no room for all of them and some are thrown out. These flowers, once so fresh and bright as they nodded in the breeze, now lie crushed and wilted on the ground.

Another spring returns and the children are out again

looking in the familiar places for the flowers they know so well. But there seems to be something wrong, for there are not so many as there used to be. The children have to go farther and search more carefully to get their arms full.

Still a third spring comes and the children are just as ready for the happy excursions and just as anxious to get the flowers. They hunt the fields over, but in the places where the flowers used to be so thick there are only a few scattering ones. They cannot understand what is wrong, but Nature could tell them if they would ask her. The year before she was short of seed, but this year it is much worse, for she had hardly any to plant in her garden. She is short of bulbs also, and of many other plants that grow from year to year, for the children carelessly pulled these up.

H. W. Fairbanks

Wild asters cover the mountain meadows.

The children do not want to go home with only a few flowers, and so they wander farther into the country than they have ever been before. Here they find them as abundant as they used to be near home.

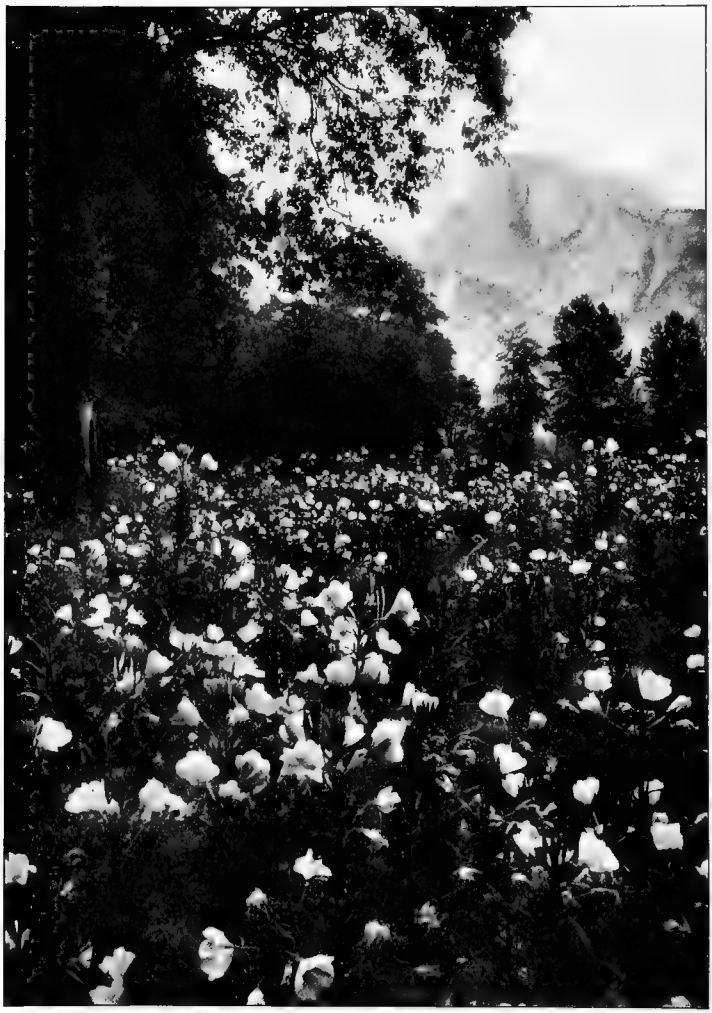
The children do not stop to think that at the base of the bright, fragrant blossoms grow the seed that will make the flowers of the next year. Nature can spare the seed of a part of the blossoms, for she grows many more than she needs; but if we pick them all, what can she do for the coming year?

The wild flowers are living things struggling for a place in the world, just as are the animals and birds. We cannot abuse and destroy too many of them if we would have them stay and add to the beauty of our homes. Should we not take just as much pleasure in gathering the flowers if we did not bring home more than we needed? Would it not be better to be satisfied with smaller bouquets and leave enough in the fields to go to seed and gladden us next year?

The reckless gathering of wild flowers has gone on so long and they have been picked so closely about many of our towns and cities, that they are disappearing. When there are no longer wild flowers within reach of the children who live in the cities, they will have lost a great joy out of their lives.

There are besides the flowers of which we have been speaking other low plants of beautiful foliage with which we love to decorate our homes. We must take care that these are not gathered too closely or they also will become scarce. We cannot go out into the woods and pull up ferns by the roots year after year and expect Nature to keep up the supply.

The huckleberry is one of the many beautiful shrubs



Thusbury's Pictures, Inc.

Nature has grown flowers in abundance, but we should not pick or destroy too many of them.

which we admire for its delicate leaves and colors. It is cut and brought in from the country in huge bundles to supply the florists. The time will come when these decorations can no longer be had if the men are allowed to cut all they can find. Just as in the case of the flowers, seekers for them will be obliged to go farther each year and by and by the shrubs will be so scarce and high priced that we shall be obliged to do without them.

We hunt far and wide for the beautiful "holly berries", with which to decorate our homes at Christmas. When we have found a berry-laden bush, we eagerly break off the branches and bear them home in triumph. The bush, once so gay with berries, is a sad-looking thing when we are through with it. The branches are broken so far back that next year it will bear few berries and we shall have to seek another.

We treat the beautiful earth on which we have been placed in a most thoughtless manner. We think only of what we want *now*, and forget that another year is coming in which also we shall want some of the earth's treasures. If we take only the surplus which each year produces, there will always be enough for us and for the people who live after us.

CHAPTER TWENTY-THREE

NATURE'S PENALTY FOR INTERFERING WITH HER ARRANGEMENTS

NATURE seems very prodigal in her ways. She is continually creating on the earth a great multitude of living things, far more than there is room for. Each one of these, if it would live, must have a certain amount of air, sunshine, and food. As there is not enough of these things to supply every one, there arises a struggle. Those that are weakest die, because they are not able to get what they need. To us this seems hard, but it is Nature's way.

And further, since many of the animals feed on the flesh of other animals, the latter have, in addition to the struggle for their food, to watch constantly for their lives. Every organism is in one sense the enemy of every other one. We do not mean that they often try to kill each other because of hate, as men do, but that they are after food to satisfy their hunger. Some of the higher animals as well as men fight for mastery, in addition to struggling for food. We hope that among men the unnecessary fighting will sometime cease, and that kindness and unselfishness will rule.

The struggle for life is ceaselessly going on around us, but so quiet is it that we are not often aware of the countless tragedies that take place. This struggle extends from the plants and animals in the pond, so small that we cannot see them with the unaided eye, upward through all the larger animals.

The struggle among all living things helps us to understand the necessity for Nature's prodigality. If the plants and animals that serve as food for others were not produced

in great numbers, they would soon become extinct. It is seldom that any one kind of plant or animal, because of its many enemies, has an opportunity to spread and obtain more than its share of food and sunshine. According to Nature's arrangements, each organism does its share in keeping down the numbers of the others. This we call the "balance of Nature."

Sometimes the balance of Nature is disturbed and one particular kind of animal gets the start of its enemies and increases until it becomes a *plague*. This may be caused by a favorable season or by the decrease of its enemies on account of disease among them. We have read of the plagues of grasshoppers which have sometimes visited the Western states and eaten up every green thing. Plagues of rats and field mice have been known to do a great deal of damage. In such cases their natural enemies, the hawks, owls, and coyotes, may be attracted to the region from far around, because of the extra food supply. After a time they may succeed in reducing the numbers of these pests.

This balance among the animals, which comes from one living upon another, is a strange and wonderful thing. No one kind can long overrun its fellows. If one does get a start and increases until it becomes a pest or plague, some enemy is sure sooner or later to spring up to destroy it. We use this method in fighting some of the insect pests which are injuring our trees. Men have searched in various parts of the world from which such pests as the gypsy moth and the San José scale have come to find some of their enemies and bring them to this country to feed on these insects.

When men came upon the earth, they soon began to

upset Nature's arrangements, and from that time until now matters of this kind have been growing worse. We have killed large numbers of the beneficial animals and birds that kept the harmful ones in check. We have carried others from the homes given them by Nature, where they were doing little harm, to new homes where they have become terrible plagues.

The killing of large numbers of hawks and owls, all the species of which many people have wrongfully thought to be harmful, has been followed by a great increase in the numbers of rats and mice. We have killed off most of the coyotes, the chief food of which was rabbits and ground squirrels. The two latter animals have now become a serious pest. They do enormous damage to the crops, and we spend thousands of dollars fighting them.

The common rabbit has in most parts of its native country so many enemies which are always on the lookout for a good meal, that it cannot increase enough to do much harm. Years ago a number of rabbits were taken to Australia, where there were none. Here they found a favorable climate and few enemies. They have now increased so that they overrun much of the continent and are a terrible pest which the farmers are unable to control.

Some years ago the gypsy moth and the browntail moth were introduced by accident into the New England states. Finding there a congenial climate and few enemies, they increased rapidly. They soon began to strip the leaves from the beautiful elms which make the streets and parks of this region so attractive. Now these moths have turned their attention to the white pine and are doing an ever-increasing amount of damage; and although they are being

fought by every means in our power, we are not certain that we can ever control them.

The codling moth, whose larva is the little apple worm, causes an immense loss in our fruit orchards. The cotton-boll weevil, which destroys so much of the cotton, is, like the codling moth, an insect imported from another country. The San José scale reached California from China and has now spread throughout our country. It has a special fondness for the sap of fruit trees, and, being so small, was not noticed until it had got beyond control. This scale causes more loss than any other of the tree insects.

The Hessian fly, introduced from Europe more than one hundred years ago, causes during certain seasons a very great loss to the wheat crop. The Argentine ant has been brought to us from South America and is proving a most destructive pest. The Norway rat was brought to our country on sailing vessels and causes more loss than most of us realize. The English sparrow has spread over much of the country and is driving many of the native birds from their homes, because of its quarrelsome disposition. It makes itself a nuisance on all our city streets.

The mongoose, in its home in India, is a great rat killer, but does not there increase so as to do much harm. Wherever it has been carried for the purpose of using it as a rat killer, this little four-footed animal has become a terrible scourge. After it destroys the rats it goes after the snakes. Then it attacks the other small animals and birds. Finally it begins upon the chickens, and even the vegetables in the garden are not safe from its voracious appetite.

Men are now watching at every port to see that no more dangerous insects and animals are brought into the country.

They are particularly on the watch for the Mediterranean fruit fly and for the mongoose.

When we upset the balance of Nature, we start a whole chain of troubles. What can we do to escape the consequences of our ignorance and carelessness? In the first place we can protect the birds, for they eat enormous quantities of the harmful insects. In the second place we can see that no more of these dangerous pests are allowed to land on our shores. In the third place we shall have to fight, by every means that we can discover, those that are already here.

CHAPTER TWENTY-FOUR

WHAT SHALL WE DO WHEN THE COAL, OIL, AND GAS ARE GONE?

If coal, oil, and gas were suddenly taken away, all the nations would become poor and many of their industries would cease. Just think for a moment of the amount of work these things do for us and what an effort there would be made to find something to take their place!

Wood once formed the chief fuel. It was used only to cook our food or to keep us warm. Now fuel is required for so many different purposes that with the decrease of the forests wood has been found insufficient.

Peat is one of those substances that has been used in parts of Europe to take the place of wood, but it is used so little in our own country that many have never seen it.

Peat is dug from bogs or marshes. We might say that a peat marsh is the beginning of a coal bed. Peat is the partly decayed vegetation which has slowly accumulated in wet places. In the colder countries it is formed largely of moss and similar water-loving plants, but where the climate is warm other kinds of marsh vegetation, and even trees, aid in forming peat. Sometimes floods bring earth and deposit it in the marshes, in which case the peat is less suitable for fuel, but forms a rich and productive soil instead.

In many of the vast swamps of long ago, when there were no men nor even the higher animals upon the earth, vegetation grew very rank. It is believed that at that remote time the air contained more carbonic acid, a substance

which promotes the growth of plants. Thus the plants in the warm, moist parts of the earth grew more densely and luxuriantly than they usually do today.

In the decay of this vegetation deposits similar to the peat marshes were formed, but they differed in being much thicker and more extensive. If the story of these ancient peat marshes had stopped here, we should never have had any coal. Fortunately it did not, for some of the swamps sank beneath the water of a lake or ocean and thick beds of gravel, sand, or clay were deposited over them. While buried deep in the earth, the decaying vegetation was heated and pressed together by the great weight of the earth above, and was finally changed to shining, black coal.

After the coal was made, but before men came to the earth, parts of the sea bottom with its buried treasures were raised to form hills and mountains. Then the rain-water began its work upon the slopes, and after a time washed away so much of the overlying material that the coal was exposed at the surface. At last through some accident, such as lightning perhaps, men learned that this black substance would burn. Coal was little used, however, as long as there was an abundance of wood and the needs of people were few.

As manufacturing and the use of the steam engine increased, coal grew in value. The business of mining coal finally became one of the great industries. The mining operations were carried on as carelessly as though the supply in the interior of the earth were inexhaustible. In the underground working it is customary to leave about one quarter of the coal in the form of pillars for the purpose of supporting the roof. At a little more expense other mate-

rials could be substituted for these pillars and all the coal could be taken out.

In using the coal we waste about another quarter. Stoves and furnaces are usually built so poorly that a large part of the value of the coal escapes as gas and smoke. In large cities and manufacturing districts the smoke becomes a great nuisance. In the making of coke from coal, enormous quantities of coal tar and gas have been lost. Most engines consume a far greater amount of coal than they should in doing a given amount of work. Most of us do not know how to use coal economically in our homes, and thus aid not only in wasting the coal supplies but in making the cost of living higher than it should be. All together, in the handling of coal we lose fully half of it. The coal supply of the earth is disappearing very fast, and at the rate at which its use is now increasing it may not last more than one hundred years.

If we cannot use coal without wasting so much, would it not be wiser for us to turn our attention more fully to the sources of power in the streams which are flowing down all our mountain sides? The use of this power when turned into electricity would enable us to save a large part of the coal, oil, and gas that are now used, and so make them last longer.

It is far easier to waste oil and gas than coal, for, when we have drilled holes in the earth, unless we are very careful the gas will escape into the air and the oil will become mixed with water, so that it will be difficult for us to get it.

Oil and gas are confined under great pressure hundreds and often thousands of feet below the surface. To make clear how easy it is to waste them, we might compare them

to the compressed air in an automobile tire. If the tire is punctured by a nail, the air issues suddenly with a sharp, whistling sound until the pressure inside is gone and no more will come out.

For many years we have been puncturing the crust of the earth, where oil has been discovered, and letting the oil and gas escape. We have saved most of the oil, but nearly all the gas has been wasted. The gas will finally stop coming out when the pressure is gone, just as the air did in the automobile tire.

On the opposite page is a picture of a "gusher" in the Sunset oil field, California, which tells the story of how we are permitting the valuable substances within the earth to be wasted. In drilling this well the oil men suddenly struck a deposit of oil and gas under great pressure. The drilling tools were blown out of the well and a column of oil and gas shot up 150 feet. For a time the well flowed forty thousand barrels of oil each day, and an unknown quantity of gas. Much of the oil was scattered around the surrounding country, and all the gas was lost. Men worked for weeks making reservoirs of earth in an attempt to save the river of oil.

Another well a few miles distant struck an enormous quantity of gas. It blew off for days with a roar like that of the steam from a giant engine. Then it took fire, and the column of flame at night was a fearful sight. There was gas enough lost from this one well to light a city for months.

Gas has been escaping during many years from hundreds of wells in the Pennsylvania, Ohio Valley, Oklahoma, Texas, and California oil fields. The gas from all these wells to-

Myrt's Studio, Bakersfield, California

A "gusher" in a California oil field wasting great quantities of oil and gas.

gether has been estimated to be equal in value to a river of oil flowing several hundred thousand barrels each day. In many districts the gas was nearly gone before people discovered its great value. It is impossible for us to realize the waste which this represents.

It has taken Nature a long time to make the oil and gas which we are losing. When she began this work, the oil regions which have been mentioned were beneath the sea. In its waters lived countless numbers of minute organisms, as well as fish of many kinds. As they died, their bodies accumulated in beds which finally became thousands of feet thick. Then the currents of the water changed and sand and mud were washed over these beds, burying them deeply.

Finally the bottom of the sea was lifted and became dry land. The movement squeezed and folded the rocky layers made of the skeletons of the animals and plants. The soft parts of their bodies held in these rocky layers produced a greenish or brownish oil and gas. The gas tried to escape from the rocks, for they were hot and it wanted more room. In some places it found openings through the rocks and escaped to the surface, usually bringing some of the oil with it. The gas was lost, but a part of the oil remained, forming deposits of tar. In other places the oil and gas could not reach the surface, but found porous, sandy rocks into which they went and remained until the oil driller found them.

The tar springs, or "seepages," indicate to the oil prospector where deposits of oil may possibly be found. He examines the country about and, selecting a favorable place, drills a well. If he is successful, he will strike oil-bearing

rocks. The oil may be a few hundred feet below the surface, or it may be a mile below. In the latter case it takes months to drill the well.

If a robber came and attempted to take by force the coal, oil, and gas which we are daily losing through our carelessness and indifference, even though he might put it to better use than we put it, there would at once go up a great cry. We would raise an army and fight for our property, and perhaps suffer great loss in defending it. But, day by day, without making any serious objection, we are letting these natural resources go to waste.

Perhaps in some far-distant future, after we have used up the stores of fuel in the earth, we may discover something to take its place; but wise and thoughtful people should make the most of what they have.

CHAPTER TWENTY-FIVE

NEED FOR PROTECTION OF CREATURES THAT LIVE IN THE WATER

PERHAPS you think it is absurd to talk about caring for the creatures that live in the water, since they can so easily hide away in its depths where we cannot follow. Perhaps you think that because the ocean is so great it would be impossible ever to catch all the fish that live in it. It is easy to understand how all the fish might be caught out of the creeks, rivers, and shallow lakes, since fish are hungry and we put before them such attractive bait; but with the ocean it seems different. It stretches so many thousands of miles and is so very deep that there does not appear to be any danger of exterminating the animals of the ocean as we have some of those of the land.

Is it true, however, that all the vast waters of the ocean are full of fish, or are they found only in certain parts? The fishermen can tell us about this matter. They know where to set the hooks and nets, and where they are most likely to get a good catch. They do not go far out where the water is deep but seek, instead, the shallow waters near the shore or about the reefs and islands. They know that the deep water of the ocean contains very few fish and none that are of any value as food.

Each kind of fish has become adapted to certain parts of the ocean, for both the food supply and the pressure of the water differ with different depths. Fish caught in deep water are often dead before reaching the surface, because of the decrease in the water pressure.

One reason why fish are not numerous far out in the ocean

is because there is little food to be had there. The reason no fish are found in the very deep parts of the ocean is because the water there contains no air particles. Strange as it may seem, although fish breathe water, they cannot live unless it contains oxygen from the air.

The fish, then, that interest us because of their value for food, are found only in the shallow waters usually near the shore and in the lakes and rivers. Because of this fact it is possible, as we have learned from experience, to set so many traps and use so many nets and hooks as entirely to destroy certain species.

The fish have their natural enemies, and there is warfare among them just as there is among the land animals. The larger and more powerful live upon the smaller ones, but, seemingly to make up for this, Nature has given the small fish quickness of movement — which the large fish do not possess — to aid them in escaping. They have also the power of increasing very rapidly. The little herring, which is the chief food of many of the large fish, maintains its countless numbers against all its enemies except the fishermen.

The Indians, with their crude traps, hooks, and spears, could obtain but few fish at a time and did not reduce their numbers. But civilized man, with his cunningly contrived hooks and nets, has the same advantage over the fish that the hunter, with his repeating gun, has over the land animals. Nature, not foreseeing how destructive man would be, has armed neither the creatures of the land nor the creatures of the water against him.

The fisherman does his work just as thoughtlessly as the hunter whose business it is to supply the market. He seems

Edward S. Curtis

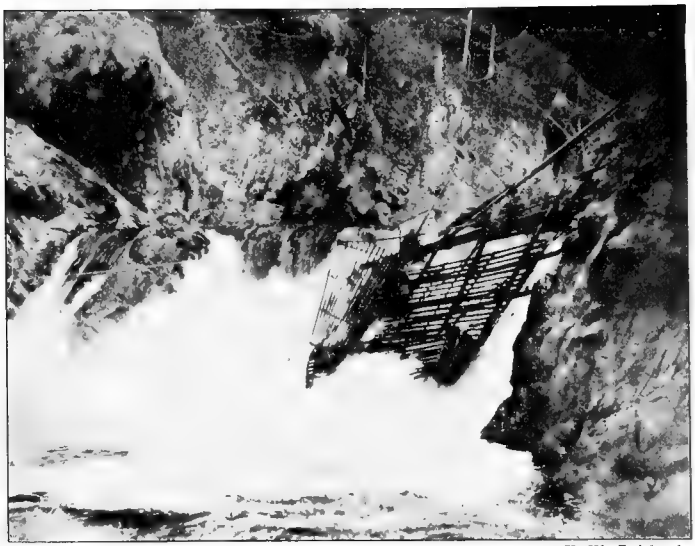
A rocky island in the Pacific Ocean, used by seals as a sunning place.

to think no more about the effect upon next season's supply, of his stretching a net across a river and catching all the fish going up to spawn, than does the market hunter who would, if he could, shoot the last duck. Is it not strange that many fishermen will do anything in their power to evade the laws governing the catching of fish when by doing so they injure their own business?

We have already nearly destroyed the mammals that live in the ocean. Among them are the whales, which were once numerous in the arctic regions. Few whaling ships now arrive with profitable cargoes of oil or whalebone. The sea otter, the fur of which is more highly prized than that of any other animal, and the walrus, valuable for its oil, are also nearly extinct.

No more cruel hunting was ever carried on than was that of the seal mothers in the open ocean where they go in search of food. When the mothers are killed the young ones, left in the rookeries upon the Pribilof Islands, soon die of starvation. The fur seal has thus been so reduced in numbers that it was threatened with extinction. Now Russia, Japan, England, and the United States have agreed to stop all killing of the fur seal for a number of years.

As a result of the great demand for fish, and the careless methods used by the thousands of men engaged in catching them, Nature unaided cannot keep up the supply. For the purpose of assisting her, strict laws have been passed in many states. These laws prohibit fishermen from stretching their nets or weirs across the streams so as to block the passage of the fish when going to their spawning grounds. They also prohibit the taking of undersized fish and in some cases allow none at all of some kinds to be taken for a given



H. W. Fairbanks

An Indian fish trap.

time. Our government is now doing a great deal to save the food fishes of the country, but some varieties are still decreasing.

The little herring is the most valuable of all the sea fish. Enormous numbers are captured in nets, and still greater numbers form the food of other fish. The herring has so many enemies that it must increase rapidly in order to hold its place in the sea. Nature has arranged that this fish should produce twenty thousand or more eggs at each spawning season. It is thought that if only two eggs out of this great number hatch and grow up, the supply of herring will be maintained. This estimate does not, however, take into account the present terrible waste of herring in

the Chesapeake and other bays on the Atlantic coast, where it is taken in nets and used for making land fertilizer. Is it any wonder that the herring is now decreasing in numbers?

The oyster was once hunted so closely that it would have disappeared from our coast waters if the young had not been taken and raised artificially. Is it not interesting to know that we plant young oysters on oyster farms, and raise oyster crops, all below the level of high tide? The greatest oyster farms in the world are upon Chesapeake Bay. There are also oyster farms in other bays upon the Atlantic seaboard, and lately the oyster has been transplanted to the bays upon the Pacific Coast.

The lobster was trapped so industriously that it also began to grow scarce. Finally the government took up the matter of protecting it. The eggs and the young were guarded, and now it is increasing in numbers.

Once the sturgeon was very plentiful in the lakes and rivers of our country. For a long time it was thought to be of no value and was thrown away when caught in nets set for other fish. Then it was discovered that its flesh was delicious, and its eggs, known as *caviar*, became a very fashionable dish. After this there followed a period of most destructive fishing, and now sturgeon are quite scarce and high priced.

Herring, shad, and salmon are migratory fish. By this we mean that they spend a part of their lives in the ocean but enter the bays and streams at the spawning season. You can readily understand that if the bays are blocked with nets the fish cannot reach the spawning grounds and their numbers must decrease. Chesapeake Bay contains such a maze of nets, many of them extending out ten miles

H. W. Fairbanks

A fish wheel on the Columbia River, in which salmon are caught on their way to the spawning grounds.

from the shore, that it is a wonder that any fish get past them.

The waters of New England were once filled with striped bass, smelt, salmon, and shad, but now these fish are almost gone. The shad are rapidly decreasing all along the Atlantic Coast. The nets in Lake Erie extend out sometimes ten miles from shore, and the whitefish as well as the sturgeon have been greatly reduced in numbers there.

When the Pacific Coast was first settled, the "salmon run" in the Sacramento, Columbia, and other rivers was a wonderful sight. The waters were fairly alive with these huge fish. Hydraulic mining so muddied the waters of the Sacramento that their numbers greatly decreased. Then came the fishermen and stretched their nets across the rivers, so nearly blocking the channels that the salmon were rarely seen on their old spawning grounds. Now salmon fishing is carefully regulated and salmon are increasing.

The shallow waters of San Francisco Bay, the ocean for some miles out from shore, and the waters about the islands of Southern California form very valuable fishing grounds, which, if they are taken care of, will furnish much larger supplies of fish than are now obtained.

The interesting discovery has been made that the waters around the islands of Santa Catalina and San Clemente form important spawning grounds for many food fish, including the great tuna. These waters were fished so destructively that many of the fish were found to be decreasing. This has led to the establishment of a fish preserve for three miles about Santa Catalina Island. Within this area no fish are allowed to be taken except with a hook and line. Some of the most valuable fish, which were almost

gone, are now becoming more numerous. The fact that the fish stay close about the island where the water is shallow makes the establishment of the preserve possible.

The salmon and halibut fisheries of the Alaskan waters have long been the source of much profit. This region, owing to the many bays and islands, fairly swarms with fish of many kinds. Protection will soon be needed here if this great storehouse of fish is to be kept filled.

The cod fisheries of the Newfoundland banks are among the most valuable in the world, and are almost the only ones where fishing has long been carried on and where the supply is not decreasing. The "banks" are formed by a great flat reef four hundred miles long, over which the water is shallow enough to offer a fine home for cod.

Hatcheries have been established in many parts of our country for the purpose of collecting and hatching fish eggs. These are used for restocking those waters that have been fished out. After the eggs have hatched and the young fish have reached a certain stage, they are shipped to the streams where they are needed. The United States fishery on the McCloud River, California, has distributed rainbow trout all over the United States. Shad and striped bass have been brought from Eastern fisheries and planted in Pacific Coast waters, where they are now rapidly increasing.

Thus we learn that valuable food fish live within certain narrow bounds instead of being distributed all through the waters of the globe. It is as easy, with our many ingenious devices of net and weir, to destroy the inhabitants of the water as it is to destroy those of the land with guns.

CHAPTER TWENTY-SIX

MAN MORE DESTRUCTIVE THAN THE OTHER ANIMALS

We have learned something about the struggle among the plants and animals for food and for room on the earth. We must not think, however, that this struggle is at all like the war that is carried on between different nations. Wars are usually unnecessary and do more harm than good, for they result in the loss of the strongest and best men. But the struggle among the animals and plants has resulted in good, for it has crowded out the weakest and those less fitted to live.

The struggle among all living things for food and a share of the sunshine has covered the earth with a far greater variety than there would otherwise be. Because so many more are born than there is room for, they crowd and elbow each other. Many are forced to make their homes in regions which they would not have chosen if they had been free to do as they pleased. It is partly because of this crowding that some of the animals which once lived on the ground became changed into birds and made their homes in the trees. A number of the mammals found more freedom in the water and finally became whales, seals, and walruses. Many moved into deserts and, in learning to live with very little water, developed curious bodies and habits. Some have found a home in the cold North, where they have become suited to a climate which would quickly kill those which had held their ground in the warm and moist tropical regions.

Nature has thus filled the earth with an infinite variety of living things, each of which is doing its part in making

the world beautiful and attractive. Man is Nature's last and most wonderful creation. He has learned to fly like the birds, to swim under the sea like the fish, and to harness Nature's forces and make them work for him. But man, with all his wisdom, has too often forgotten that he is really a brother to the lower creatures. The inhabitants of the air, the land, and the water could, if they were able to talk, tell the most pitiful tales of man's cruel treatment of them.

Of course we have to eat, as do all other living creatures, but for thousands of years people have supplied their wants largely from agriculture and from the domestic herds. Although very few of us now have to hunt for our food, and these few are those who live far out on the borders of newly settled regions, yet we have not forgotten the hunting instincts of our ancestors.

Our ancestors of long ago, like the savages on the earth today, seldom killed game unless they needed it for food. We, who think ourselves far better than they, now kill wild life for the pleasure of the chase. The professional hunter who seeks the glossy coats of the fur-bearing animals or the beautiful plumage of certain birds gives no thought to the wasted bodies that he leaves behind.

Since men have become civilized and their needs have become so many, Nature's arrangements have been seriously disturbed. She has not armed the wild creatures against men, who, with all kinds of marvelous weapons, are able to take advantage of them. The wild creatures discover very quickly that they can find little protection against this new enemy, no matter how quick and sharp their senses are.

The blue jay has only his sharp eyes to help him when he

seeks the cunningly hidden nest of another bird with the hope of being able to dine upon eggs. The breakfast of the wolf depends alone upon his quickness in catching a rabbit. The mountain lion depends upon his stealthiness when stalking a deer. The Indian relies upon his skill in imitating the call or the appearance of an animal when he tries to approach near enough to use his bow and arrow. Civilized men have lost much of the keenness of sight and hearing they once had, but they have far more than made up for this through their ingenuity in making deadly weapons.

We depend no longer upon the hunt for each day's supply of food. But the instinct to hunt which still remains we use to amuse ourselves while upon our camping trips. Some people even made a living by hunting for the market, although, fortunately for the wild creatures, little of this kind of hunting is now permitted.

The desire to get out of doors and live for a time each year among the wild mountains is another instinct which comes to us from our savage forefathers. This is a beneficial instinct, for life in the fresh air gives us new strength. The hunting instinct is not wrong in itself. It is the manner in which we hunt that is wrong. But how much finer it would be if, instead of using an outing as an excuse to destroy the wild creatures, we should use it to learn about them and their curious ways. How much more real pleasure there is in studying the habits of the denizens of the woods and fields than there is in killing them!

Many a boy wants to carry a gun, because he has read lurid stories of Indians and robbers, or of hunting in the jungles where lions and tigers abound. This often leads to the killing of harmless birds for the lack of bigger game.

Eastman Kodak Company

The only right way to hunt birds' nests — with a camera.

Boys should be taught either at home or in school the sacredness of life, and a feeling of pity and love for the wild creatures that are surrounded by enemies on every side. They should be taught that animals have feelings and that they want to live. They should be taught how wrong it is to destroy life uselessly. The nest of eggs or helpless young left to their fate through the thoughtless killing of a mother bird is a sight which must arouse the sympathy of every boy who has been taught what it means.

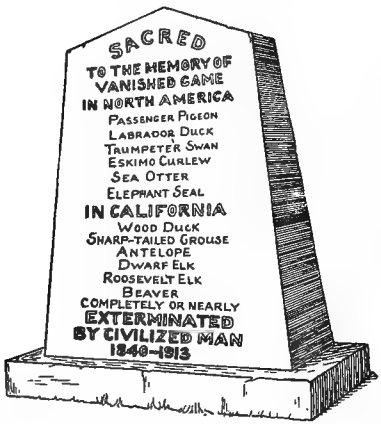
The killing of the mothers is the surest way to destroy a species. The laws in most of our states now regulate hunting during the breeding season and limit the number of wild animals or birds that may be taken in a given time. Whenever the numbers of any species become so reduced that it is in danger of extinction, all hunting of that species should be prohibited for a number of years.

We should feel sorry for those men who live in a civilized land and get the benefit of its advantages and yet are worse than savages at heart. If these men who are so wasteful of wild life could be stripped of their destructive weapons and sent into the wilds to make their living as savages do, they would soon learn to be more careful.

The animals prey upon each other because it is their nature to do so and because their lives depend upon it. Savages hunt because they must have food. We do not need to hunt, but, because of our higher intelligence, our hunting methods are far more destructive than are those of either animals or savages.

CHAPTER TWENTY-SEVEN

WHAT IS HAPPENING TO THE ANIMALS AND BIRDS



"There is no recovery of an extinct species. Conservation or devastation — which shall it be? Common sense demands the regulation of hunting in such a way that our wild life will persist as a permanent asset." *Western Wild Life Call*, published by the California Associated Charities for the Conservation of Wild Life.

NATURE has done more for our land than for almost any other. She has given it vast forests, fertile soil, favorable climate, enormous water power, many minerals, and a wonderful variety of animal life.

During all the centuries that the Indians lived here before the coming of white men, wild game furnished them their chief food, but in spite of this, the amount of game was not decreased. When our forefathers landed upon this continent, it fairly swarmed with animals and birds. With the clearing away of the forests and the settling of the prairies men could not help depriving many wild creatures of both their shelter and their food, but this was not the chief cause for their rapid decrease in numbers. Hunters followed them persistently into the wilder hills and mountains, and many, not needed for food, were killed for their furs.

Now we may travel for days through the remote and still unsettled parts of our country and see very little life of any

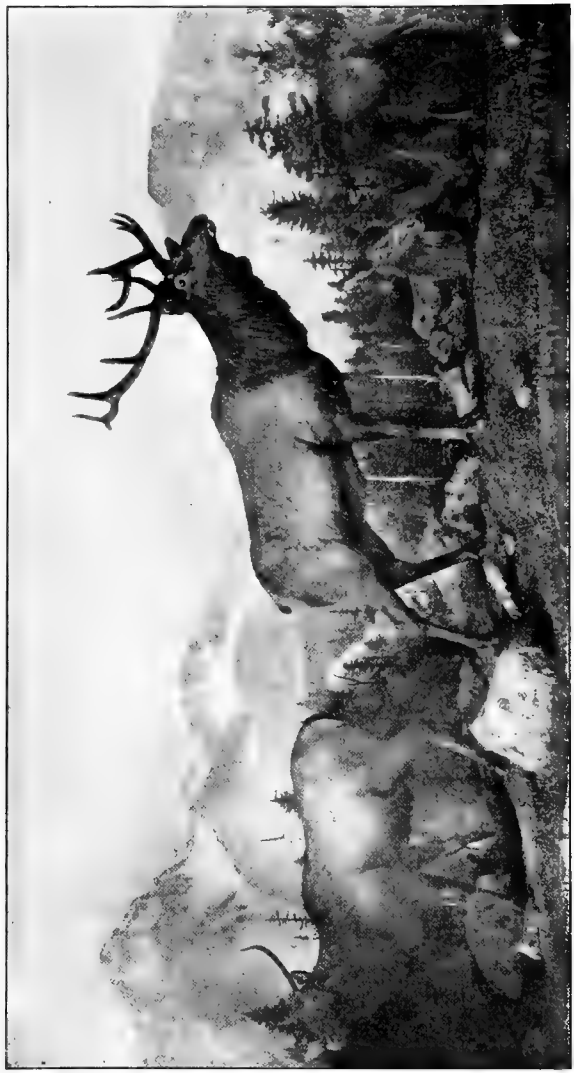
kind except birds and the smaller animals, such as squirrels. Occasionally we may start up a deer that flees away from us like the wind. Still more rarely we come upon a bear and are fortunate if we get even the merest sight of him before he is gone.

The fear of man has spread among all the wild creatures. There is good reason for this fear, because man has completely exterminated some species and so reduced the numbers of others that careful protection will be needed to save them. Travelers tell us that in those lands where man rarely goes the wild creatures have little fear of him.

The story of the slaughter of the buffalo is known to us all. Once this noble animal roamed from the Alleghenies to the Rocky Mountains. Countless thousands were killed merely for their hides, and other thousands were killed for sport. Finally, when they were almost gone, people awoke to the importance of saving them. Several small herds, not more than a few hundred in number, that had escaped

L. A. Huffman, Miles City, Mont.

Why the buffalo have nearly disappeared from the land.



American Museum of Natural History

A group of Roosevelt elk.

the hunters were placed under protection and now they are slowly increasing.

The grizzly, king of bears, was once abundant in parts of the Rocky Mountains and upon the Pacific slope, but now he is found only in the Yellowstone Park region. The man who killed the last specimen in California is proud of his great achievement.

Of all the elk which once spread over the western part of our country, only a few remain outside of the Yellowstone region. A protected herd exists in the San Joaquin Valley, California, and another small herd roams through the wilder parts of the northern Coast Ranges. The antelope, so common on the plains only a few years ago, are all gone except for small, scattered herds in the more remote parts of the West.

Of the many fur-bearing animals which once inhabited the Northwest, beavers were the most widespread and abundant. Their pelts were so valuable that they were used as money. For many years the trapping of these little animals was an important industry, until at last they were practically exterminated in every stream throughout the western half of the country. A few beaver are known to remain in the Yellowstone Park, where they are of course carefully protected. In Oregon a few escaped and have been carefully protected for some years. In certain places they are now quite abundant. In parts of New England and Canada they are now increasing under the protection of the game laws.

The sea otter, now extremely rare, is so highly valued for its fur that it soon may become extinct, although completely protected by law.

New York Zoological Society

A beaver and its lodge.

The passenger pigeon, whose flights almost covered the sky at times not more than forty years ago, and whose numbers seemed so great that no one believed it possible of extermination, is now gone forever. The extinction of these birds was due chiefly to their being slaughtered at their roosting places.

The California condor, one of the largest of birds, is almost extinct. The prairie chicken has disappeared from the prairies and plains. Certain species of grouse, and especially the sage grouse, mountain quail, and others, which inhabit sparsely settled regions, are thought to be still holding their ground, but should be more carefully protected. The valley quail is, however, much reduced in numbers; while ducks, geese, and smaller shore birds are decreasing with each succeeding year.

Even in the jungles of far-away Africa, where we would think the animals are exposed to little danger of extinction, some of them, such as the elephant, are in urgent need of protection. In the far North the great polar bear will not long survive unless rigidly protected.

Finley & Bohlman

A California condor.

What terrible scourge has so suddenly come upon the birds and animals that once adorned our country? How is it that in the short space of fifty years many of them have almost disappeared from their ancient haunts? We feel like hiding our faces in shame, for it is the same man scourge that for many hundreds of years has been destroying the forests, the animals, and the birds of many other countries.

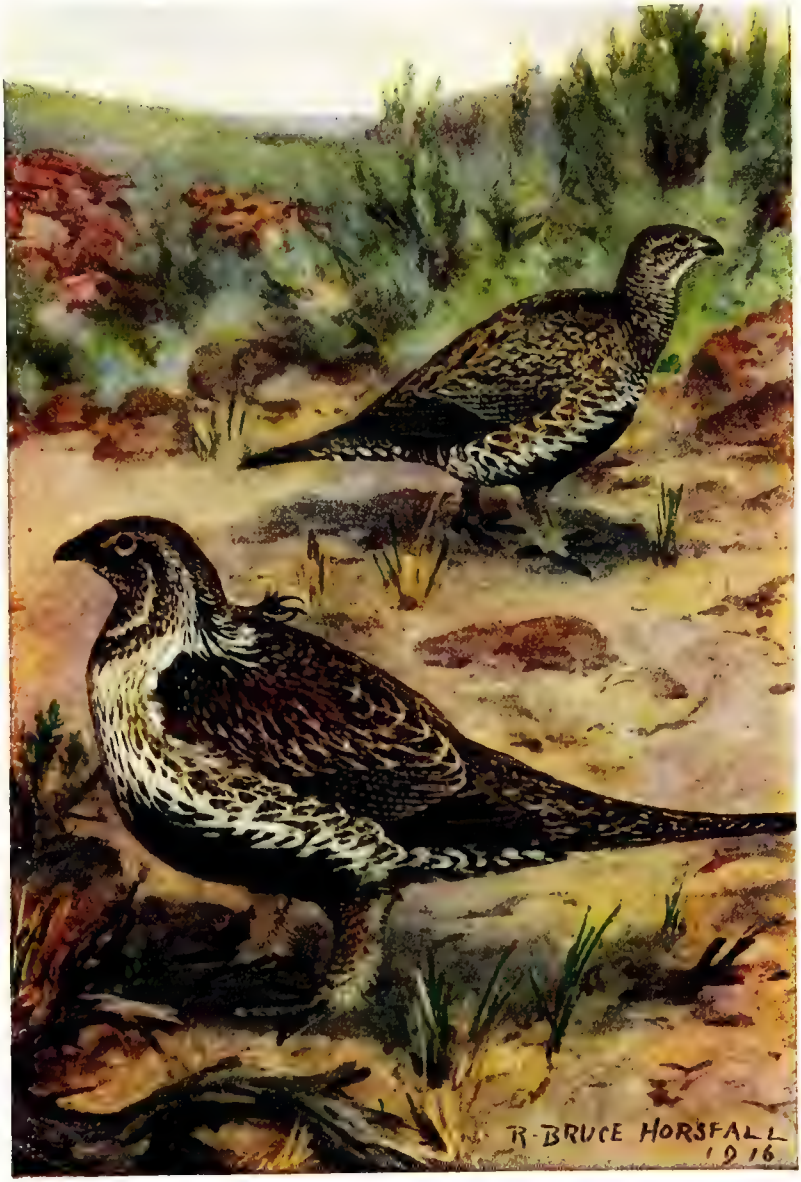
The helplessness of all the wild creatures before man's destructive weapons should arouse our sympathy, if nothing else does. Leaving out of account a few predatory animals that destroy large numbers of other animals, we should most earnestly try to protect those that remain.

The beauty of the birds, their sweet music, the companionship which they afford, and, last but not least, their great value to the farmer and fruit grower, should arouse our earnest efforts in their behalf.

In our country alone an army of five million men and boys go out to hunt wild creatures every year. The animals are so defenseless against man's weapons that it is not a fair fight, in which the quicker or sharper escape, but a slaughter.

If these hunters were savages armed only with bows and arrows, then the wild creatures would have a chance for their lives. Besides, savages do not kill for sport, nor do they purposely destroy Nature's most valuable gifts to them.

The forest that has been cut down will grow again. The soil that has been made poor will, if let alone, sometime become fertile again. But those species of birds, animals, and fish which we have completely destroyed will never be restored to us.



Nat'l Ass'n Audubon Societies

The sage grouse, which is in danger of extinction.

CHAPTER TWENTY-EIGHT

THE TRAGEDIES OF MILADY'S HAT AND CAPE

Our savage ancestors depended largely for food upon animals, birds, and fish which they obtained. They used the skins and furs for clothing and the plumes for decorating themselves. They allowed no part of the bodies of the animals they killed to go to waste.

We do not now have to depend upon the wild creatures for food, because our flocks and herds supply all that we require. But Dame Fashion has decreed that furs and feathers are still the proper thing to wear. Thus it has come about that those animals that have soft, furry coats and those birds that have bright plumage are hunted more eagerly now than they were long ago when food was the most important thing.

The demand for furs has always been great and the trapping industry has employed thousands of men ever since our land was discovered, but in recent years feathers have become almost as important. No region where fur-bearing animals have their lairs, or birds of beautiful plumage have their nests, is too far away or too difficult for the hunters and trappers to go and hunt.

The business of killing wild creatures for money makes beasts out of men and has led to most heartless cruelties. The savage, hunting for food, kills his prey at once; but the fur trapper with a circuit which takes sometimes a week to cover often has to leave his prey, tortured in the traps, until it starves to death.

If the wearer of that handsome warm fur coat could know what was, perhaps, the story of the wild creature to which it

once belonged, would she enjoy it so much? Could the wearer of that gay hat, for the making of which not only a mother bird, but perhaps a whole family of little ones, gave up their lives, take so much pleasure in it if she knew the history of its plumes?

It is not the desire for warm furs about our necks or for beautiful feathers in our hats that is wrong. It is the needless suffering that those who hunt and trap cause the wild creatures that we should be ashamed of and insist upon having stopped.

The work of the trapper and hunter is nearly done. These men have despoiled for money the life of a whole continent in a few short years. The fur-bearing animals, if hunted in moderation, would have continued to people the wilds for all time to come. But neither the wearer of furs nor the hunter has given one thought to their preservation.

In the getting of bird plumage for millinery purposes we find cruelties practiced which are almost beyond our belief. The lowest savage that ever lived on the earth could be no worse than many of our bird hunters.

Birds have habits which make them easier to kill than fur-bearing animals. Although the modern fashion for feathers began less than fifty years ago, the birds that afford bright and graceful plumage have already been nearly exterminated. Now most of them are protected in our country, and the sale of feathers from other countries is prohibited in our markets. But there are some places where the law is not enforced, as well as many other countries where there are no laws, and thoughtless women still wear plumes. To supply the demands of fashion all the remote lands as well as islands of the sea are being searched.

Finley & Bohlman

Young great blue herons in their nest.

The slaughter began with the bright-colored songbirds, terns, gulls, herons, egrets, and flamingos. Then it extended to other sea birds, including the albatross, to bright-colored tropical birds, and to the wonderful birds of paradise. How true is the following statement made in a millinery store:

"You had better take the feather for twelve dollars," said the clerk, "for it is very cheap at that price. These feathers are becoming scarce and very soon we shall not be able to secure them."

Here is milady's beautiful cape glistening with all the colors of the rainbow. Of what is this gorgeous thing

made? Would you believe it possible that it is formed entirely of humming birds' skins, with the heads and long, slender bills? Perhaps a thousand of the tiny birds were sacrificed that some woman might have a beautiful cape. Does it seem possible that any gentlewoman could wear this cape, who had any realization of the tragedies that had to take place in humming-bird life in order that it might be made? Could she wear this cape if she knew of the forsaken nests and the hundreds of dying young ones waiting for the mothers that never returned?

But more terrible, if anything, than the story of the humming-bird cape is the story of the delicate egret plumes on yonder hat. They once adorned the mother bird at nesting time in some far marsh. The feathers are almost perfect at this time, and to get them the bird must be killed. Each bunch of egret feathers represents a family tragedy, — a

Finley & Bohlman

Forster's tern or sea swallow on its nest. The wings and tail of this bird are used for millinery purposes.

nest of little birds left to die, because the mother has been sacrificed to satisfy the demands of fashion.

The plume hunters invade the nesting places of the egrets, herons, and flamingos, often leaving not a single bird in what were once happy colonies, except the starving little ones. Millions of these plumes have been obtained along our seacoasts and about the interior lakes and marshes. Is it any wonder that the egrets are nearly extinct as a result of this merciless slaughter?

Now, when it is almost too late, protection has been given these beautiful birds. Bird refuges have been established at different favorable points along the South Atlantic and Gulf coasts and in the Klamath and Malheur Lake regions of Oregon. These refuges are watched over by wardens, and we hope that the birds inhabiting them will thus be enabled to increase and again fill the almost forsaken marshes.

In our plea for the protection of the birds of attractive plumage, we must not forget those of the tropical jungles. Remote as many of these jungles are, the plumage hunter is devastating them already. The bird of paradise, found in the East India islands, will soon be extinct unless protected.

CHAPTER TWENTY-NINE

THE COURT OF THE ANIMALS AND BIRDS

ONCE upon a time, not very long ago, the birds and animals were brought into court to be tried on the charge of committing all sorts of misdeeds. Some of their accusers wanted to shoot them for food. Others said they did much harm and should be destroyed, while still others envied their beautiful coats of fur or feathers. To settle the matter fairly, the judge decided that each prisoner should be tried by itself.

The first case called was that of the English sparrow, who made such a noisy disturbance that the bailiff had to call for silence. All witnesses asserted that the bird was a foreigner and did not belong in this country. They further testified that the sparrow was a meddlesome, gossiping neighbor, always fighting the other birds and driving them away. The sparrow looked around, but not a single friend could he find. The court decided that he should be driven out and made the lawful prey of every one. He cautioned all present, however, always to be very careful to distinguish between the English sparrow and the other sparrows. The latter birds must on no account be molested, for they were without any exceptions most useful citizens.

In regard to the linnet the judge hardly knew what to say. The bird was shown to be a sweet singer, but very destructive of fruit. It was finally decided that a census of the linnets must be taken occasionally. Whenever their number was found to be so great as to endanger the fruit crop in any particular place, the farmers were to be allowed to dispose of a certain number.

The bobolink had many friends as well as enemies present. Every one that knew the bobolink in its summer home in the North insisted that this beautiful singer must be protected. But the people from the South, where it spends the winter, wished the privilege of shooting it. They said that its flesh formed a delicious morsel and also that in the rice fields, where it was known as the "rice bird," it did a great deal of harm. The judge refused to listen to the plea of the hunters and said that this attractive bird must be protected in both its winter and summer homes.

The turn of the blue jay came next. Every one wondered what the charge against this bird with the beautiful blue plumage could be. Some thought that he was on trial for his discordant screeching, which alarmed all the inhabitants of the woods. The charge against the jay was, however, far more serious. He had been caught while making his breakfast of some baby birds which a mother robin had just hatched. The quail and every other small bird present called for vengeance on this ruthless destroyer of their homes. The gardener also added that the bird ate his cherries and apples.

The jay now presented a strong defense, saying that most of his food was made up of harmful insects and worms. He proved that he did almost as much good as harm. The judge, knowing what a wise bird the jay was, told him to go but that he must thereafter look out for himself.

The family of hawks was next examined. There were many witnesses who declared that they were the most destructive of neighbors and lived entirely upon small birds and chickens. The songbirds all raised their voices against hawks, saying that when they left their nests to hunt for

food for their children, they were never sure of finding them alive upon their return. The judge inquired carefully as to the truth of these complaints, but found that only a few of the hawks were guilty as claimed. These included the peregrine falcon, sharp-shinned hawk, and Cooper's hawk. The other hawks proved that they were the farmers' best friends, for they waged endless war upon mice, rats, ground squirrels, gophers, and rabbits, and only occasionally caught other birds. They had evidence also that in those places where their numbers had been much reduced by the hunters, the small rodents increased enormously.

The court had to be held at night to accommodate the owls and give them justice. The judge decided from the evidence that, in this family as in the last, there were good

Finley & Bohlman

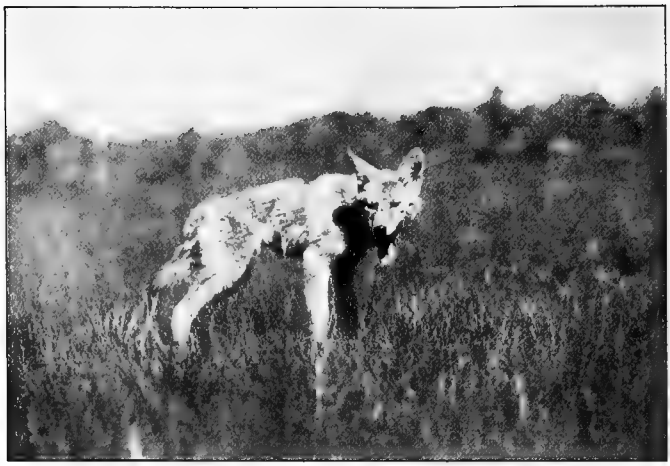
Full-grown young red-tailed hawks.

Finley & Bohlman

The screech owl at home. This is a well-known bird, of great economic value because it catches so many mice.

members as well as bad and he could not condemn them all to death. The owls proved that they were of even more benefit to the farmers than were the hawks, because of the large number of rats which they ate. The great horned owl and the barred owl only were singled out for punishment.

The case of the meadow lark was called next. An old farmer complained that this bird had destroyed his young grain. Then the hunters made the plea that the meadow lark was really a game bird and that they ought to be allowed to shoot it. In defense of these birds the stomachs of many of them that had been killed were shown in court.



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A coyote, one of the keenest-witted animals of the Western plains.

It was proved that two thirds of all their food was made up of harmful insects and that the farmers ought to be glad to have them about. It was further shown that if the insects killed by the meadow larks in one day in the San Joaquin Valley, California, were loaded on the cars and hauled away, it would take a train of twenty cars of ten tons each. The meadow lark, upon this showing, was allowed to go unmolested and at once began a happy carol.

The grizzly bear had been summoned, but could not be found, for all of his species had been killed except a few in the Yellowstone Park. But the black bear was brought in and accused of eating young calves and colts. The stockmen asked that all the black bears be killed. The judge decided, however, that as there are so few left, and they are so timid and rarely do any harm, and are, besides,

among the most interesting of the citizens of the woods, they should go free and be protected from the hunter.

The coyote was next dragged in and accused of all manner of evil deeds. He pleaded in defense that he helped to keep down the numbers of the rabbits and ground squirrels, and that if it were not for his tribe, these little animals would eat up everything. The judge decided that the coyote was on the whole a rather unpleasant neighbor and refused to afford him any protection. Every one knew, however, that the coyote was so sharp and keen that he was a match for most of the enemies about him and would get along very well.

Those sly little animals, the skunk, weasel, coon, and mink, destroyed a great many birds, especially those that nested on or near the ground, according to the report of most of those present in court. But the skunk had some good friends who showed that his chief food was insects and worms, and that he did more good than harm. It was further proved that the fur of all these animals was so valuable that, while trapping them would be permitted, they must not be exterminated. In regard to the weasel, the testimony showed that he was a badly slandered animal. Most of his food appeared to be rats and mice, and only rarely did

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A weasel in its summer coat.

he kill chickens. The judge added that these poor animals had too often been condemned offhand. Although they occasionally ate chickens, no one had tried to find out the good which they did.

To hear the complaints against the great California sea lion, the court adjourned to the seashore. The fishermen declared that the sea lion ate the fish upon which their livelihood depended, and also broke their nets. They demanded that all the sea lions be killed. Careful search in the stomachs of some of them that had been taken for that purpose made it very clear that the fishermen were wrong. The sea lions ate almost no fish, but lived upon squid and other sea animals not valuable to the fishermen. As a result, these interesting animals were given full protection.

The oyster farmers complained most indignantly to the court about the conduct of the wild ducks. They said that the ducks ate a large part of the young oysters on their oyster farms. They wanted the ducks shot without delay, for their business was almost ruined. This matter was carefully looked into, and it was proved that the ducks really ate very few oysters.

The judge remarked as he adjourned court that if all the accusations were true, hardly a wild creature would be left. He said further that each one was entitled to fair treatment at the hands of men unless it was wholly bad.

CHAPTER THIRTY

THE BIRDS OUR GOOD FRIENDS AND PLEASANT COMPANIONS

As we lie partly awake on some bright spring morning, we hear through the open window such a chorus of music that it seems almost as though we must be in some enchanted land. This music, however, is the songs of the birds that nest about our homes.

We can distinguish in the chorus the notes of many different birds. From the treetop come the sweet songs of the oriole and robin. Upon a low bush sits a black-headed grosbeak that never seems to weary of his refrain. From various hidden places in the dense foliage come the notes of the song sparrow and the lazuli bunting. From its perch upon some fence post the meadow lark adds to the cheerfulness of the morning. If your home is far enough south, you may hear the mocking bird pouring forth its melody in endless variation.

Rising above all other sounds, as the morning advances, are the cheery calls of the quail who seems to say: "Where are you? Where are you? Stay right there; stay right there." Both in the morning and in the evening the almost heavenly music of the thrush echoes through the deep woods. In the quiet night the hoot of the owls is most entertaining.

Would you for anything have the birds leave us? Would you for anything lose these airy creatures whose music, bright plumage, and graceful movements not only add so much to the pleasure of our daily lives but also serve us in so many ways? The woods, fields, and waters would be lonely without them.

Did you ever think that it is possible, that it is indeed likely, that many of these beautiful creatures will leave us for all time if we do not treat them kindly and give them every protection in our power? Did you ever think of all the enemies that are constantly on the watch for the birds, — the thoughtless boy who robs their nests, the angry farmer who mistakenly believes they injure him, the hunter who thinks only of how good they taste, the sleek cat lying so innocently by your fireside, which loves a bird above everything else, and last of all, the blue jay, butcher bird, and some of the hawks and owls?

To realize how our home would seem without birds, let us take an imaginary journey far across the water to "sunny Italy." Here you will rarely hear bird music upon spring mornings, unless it be that of some poor caged creature. If you will walk through the country, you will see few birds where once they must have been abundant. But upon every holiday you will see the fields filled with hunters, who with keen eyes are watching for any stray birds that have happened to stop on their journey across the country to rest and to hunt worms or taste a bit of fruit. The Italian does not know the good the birds do his garden and that it would be the part of wisdom for him to let them have a little of his corn and fruit.

We will now journey to Spain and learn something about the treatment of our bird friends there. This country was once rich and prosperous. From it came many of the early explorers of our own land. The people of the central highlands of Spain never loved to hear the birds sing, because they were always thinking of the grain which the birds took. Thinking to save their crops, they not only

killed and scared away all the birds they could, but they also cut down the trees so that the birds would have no places to nest.

Thus the people freed themselves from the birds, but what was the harvest that they reaped? When the trees were gone they had no fuel, the soil dried out more quickly, and the insects increased until they destroyed far more of the grain and fruit than the birds could possibly have done. The people are now very poor and just manage to live from one harvest to another.

Now let us learn a little about our own birds and what they are doing for us. We ought to know the habits of all the common birds that frequent our gardens and be able to tell each by its note. This would add greatly to our pleasure when out of doors and make us appreciate the services they are rendering.

Go where you will through the open fields or among the trees and bushes, you will find different kinds of birds and all of them busily engaged. They are searching over every bit of ground as well as over the trunks, branches, and leaves of the trees. Some are after the seeds of different kinds of weeds. Others are getting the worms and insects that infest the trees. Watch a flock of the little titmice going carefully over all the leaves and branches of an oak tree. When they have finished, there are few insects or their eggs left upon it.

How anxious are some of our farmers as well as the sportsmen to have the meadow lark classed as a pest or as a game bird. Would that the farmers knew how much good this bird does them! The stomachs of many of these larks have been carefully examined in order to find out what

Finley & Bohlman

A young meadow lark.

they really do eat. The contents show that more than half of the food of the meadow lark is made up of harmful insects, including beetles, grasshoppers, crickets, Jerusalem crickets, cutworms, caterpillars, wireworms, bugs, bees, ants, wasps, flies, spiders, and many others. These birds also eat large quantities of the seeds of weeds and at times damage the grain fields. The good that they do, however, far outweighs the evil.

Woodpeckers belong to another class of birds that are very useful to us. How often have we heard them hammering upon a dead tree as they drill holes in search of the worms and beetles that are hidden under the bark or in the heart of the wood. It has long been the habit of

hunters to shoot woodpeckers just for sport, although no one eats them nor are they known to do any harm. With a decrease in their numbers there has been an increase in insect pests which are now destroying so many trees in all parts of our country. The woodpeckers in the Sierra Nevada Mountains are worth almost their weight in gold, for they destroy millions of beetles that are killing the great sugar pines and yellow pines. Here and there you will find a tree, attacked by the beetles, from which the woodpeckers have almost stripped the bark in their search for these insects.

The food of the martins and swallows is wholly made up of insects. We have all seen them in their graceful flight and have noticed how they seize their insect prey while on the wing. The martins are of little value for food, and yet, in some parts of our country, they have become almost extinct because of the pursuit of them by pot hunters.

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A barn swallow.

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A least sandpiper or snipe, one of the shore birds.

The shore birds form a group of very great value. They include those long-legged birds with slender bills which are found usually along the shores of the ocean and of lakes and small bodies of water, but sometimes in the interior away from the water. The food of these birds is almost wholly insects, which are harmful in various ways. Among these insects are grasshoppers, army worms, cutworms, cabbage worms, grubs, horseflies, and mosquitoes.

So cruelly and relentlessly have the shore birds been pursued by men who call themselves "sportsmen," that many species are nearly extinct. We hope that the Migratory Bird Law will be enforced and that with the protection this gives them they will again increase and fill their old haunts. But we must ever be on the watch, for there will still be greedy hunters trying to evade the law until all our boys grow up with love and appreciation for the birds. The

killdeer, snipe, and other plovers, whose habits make them the most interesting of the shore birds, especially need our protection. We have all seen these birds in our walks along the shore. Small and delicate their bodies are; each one would make scarcely a mouthful, and yet the pot hunters have seemed determined to kill them all.

How many people ever think of the quail in any other light than as a delicious morsel to be served up on toast for dinner? The quail is not only useful because of the insects which it destroys, but is a most wonderfully interesting and attractive bird. If you have ever disturbed a mountain quail with a brood of young, you will never forget what an interesting sight the mother presented as she strutted back and forth on a log, warning her little ones to keep out of sight.

Quail eat over a hundred kinds of insects, and happy

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A white heron.

should be that farmer who can get them to come about his home. Can you find it in your heart to shoot the father bird, as, perched upon some sightly point, he watches for danger while the mother just off the nest with her little brood feeds trustfully under his care?

The hunting of quail for market is now prohibited by law. But before protection came market hunters were known to carry out the most cruel methods in order to bag the quail in large numbers. In the drier parts of our country, the springs where quail came to drink were covered until the thirsty birds gathered in large numbers. In this way the hunters were able to obtain all they wanted.

Let us henceforth show by our kindness and good will to the living things around us that we are not merciless savages, thinking only of something to eat, but rather that we appreciate their presence and the great good that they do.

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Gulls and terns on their resting ground.

CHAPTER THIRTY-ONE

HOW TO BRING THE WILD CREATURES BACK AGAIN

In the preceding chapters we have learned something of the destructive warfare that men have carried on against wild creatures. We have learned that some species are already extinct and that many others have been so reduced in numbers that they are threatened with the same fate.

Nothing that we can do will bring back those that are gone, but we can save those that are left. Throughout our own country as well as many foreign countries, people are waking up to the necessity of protecting wild life. Thousands of men and women are spending their time and money trying to save birds and other animals. Among the things they are doing is the establishing of refuges and game preserves, working for better laws, and teaching boys and girls to be careful of life and not wantonly to destroy it.

The most important thing that we can do to bring wild creatures back again is to let them alone. Man is their worst enemy, and, if he can be kept from hunting, nearly all will be able to take care of themselves and increase in numbers. We can help Nature by supplying them with food when it is scarce and by protecting them from a few predatory animals and birds. The worst of these are the cougar or mountain lion, wild cat, lynx, wolves, and coyotes; the blue jay, butcher bird, and several of the hawks and owls. The cougar is the worst of all, for it has been estimated that one of these animals kills on the average fifty deer a year. Many of the states offer bounties for the killing of the mountain lion and coyote.

Ordinarily birds are able to secure their own food; but

We can help to conserve bird life by providing safe nesting places for our feathered friends.

sometimes during long, snowy winters those that do not fly away South need food. There are also many trees which bear fruit that is not much used by us but which is very attractive to the birds. The planting of such trees aids in bringing birds to our homes and encourages their increase.

The settlement of the lands suitable to farming has deprived some of the hoofed animals, such as the elk, of their natural feeding grounds. The elk that are found in the summer in the meadows of the Yellowstone Park migrate in winter to the lower valleys outside of the park. These valleys are mostly fenced up, and to keep the elk from getting into trouble with the farmers it is often necessary for the government to buy hay and feed them.

In order to make sure that the wild animals shall be free to live and increase safe from the hunter, we have established great game preserves in different parts of the country. These are usually regions that are wild and unsettled and not useful for other purposes. All the great National Parks which we are trying to keep in their natural condition with their animals, birds, and plants are now game preserves. Among them are the Yellowstone, Yosemite, Rainier, and

Crater Lake parks. Visitors to these preserves are not allowed to carry any guns, and wardens constantly patrol them.

The life of the Yellowstone Park is wonderfully interesting. Here we find droves of many of the animals that were in danger of becoming extinct. Among them are the buffalo, elk, and antelope. Here the grizzly and all the lesser bears are safe from the hunter. They have almost lost their fear of man and come about the camps and hotels for food, as the domestic animals do. In the park are some colonies of beaver, too, which will never again be disturbed by the fur hunter. On the higher peaks are a few Rocky Mountain sheep.

Another way in which we are protecting the wild animals is by making it legal to hunt them during only a short time each year. This is called the "open season." In the case of some of the animals that are nearly extinct we have made a "closed season" extending through a number of years. With this protection we are hoping that they will be saved and sometime become numerous again. All our states have made game laws which give more or less protection to the deer, elk, moose, antelope, squirrel, and other animals. In the case of some of these animals the females are absolutely protected, and the number of the males — as of the deer, for example — that may be killed in a season is often as small as two, and in two states it is only one. A heavy fine is imposed upon any one killing the protected animals or having their meat in his possession.

We are trying to protect the birds in much the same manner as the wild animals. But because of their migrations this is much more difficult. Many kinds of birds

travel with the changing seasons from north to south across different countries. If the people of one country protect them and those of another do not, they may easily become exterminated. Some species have become extinct in the last fifty years, and others have been reduced to a few pairs in regions where they were once seen in thousands.

There are three things that have brought about this slaughter of the birds. The first is hunting them for food. This was not so serious until the market hunters began their work. Then the small game birds that were salable quickly began to disappear. In most of our states the sale of game birds in the market is now prohibited.

Another cause for the decrease in the birds is the wanton shooting of some just for sport, and the hunting of others that are mistakenly supposed to be harmful. We cannot wholly stop this until we teach people to respect the birds, to love them for their music, and to appreciate the great good which many of them do by their destruction of insects and small animal pests.

Many of the birds which we have too often tried to kill or drive away are among the best friends we have. When we have learned all about their habits and their food, we shall find that only a very few are really harmful, and that the others abundantly repay the toll that they take of our produce. The farmer and the fruit grower should be particularly interested in protecting and encouraging the birds. If the birds pull up the sprouting seeds in your garden, do not kill them but protect the plants with wire screens. It is likely that these very birds feed largely upon the insects that are so harmful to your crops.

If the children in our schools could spend a little of their

American Forestry Association

The boys who are going to see that our wild life is protected.

time in the interesting study of bird life, we are sure that when they grow up the wanton destruction of birds will almost cease. The Boy Scouts and the Camp Fire Girls are learning to love and respect life in the wilds and would not for anything injure its inhabitants. The children of the Agassiz Associations and the Junior Audubon Societies can also be proud of the work they are doing. They are not only saving the birds about our homes but are attracting others by putting out food, planting trees that bear attractive fruit, and making nesting places for the birds.

The third important thing which has been bringing about the decrease of the birds is hunting them for their plumes. For fifty years the demand for plumes for millinery purposes has been growing. The trade has spread until it now reaches the most remote islands of the sea. No bird, be

its home in the most remote and inaccessible jungles, has until recently been safe from the plume hunter.

Now some of the foremost nations have passed laws for the protection of many of the water and jungle birds, which, unfortunately for themselves, are so beautiful that milady longs to have them for her bonnet. Nearly all the states of our own land offer more or less protection to birds of beautiful plumage. There is, however, much yet to be done, for in parts of our country birds that should be protected are still at the mercy of the plume hunter.

The Migratory Bird Law recently passed by Congress is one of the most important things which we have ever done for the birds. This law protects the multitude of water birds as well as land birds, that migrate with the changing seasons. It is especially important that all such birds be protected in the regions where they nest.

In the case of the water birds the nests are often grouped in colonies in certain places and not scattered singly here and there as with most land birds. Thus when a colony, say of the heron, tern, or flamingo, is found it is very easy for the hunter to break it up and destroy all the birds. Among the water birds the gulls, terns, grebes, herons, egrets, osprey, flamingos, and pelicans have been so hunted for their plumes that some of them are almost extinct. Several of these species love the rocky coasts, where their nests are found upon the almost bare ledges of the cliffs. Others establish colonies about the marshy lagoons of the Gulf and South Atlantic coasts and about the marshy shore of the lakes of the interior.

During recent years many bird refuges have been established in various parts of the country. Such refuges are

E. R. Sanborn, N. Y. Zoölogical Society

A flock of wild duck.

now scattered all along the Atlantic and Gulf coasts, as well as at various other localities throughout the country which are favorite nesting places for the birds. Some of these refuges have been established and are guarded by the government; others have been donated by wealthy persons who love birds and want to see them preserved.

The most beautiful of the water birds have been so relentlessly hunted by the plume gatherers that at the time of the establishment of the refuges some of them were almost extinct and it was feared the birds would not be able to survive. But in most cases the effect of protection was magical. The bird refuges in the Southern coast islands and marshes which were almost deserted are now alive again with birds. Here we can get some idea of the wonderful richness of life before the bird hunters began their work. Even now, in spite of the watchful patrols, the hunters

sometimes succeed in getting at the colonies. In order to insure full protection the refuges must be extended and more patrols employed, for such is the value of the plumes that desperate men will undergo great risks for the sake of obtaining them.

In order fully to stop this work, all those countries where plumes are in demand must forbid their sale. Only when there is no more demand can we get rid of the hunters.

In our efforts to protect bird life, we must not forget to take into account the instincts of our friend Pussy. It hardly seems as though the quiet house cat could do much harm, but if you will watch one out of doors when the birds are around you will be convinced that Pussy is one of the worst enemies that small birds have. Cats destroy many thousands of birds throughout the country. It is believed that they each average at least fifty birds killed every year. If you will multiply this number by the number of cats in your neighborhood, you will get some idea of the great losses among the birds due to the cats. We must choose between Pussy and the birds.

Arbor Day and Bird Day in our schools help call to mind the claims Nature has upon us. We might celebrate them by planting trees which furnish food that the birds like, for the trees and birds go together.

How pleasant it will be when that happy time comes in which the wild creatures will cease to regard man as their worst enemy! How pleasant it will be to go out through the fields and woods and along the shores and find that they look upon us as friends!

THE PRECEPTOR'S PLEA FOR THE BIRDS

Plato, anticipating the Reviewers,
From his Republic banished without pity
The Poets; in this little town of yours,
You put to death, by means of a Committee,
The ballad-singers and the Troubadours,
The street musicians of the heavenly city,
The birds, who make sweet music for us all
In our dark hours, as David did for Saul.

The thrush that carols at the dawn of day
From the green steeples of the piny wood;
The oriole in the elm; the noisy jay,
Jargoning like a foreigner at his food;
The bluebird balanced on some topmost spray,
Flooding with melody the neighborhood;
Linnet and meadow lark, and all the throng
That dwell in nests, and have the gift of song.

You slay them all! and wherefore? for the gain
Of a scant handful more or less of wheat,
Or rye, or barley, or some other grain,
Scratched up at random by industrious feet,
Searching for worm or weevil after rain!
Or a few cherries, that are not so sweet
As are the songs these uninvited guests
Sing at their feast with comfortable breasts.

Do you ne'er think what wondrous beings these?
Do you ne'er think who made them, and who taught
The dialect they speak, where melodies
Alone are the interpreters of thought?
Whose household words are songs in many keys,
Sweeter than instrument of man e'er caught!
Whose habitations in the treetops even
Are halfway houses on the road to heaven!

Think, every morning when the sun peeps through
The dim, leaf-latticed windows of the grove,
How jubilant the happy birds renew
Their old, melodious madrigals of love!

And when you think of this, remember too
'Tis always morning somewhere, and above
The awakening continents, from shore to shore,
Somewhere the birds are singing evermore.

Think of your woods and orchards without birds!
Of empty nests that cling to boughs and beams
As in an idiot's brain remembered words
Hang empty 'mid the cobwebs of his dreams!
Will bleat of flocks or bellowing of herds
Make up for the lost music, when your teams
Drag home the stingy harvest, and no more
The feathered gleaners follow to your door?

What! would you rather see the incessant stir
Of insects in the windrows of the hay,
And hear the locust and the grasshopper
Their melancholy hurdy-gurdies play?
Is this more pleasant to you than the whir
Of meadow lark, and its sweet roundelay,
Or twitter of little fieldfares, as you take
Your nooning in the shade of bush and brake?

You call them thieves and pillagers; but know
They are the winged wardens of your farms,
Who from the cornfields drive the insidious foe,
And from your harvests keep a hundred harms;
Even the blackest of them all, the crow,
Renders good service as your man-at-arms,
Crushing the beetle in his coat of mail,
And crying havoc on the slug and snail.

HENRY W. LONGFELLOW,
The Birds of Killingworth

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