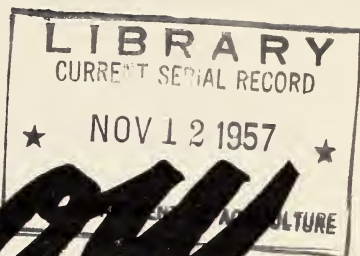


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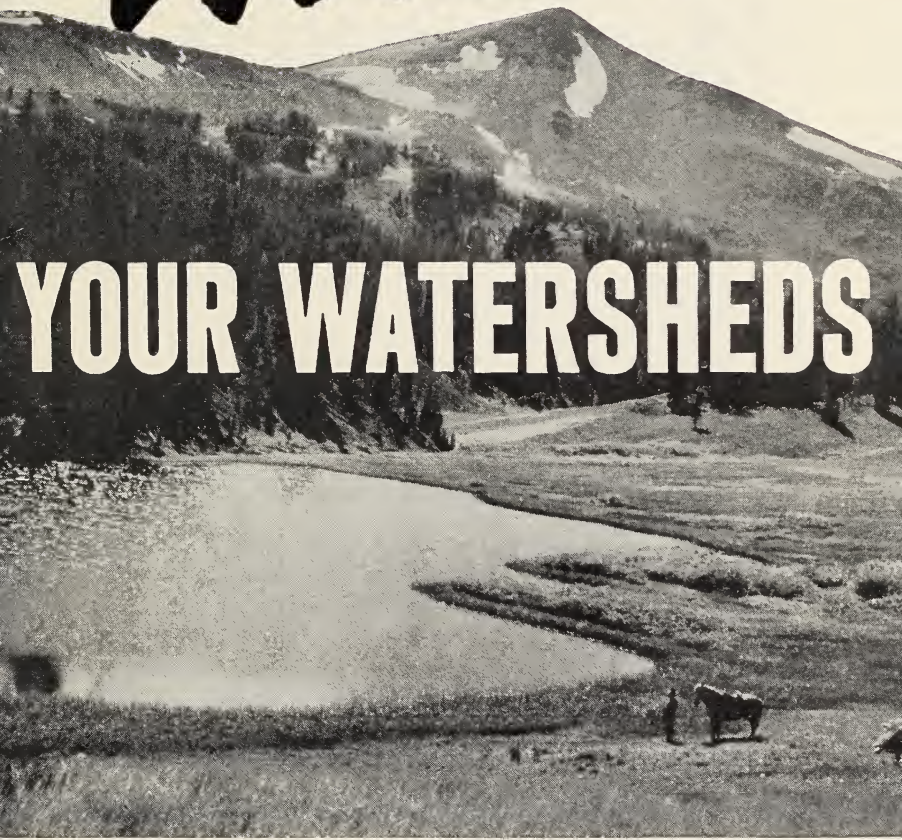
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Know

YOUR WATERSHEDS



U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Leaflet No. 282, formerly AIS No. 67

ALL OF US ARE WATER USERS. We are dependent upon water every day of our lives. Our farms must have it to grow the crops and raise the animals that give us food and clothing. Our homes must have it for drinking, washing, and cooking. Our towns and cities must have it for fire protection, sanitation, and recreation. Our industries must have it to produce power and light, to use as a solvent, as a cooling agent, as a means of waste disposal, or as part of finished products. Without water, we could not live.

And yet, how many of us give any thought to where the water, so necessary to life, comes from? How many of us realize that too often our wells go dry, streams dwindle, communities are plagued by alternate shortages and floods because—far away in the hills—the watersheds have been severely damaged by fire, by too much grazing, by improper logging, or by other abuses of the land?

This booklet gives some facts about water. It tells what we must guard against, and what we can do to assure safe and dependable water supplies.

Washington, D. C.

Issued February 1948
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KNOW YOUR WATERSHEDS

Water, Water Everywhere . . .

Back in November 1933 someone was careless with fire in the mountain watershed area above the town of Montrose, Calif. The brush cover was completely destroyed. On New Year's Day, 1934, a heavy rain beat down upon the mutilated soil and brought a disastrous flood to Montrose. Thirty lives were lost and direct property damages amounted to \$5,000,000. People noted that no floods came from unburned watersheds in the vicinity which received the same storm.

In July 1946 the overgrazed range lands above the town of Mount Pleasant, Utah, gave birth to a flash flood which also caused great damage. Several feet of mud, boulders, and other debris washed down through the main street and over the surrounding farm lands.

So it goes, country-wide. Hardly a year passes without proclamation through screaming headlines that floods have struck again—along tributaries of New England's Connecticut River, Georgia's Chattahoochee, the Central States' Ohio and Mississippi, out of gulches and arroyos in the West.

Strange as it may seem, while all this unrestrained water plays havoc in many sections of the country, many places are beginning to feel the pinch of shortages. A considerable lowering of the ground water table is taking place over large areas. In the San Joaquin Valley of California and the Gila River Basin of Arizona, for example, water now is scarcer, wells must be dug deeper, pumping costs are higher.

There is an interesting story behind these events. It is one of use and abuse of lands—our watershed lands—upon which all of us must depend for life-giving, life-sustaining water.



From Sky to Land

For most of us, obtaining water is a simple thing. One twist of the faucet and—presto—pure, clean water. Backing up the faucet, however, are the pipe and conduit, the lake or reservoir, the stream, the land itself. In a very real sense, the land is the source of the water we use. It is the vast natural reservoir that collects and stores the water as it falls from the sky in the form of rain or snow. The choice is our own, whether the land produces good, clear water or poor, muddy water.

Nature's Water Factory—the Watershed

Simply stated, a watershed, or drainage basin, is an area of land from which a stream gets its supply of water. The watershed may be as small as a farm or as large as several States. It is more than a combination of hills and valleys and streams, forest, grass, farm crops, and the soil beneath. A large watershed also includes the cities, roads, people, and animals. For there is an interrelation among all things, animate and inanimate, on a watershed which bears heavily on the yield of water from the land.

How the Watershed Operates

Suppose we start off with a watershed in effective working condition, yielding the best possible supply of clear water. Plant growth is present here in good measure. The leaves and branches of trees, shrubs, grass, or other plants help break the force of the falling rain. Together with the plant litter on the ground, they keep the rain from loosening the soil particles and splashing them about, thus causing them to seal up the myriad pores in the soil surface. All the while the various plant and other organic materials are rotting and working into the ground, ever improving the spongy, porous nature of the soil.

Along the channels in the soil that are made by the roots of the plants and the burrowing animals and insects, the water seeps to lower and lower levels. In effect, the trees, brush, and other plant growth and their litter combine to stop the water from running off the surface rapidly and washing soil away. They help it instead to sink into the ground.



The watershed with good plant cover, litter, and humus (made up of the decayed and decaying litter) functions like a blotter. It soaks up the water from rain or melting snow. Some of this water goes back into the air later through evaporation from the ground and plants. Some enters and is stored in the soil. Part of the stored water is held in the soil for plant use; the rest slowly moves downward to feed the streams by underground flow. When very heavy and long rains occur, the soil may be unable to take in all the water that falls. The excess water then runs off over the surface, but at a slow rate.

When a watershed is in good condition it operates for our benefit, providing a steady, fresh flow of water. Sometimes, during an extremely heavy rainfall or rapid snow-melt period, even a well-conditioned watershed cannot successfully control all of the water. We have floods occasionally from well-forested or well-sodded watersheds. But at least these watersheds do slow down and delay the water reaching the streams. This can mean a great saving in flood damage. Then too, such watersheds greatly reduce the amount of injurious sediment or debris carried by the floodwaters.

The picture is different on watersheds in poor condition. When protective plant growth is lacking, the whole system of stream flow is upset. Rainwater gets rapidly into the streams, causing quick rises. Topsoil washes from the land where it was an asset, to the streams and reservoirs where it is a liability.

What Our Watersheds Mean to Us

Our lives, the growth and health of our communities, our prosperity—all largely depend upon an adequate and regular supply of good, clean, usable water. Farmers in the arid regions must have a steady, reliable supply of water for irrigation if they are to grow any crops at all. Cities and towns require plenty of water for domestic use and to expand current industries and develop new ones. To protect our communities from fire, to beautify our homes with lawns and shrubbery, to go swimming, boating, and fishing—we need good water; we need good watersheds functioning properly to supply water in ample amount.



For the country as a whole, public interest in our watersheds naturally stems from our desire to avoid damaging floods and, at the same time to be assured that the flow of streams will be steady and supplies of water abundant.

It appears, then, that it is squarely up to all of us to protect our watersheds from fire, excessive timber cutting, careless logging practices, overgrazing, and other damaging uses. To maintain water—an important public resource in

any watershed—we must maintain the soil and its protective plant covering. Our cue comes from the recognition by our Congress that the control of floods, siltation, and erosion is a definite public responsibility.

Protection is especially needed on the higher and rougher portions of watersheds. These are largely nonfarm or wild lands. They have the steepest slopes, their soils are often shallow, and yet they receive far more rain and snow than the lower lands in the same general locality. These watersheds are easily damaged by erosion and give quick rise to floods when plant and litter cover is thin or lacking; the soil in such cases cannot take in and store the water fast enough. Runoff is speeded up as a result. Watersheds are critical areas in times of heavy rain or during the spring thaws. Once damaged, they recover very slowly.

An important sidelight in the whole water picture is the acute problem of water supply in our Western States. It is no exaggeration to say that the very future of the West hinges on how its watersheds are handled—for good or harm.



Managing the Watersheds—for Good or Harm

It is easy to read the signs of a good, well-managed watershed. Except in semidesert areas, the plant cover is thick and the soil is spongy. Clear streams and good water flow from such a watershed. In most places they keep flowing even in the dry seasons. The banks of the streams are stable, very little silt is carried along in the water to clog reservoirs or water intakes, and fish may be found in the cool, clear pools. On the slopes there is nutritious forage for livestock and game. A good forest growth has resulted from proper logging, fire damage is not in evidence, and the road banks and slopes are protected with plants.

Obviously there must be planned use of the soil and plant cover on a watershed if the flow of water is to be sustained. On the croplands this involves good farming methods designed to prevent erosion and waste of the precious water. On the



nonfarm lands—often the most important for water production—the various uses of the land, such as livestock grazing, timber cutting, hunting, and camping, must be so carried on that they do not speed up the surface runoff or encourage erosion, or impair underground water supplies, or cause water pollution.

In our national forests the watershed management plans provide for grazing only such numbers of animals, and in such manner, that they will not affect water supplies by injuring the plant cover or compacting the soil. These plans provide for the cutting of the timber and for logging by methods that will not adversely affect water yield by tearing up the forest floor and leaving eroding roads and trails. New timber crops are kept growing. The plans also provide for recreational use which will avoid water pollution and minimize the fire hazard. They provide for the location and construction of mountain roads and highways so that only a minimum of soil erosion will result. Finally, they provide for reseeding worn-out range areas, for planting forest areas that are not in good shape, and, if necessary, for closing certain critical watershed areas.

Management plans of this nature stand a good chance of being carried out on publicly owned watersheds. This is one reason why it has long been recognized that public ownership is the best means of safeguarding watershed values where the public values in land and water are very great. This has been the experience of cities like New York; Asheville, N. C.; Akron, Ohio; Little Rock, Ark.; Salt Lake City, Utah; and a great many others. These communities found it necessary to own and carefully manage their watersheds in order to protect their water supplies. In several other areas local communities have purchased important watershed lands and turned them over to the United States Forest Service to assure their correct management.

Here is how land ownership can affect watershed management. One landowner may be interested only in cutting the timber on his land. Another may want to use the grass cover

on his land only for livestock grazing. Still another might want to use his land only for hunting and camping or some other form of recreation without adequate regard for sanitation and fire protection.

In each case, a concentrated use of the land by the individual owner may well throw out of balance the regularity of a water supply upon which many of his fellow citizens depend, may well add to pollution, and contribute to serious floods. Naturally every landowner wants to get returns on his investment as soon as possible. And he often cannot afford—as an individual—to do the things necessary to protect the public interest in watershed values, which often extends beyond State boundaries. So a watershed may suffer when the purpose of supplying and controlling water is slighted in favor of some other objective.

In this country of ours far too many important watersheds are already suffering from neglect and abuse—to the detriment of proper water flow, the public, and the land.

Sick Watersheds Can Be Healed

A sick, poorly managed watershed can readily be recognized. There is little or no litter on the ground, little humus in the soil. Nine chances out of ten, there is strong evidence of fire damage to trees and smaller growth. Bare or weedy areas remain where once forest or grass grew. The slopes are scarred with small and large gullies. Stream banks are bare and eroding, the channels are choked with gravel and silt, and, after rains, the stream flow is muddy.

Such were the symptoms of the watersheds in Davis County, Utah. There overgrazing and trampling by livestock on the mountain slopes made the watersheds sick. Huge quantities of mud and rocks washed down into the fertile valley with every heavy rain. Highways and railroads were blocked, buildings were wrecked, nearly 2,000 acres of valuable orchard, garden, and farm land were ruined. Six lives were lost in one flood alone.



Then came decision and action. The private range lands in the watershed were bought up and placed in public ownership. Grazing was controlled and in some places excluded altogether. Contour trenches were built on the worst of the overgrazed slopes, to prevent surface wash until grass and brush and trees could become well established to hold the soil in place. The trenches alone caught and held water, preventing serious floods during torrential rainstorms the very first summer after construction.

By the end of the second season the grasses in the trenches were growing vigorously and the native plants were recovering rapidly. Now after 20 years and very heavy cost, the damaged parts of the watershed are also recovering. Several more decades will be required to heal all the sore spots. In the meantime, no grazing can be permitted, and the plant cover must be completely protected from fire.

Yes, sick watersheds can be healed. It's simply a matter of putting the plant cover back on the soil. But doing this is not always simple. Sometimes plants come back naturally if the watersheds are protected from fire, grazing, and other damaging uses. But some watersheds are sicker and further gone than others. On some, gaping gullies must be blocked to prevent further erosion. And, as in the case of Davis County, Utah, a major operation must be undertaken; a long period of convalescence is required.

Millions of America's watershed acres need a heavier plant cover. Artificial reseeding will help. However, because of the size of the job, the work must be done in full cooperation with nature. It should be remembered that it may take many years to build up an inch of rich topsoil that can be washed away in a matter of minutes when the land is bare. Restoration is a slow process at best, but it is possible and it pays dividends as long as enough soil remains for plant growth.





The restoration of our damaged watersheds will take considerable money as well as time. While private owners are being urged to make conservative use of the forest and range resources on their lands, it is realized that they cannot always afford to build the necessary structures or pay for other expensive features required. Since public interests are at stake—since watershed conditions in one State often affect other States—since, often, only the public as a whole can afford the cost, curing our watershed ills must be both a national and local responsibility.

Keeping Healthy Watersheds Healthy

No less a public responsibility is watchfulness over the care and use of important watersheds still in good condition. The easiest way to safeguard our watersheds, perhaps, would be to lock them up—exclude everybody and everything and let nature take care of them. But we cannot forget that most watersheds, in addition to supplying water, are valuable for other good purposes—for the grazing of livestock, for recreation, for fishing and hunting, as a source of timber products and minerals. With sound management they can generally be used for all these purposes without sacrificing watershed protection.

They can be managed for “multiple use.” Under multiple use each resource is handled so as to bring the most good to the most people in the long run. The interests of every person affected are recognized. Greatest benefits for the most people are obtained when all uses are planned and fitted together so that each has its proper place according to its importance. That principle is basic in the management of watersheds within our national forests.



At the same time our Government and several universities are seeking still better ways to manage watershed lands, not only the Federal areas but State, municipal, and private lands as well. The United States Forest Service is looking into such things as the influence of different kinds of grass, shrubs, and trees upon the ability of the soil to take in and store water. It is finding out what logging, grazing, and road construction can do to the flow and quality of water and what are the limits of use without damage

to the watershed values. It is also studying the basic problems in water production—how water moves through the soil under various conditions, how the soil may be kept spongy and porous, how floods may be prevented or minimized, erosion reduced, and reservoirs and irrigation canals kept free of sediment. These are studies which can eventually benefit farmers, ranchers, sportsmen, every one of us.

As quickly as the answers to these problems are found, they should be translated into improved methods of management and put into practice. Always, the objective is to get as much use as possible from a watershed without damage to it.

How do the various uses compare? The greatest value of one piece of land may be its timber; of another, its grass and shrubs for forage; of a third, its possibilities for recreation. But—and this is unknown to many people—for a large part of our mountain lands, the watershed values to the public (direct values in dollars-and-cents) are by far the greatest.

Here is Where You and I Come in

As water users, we can do several things to protect our interest in our watersheds. First of all, let us become familiar with conditions on the watershed from which we get our water. Next time we are out hiking, camping, hunting, or fishing, or just taking a Sunday drive perhaps, let us see for ourselves how the land is being treated. Here, once again, we will find the clues:

1. Is the ground well covered with grasses, shrubs, or trees?



2. Does the use the land now receives allow the plants to reseed and reproduce young plants?



3. Do the shrubs and trees look strong and healthy?



4. Is there a layer of dried grass, leaves, and small twigs over the ground?



5. Does the ground feel soft and springy underfoot?



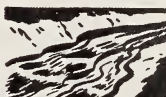
6. Where gullies are present, are they eroding?



7. Are the stream banks receding and washing away?



8. Do the streams run muddy during or after rains?



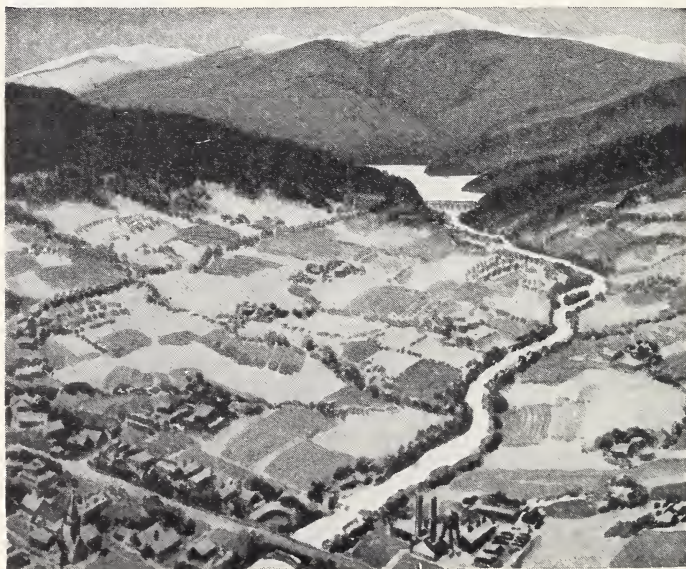
9. Is there evidence of stream pollution that could endanger the welfare of towns and cities below?



If we can say "Yes" to questions 1 through 5 and "No" to questions 6 through 9, our watershed is in good condition. If it is "No" for the first five questions and "Yes" for the last four, our watershed is in poor condition and trouble lies ahead.

When we have learned what our watershed is like and how it is being used, then we can find out from public officials and other informed sources whether the management of the watershed is adequate, and if not, just what is needed. We can—you and I—make our ideas known to the persons and agencies responsible for watershed protection and management. We can insist on getting the right answers to our watershed problems, and on the adoption of proper methods by the managing agencies.

It is up to all—each one of us—to give careful thought and constructive support to good watershed management. After all, what happens on our watersheds can well determine whether our communities and our Nation prosper and progress, or go downhill with wasted waters to poverty and oblivion.



NOTES ABOUT LOCAL WATERSHED

Name of watershed (stream) :

Use of land (logging, grazing, etc.) :

Condition of grasses, shrubs, trees:

Ground condition (hard, well covered, etc.) :

Evidence of erosion (raw gullies, etc.) :

Stream banks (stable, eroding) :

Condition of water (suitability for human use or fish life) :

Name and address of local official to consult about what needs to be done:

