

4-H FORESTRY PROGRAM

Unit C-3

Managing the Forest for

WATER, WILDLIFE AND FORAGE



member's manual
and
leader's guide

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The 4-H Forestry Program

Educational aids in the National 4-H Forestry Program consist of three parts. Unit A — Trees — explains what trees are, how they grow, why they are important and what characteristics identify them. Unit B — Forests — is about trees as part of the forest ecosystem, what values people hold for them, and how they are managed. Unit C — Forestry — discusses how people manage the forest resources which provide forest products, recreation, water supplies, wildlife shelter, jobs and other needs.

This sub-unit is only part of a much broader presentation of forestry interests contained in Unit C. In all there are eight publications in Unit C designed to give you an overview of various aspects of the forest industry. You will be advancing from general concepts, as presented in Unit B, to more specific topics, such as

- *C—1 The Tasks of Tree Farming
- *C—2 Forest Recreation
- *C—3 Managing the Forest for Water, Wildlife and Forage
- *C—4 Urban Forests
- *C—5 Careers in Forestry
- *C—6 The Dollar Value of Forestry
- *C—7 Timber Harvesting
- *C—8 Great Plains Forestry

Acknowledgments

This educational material has been prepared for 4-H use by the National 4-H Forestry Committee composed of representatives of SEA—Extension, U.S. Department of Agriculture and the Cooperative Extension Service of the State Land-Grant Universities. Special thanks are extended to the International Paper Company for financial and technical assistance. This material is published by the National 4-H Council, 7100 Connecticut Avenue, Washington, D. C. 20015.

Special appreciation for technical assistance is extended to Michael Bolin, Joseph Buhaly, Vernon H. Burlison, Dr. Clyde E. Chesney, Dr. Pete W. Jacoby, Dr. John F. Kundt, Dr. R. T. Marks, Dr. Cecil Mayfield, Will A. McElfresh, Dr. Kemp L. Swiney and George D. Walker, all of the Cooperative Extension Service and to Herman Hossfeld, International Paper Company.

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Managing Water Resources

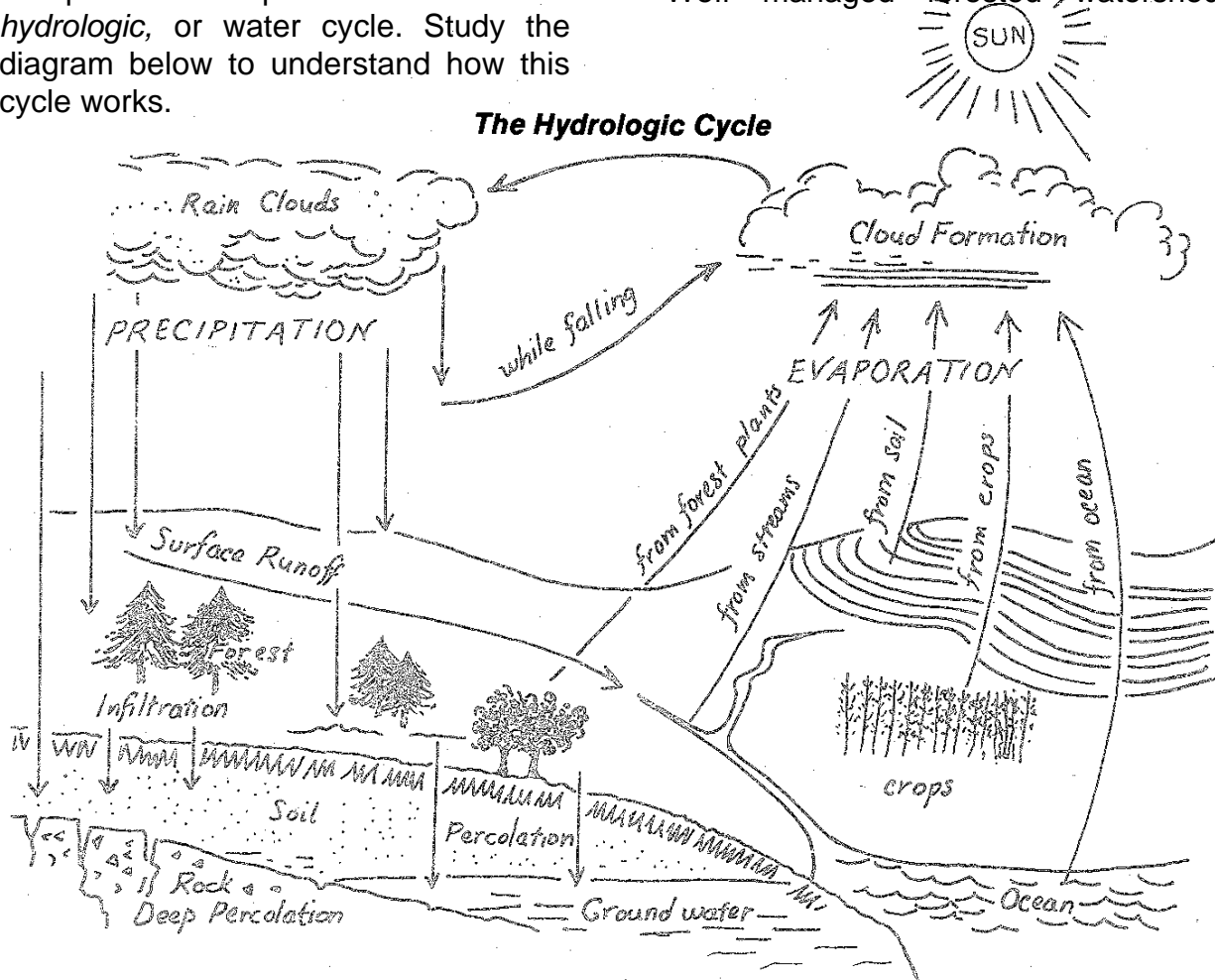
The hydrologic cycle

Water is one essential natural resource needed by almost every living thing on earth. A continuing supply of water is made available to us in an amazing way. Water evaporates from solar-heated oceans, lakes, rivers, ponds and other water surfaces in the form of water vapor. Water vapor is small droplets of water suspended in air and carried inland by air currents to higher and colder air. When the air has cooled to the point where it can hold no more water vapor, it condenses to form fog, rain or snow. This precipitation, upon reaching the ground, either directly evaporates or becomes runoff that flows to large bodies of water, where the cycle is repeated. This process is called the *hydrologic*, or water cycle. Study the diagram below to understand how this cycle works.

Watershed Protection

A watershed is an area of land that is drained by a body of water, usually a stream. The watershed stores some of the water, while more water either evaporates into the atmosphere or is released into streams. Soil conditions and plant cover in forests affect how much water reaches a stream, how pure it is and how regularly it flows over a year's time. Most watersheds contain roads, buildings, cultivated land, range and pasture and other non-forest cover.

Forest lands greatly influence natural flood barriers and sub-surface water flow. Forest soils retain moisture and store water. Runoff or flooding will occur when the soil becomes filled with water. Well managed forested watersheds



have less soil erosion and so contribute very little silt to streams, reservoirs and harbors. "Spongy" forest soil soaks up much of the water, while some water *percolates* deep into underground supplies.

The forest protects watersheds naturally by intercepting the rainfall on its way to the ground. The forest floor is protected by the various levels of vegetation, including tree crowns of different heights, shrubs and herbaceous plants. The plant cover breaks up large drops into smaller ones. Fallen leaves on the forest floor act further to break up large raindrops, which can then filter down into the porous forest soil. The action of bacteria, earthworms, fungi, insect larvae and other minute forms of plant and animal life keeps the soil porous and spongy—ideal for holding, storing and filtering large quantities of water. The forest conserves more water than would a plowed field, for example, where much of the water runs off the surface.

Underneath the organic layers of litter, duff and humus (see Unit B, page 14) is mineral soil. The upper layer of topsoil contains much organic material. Plant roots and channels created by microorganisms and burrowing animals keep the soil porous and give it a crumb-like structure that can hold and percolate much water. Below the topsoil layers lies the **subsoil**. This layer is more compact than topsoil. But it is still filled with many holes and channels made by decayed roots and animal burrows that allow water to flow deeper into the earth. If the soil here is too compact, however, it absorbs water more slowly and may limit the amount of water that reaches groundwater reservoirs.

When rain falls in the forest, part of it clings to the leaves or needles of trees and other plants. Some rain evaporates, and some trickles down the plant stems. In a hard rain, much water falls directly

on the forest floor. It infiltrates gradually into the soil and fills its pores. Some of this water is pulled up into the stems and leaves of plants to be transpired into the air. Some forest soils can absorb 50 percent of their volume in water before they become saturated. When the surface soil cannot absorb all of the water that reaches it, some runs over the ground and flooding begins.

Forests are also important in protecting the watersheds in areas of high snowfall. Although the total snow accumulation will be less in a coniferous forest than on a treeless plain, the snow may remain up to a month longer in the forest. The tree cover successfully shades the snow from the sun and blocks the wind. This delay in snowmelt usually reduces high streamflow in the early spring and releases water later when it is needed most. While the soil of open fields commonly stays frozen, the soil under the snow and duff layers in the forest remains unfrozen and allows snow melt to filter deeper into the earth.

Over-grazing, careless logging and forest wildfires are the sources of greatest damage to watersheds. Over-grazing destroys ground cover and compacts the soil, causing water to run off rather than soak into the ground. Improper skidding rips up the soil and can start erosion which carries silt into streams. Improperly constructed logging roads and exposed areas of soil may contribute to muddy water in streams.

Wildfires usually occur when the duff is dry, the soil moisture low, and the wind brisk. The wildfire consumes leaves, twigs, shrubs and small trees and may erode the soil wherever the duff is dry enough to be burned. Further, the ashes that dissolve in the floodwater pollute many streams with high concentrations of potash (lye), which can be dangerous to aquatic plants and animals.

Controlled burning in strategic locations can help reduce the fuel level in

a forest area, thereby reducing the potential for serious damage by a natural fire. However, this practice is only done when the soil is moist and other conditions make it unlikely for the fire to spread out of control.

Flash flooding is a problem in both dry mountainous areas and in urban areas during periods of heavy rainfall. The dry mountains have little plant life covering the shallow rocky soil. Many mountain tops are made of solid rock. The water cannot go into the soil, so it runs above ground toward sea level, sometimes in great amounts. In urban areas most forested sections have been replaced by paved roads, parking lots, tennis courts, concrete sidewalks, homes and other buildings.

There is no water absorption on these areas and rain water can cause floods in storm sewers, ditches and small streams.

Good watershed management tries to insure that soils stay in place and are not eroded away into stream channels. Proper management prevents the destruction of forest or grass cover by wildfires or unwise logging or grazing. Such a program also:

1. Attempts to restore plant cover promptly on already denuded areas.
2. Heals or stabilizes eroding gullies and stream banks.
3. Locates roads and logging skid trails where they will not start gullies or release soil into streams.
4. Regulates recreation uses to preserve plant cover and maintain water quality.

In some cases managers may replace deep-rooted trees (which consume great amounts of water) with shallow-rooted plants such as grass to increase the outflow to streams that supply water to communities. Good watershed management seeks to adjust the various uses of natural resources in order to conserve those resources, to hold the soil in place, and to make water available to meet human requirements in the best way possible. Good management can produce water, timber and wildlife all at the same time in the same forest watershed.

Things you can do

1. Go outside in the rain and locate flowing muddy water. Trace the water back to the area where the mud occurred and list the cause of soil erosion. Do this several times in different locations. Recommend some practices to stop the soil erosion.
2. Locate the smallest watershed you can find near your home or school and make a map of the boundaries of this area. Find out which river, lake or ocean receives the runoff water from this area.
3. Build a demonstration plot or an exhibit for showing the difference in surface runoff between a sloping area with bare soil (from cultivation, overgrazing, wildfire or heavy recreational use) and an area with protective forest litter.

Wildlife Management and Protection

Forests provide a home or "habitat" for many kinds of wildlife — **game animals** such as deer, elk, bear, moose,

squirrel, turkey, quail, grouse, wood duck, woodcock and raccoon and **non-game animals** such as songbirds, hawks, owls,

mice, shrews, moles, chip-munks, snakes, turtles and lizards — as well as many forms of tiny insects and animals that live in the soil. The important elements of wildlife habitat are *food*, *cover* and *water*. The interaction between these factors determines the kinds of wildlife to be found in any forested area. For example, most game fish such as trout, small mouth bass and pickerel prefer clear, cool streams in forested areas.

The greater the diversity of forest habitats, the greater the variety of animals that can be found. Wildlife managers recommend clear-cutting small acreages in irregular shapes to produce browse for deer, turkey, elk and moose. Some areas of the forest are maintained in grasses and low, seed-bearing annuals for rabbits, quail, songbirds, turkey, deer and squirrels. As older clear-cut areas grow up into young trees and shrubs, different kinds of animal species will occupy the area. Thus new clear-cuts are made at specific time intervals so that new browse will be available to wildlife.

Wildlife managers can strengthen habitats by:

- a. Leaving den trees.
- b. Building nest boxes for squirrels, wood ducks, and songbirds.
- c. Planting shrubs that produce food around fields, forest edges or clear-cuttings, ponds and roads.
- d. Constructing watering devices in dry country. Planting coniferous trees in or around hardwood forests will help produce good winter escape cover and protection from enemies and snowstorms.

Since there are so many species with different needs and uses, in some cases it may be necessary to feature only a few

species at a time on a given tract, then manage the tract specifically for that species. The selection of what species to feature should be based on three factors:

1. **Habitat capability** How much food and cover can the land produce within the home range requirement of the species, either naturally or with intensified management?
2. **Compatibility with other forest resources** How will this choice affect other resources, such as water quality? How will it affect costs, benefits, management zones and unique factors such as the presence of a threatened or endangered species?
3. **Public Interests** What impact do the side effects of habitat management (such as smoke from a prescribed burning that helps produce annual plants for quail to feed on, or the unattractive appearance of some clear-cut areas, or mosquitoes that result from planned brood areas for ducks) have on the public? What input will people who use or live in the area have in making these decisions?

Water is essential to all forms of wildlife, and its scarcity or abundance influences their numbers and distribution. Beavers, ducks and fish require it for their homes, while most other animals and birds need water for at least drinking and bathing. Building small ponds in areas that lack a year-round water supply will attract many animals that otherwise would not come to those areas.

Things you can do

1. Take an inventory of all the animals, birds, reptiles and insects of a selected area such as your backyard, a small park, five acres (2 hectares) of forest land, a cemetery or your school yard. Many animals are active in the daytime, but others only come out at night. Select a moonlit night and use binoculars to observe nocturnal animals.
2. Select an animal and compile as many facts as you can on its requirements for food, cover and water. Also, give information about its breeding habits and how it rears its young.
3. Build nest boxes for squirrels, birds and wood ducks. Erect the boxes in the appropriate locations where each species would normally find a nesting site. Keep records for each box on the kind of animals that first used the box and note if they raised their young in the box. List any other observations you make on these

4. Plant shrubs that produce berries or other edible fruits that birds and small animals will eat. Observe the different species which feed on the fruit of the shrubs. (The nest box activity and shrub planting project could be combined into one project.)
5. Visit a forest area (preferably with a wildlife biologist) and note all wildlife use you see. Ask a wildlife specialist to explain methods of increasing game and non-game animals in your region.
6. Make an exhibit of the natural foods produced in the forest areas of your general locality for one or more wildlife species, such as black bear, elk, whitetail deer, quail, cottontail rabbits, wild turkey, grey squirrels and muskrats.
7. Find out if there is a 4-H Wildlife Project in your area. Consult with the leader and members to see how you might participate in a joint project.

Forest and Range Management

Range management is the science of planning and directing the use of the range to obtain maximum production of forage for livestock and wildlife without damage to forest and watershed areas.

To the forest owner, grazing can be a source of extra income. Mature trees are harvested and tree seedlings planted in the scattered clumps of forested areas on vast rangelands in the West. Ponderosa pine is the most common tree managed on western rangeland.

Grazing domestic livestock in the deciduous forests of the East is a poor cattle and forestry investment. There are several reasons for this:

1. Livestock may eat poisonous plants growing in the woodlands.
2. Eastern forests do not allow nutritious plants to grow in the shade of the trees.
3. Livestock use more time and energy searching in woodlands for edible plants that are actually less nutritious.
4. Livestock compact the soil on hills, which causes increased run-off during the peak periods of rainfall. This robs trees of needed moisture and causes soil erosion and injury to roots.
5. The loss of mulch (duff) exposes the soil to drying winds.

If grazing on forest lands is not controlled, it can do much harm to the basic resource. This has happened in the hardwood forest areas in the East and in the Central States where dairy cattle have caused soil erosion by their extensive overgrazing. When livestock or other grazing animals are left too long on farm woodlands, they destroy tree seedlings and compact the soil. Forest experiment station studies have clearly shown that yields of forage in farm woods are low, and its nutrient content minimal. Overgrazing compacts the soil so that the water cannot soak in easily and quickly. As a result, the runoff is much greater.

Sometimes light grazing for very short periods may occasionally be beneficial. For instance, during drought emergencies, when pastures dry up, farm woodlands can be a useful source of forage. However, most of the time farmers must choose between pasture and timber. Steeper slopes should be kept in trees. On level lands grazing is probably more economical.

Western forest ranges, which are usually located in the mountains, ordinarily do not support a large number of livestock for a given area. The small amount of annual rainfall there greatly lowers forage production. Therefore, great care must be taken to prevent overgrazing, because damaged range grasses take a long time to grow back. Most of the forest range land in the West is under public control (within national forest areas and federal grazing districts) where grazing is closely regulated. Range management specialists check grazing progress so they can prevent overgrazing on the land.

Western cattle grazing is an important secondary use in open ponderosa pine forests. Open forested lands can produce a moderate amount of forage, clean water and healthy wildlife species only if the amount of grazing is kept in line with the amount of forage growth. This practice is called "sustained yield" grass management.

Practical range management

One of the most difficult jobs in range management is to have all parts of the range grazed uniformly. On most ranges livestock concentrate on some areas and avoid others. Many factors — including topography, the nature and habitats of livestock, inadequate water facilities, and inadequate grazing management — contribute to this poor distribution. Handled properly, the following practices can lessen this problem:

1. **Salting** Mature cattle require from one to two pounds of salt each per month, and mature sheep require one-third to two-thirds pounds. Salt should not be placed near watering facilities because this would stimulate overuse of a small area. Salt blocks should be rotated in areas that are normally avoided by livestock to entice the animals to feed on the grasses and forbes.
2. **Water** A supply of water can be developed where needed, or even removed by fencing off springs or reservoirs where herbage has been well grazed. If natural watering places cannot be developed, water can be hauled in for short periods of time.
3. **Fencing** Strategic fencing can allow more uniform grazing on the range. It must be used with caution, since livestock tend to concentrate near fences that cross natural travel routes. Fences can be used to isolate particular vegetation types — meadows that remain soft and wet late in the season, or other choice grazing areas — until they can be used to the best advantages of the vegetation and livestock.
4. **Range riding or herding** Physical structures can never take the place of good riders and herders for distributing livestock and protecting both the animals and

the range. The herder must know the country and the grazing habits of the livestock. He must also be able to recognize signs of over-grazing. Livestock tend to congregate at water holes or on one favorite hillside if they are left unattended. Good herders keep the animals moving and make them cover the whole range.

If a range is overgrazed or otherwise damaged, fence out livestock until the grasses have grown back. Special grass seed and fertilizer may be necessary in order to reestablish a good sod. The soil must become porous again on the heavily compacted areas before the range can be grazed again. While the soil is rehabilitating, poisonous plants caused by over-grazing should be removed to protect the cattle.

A sound grazing system will promote the most efficient use of the range that is practical. It should strive to at least maintain, and hopefully improve, the condition of the range, while at the same time allowing a high level of livestock production.

Things You can do

1. Visit a farm with grazing animals. Examine the pastured areas for signs of over-grazing: short grass, bare soil, trampled-down banks, browse line in forest area. Note any poisonous plants in the grazed area. How could you improve the pasture and livestock food?
2. Invite the local Cooperative Extension agent in Agriculture or Range Management to give a talk to your club on local forage for livestock.
3. Obtain seeds from three or four different species of forage grass and alfalfa. Cultivate a small parcel of land, sow the seeds and observe the different growth habits of the various species of forage. Record the length of time it takes for the seed to germinate, and measure the height of the plants at the end of the growing season.
4. Carefully examine an eight-inch layer of topsoil in an ungrazed forest and compare its condition with the soil in an over-grazed area.
5. Visit a woodland and list all of the plant species that are being grazed.

Leader's Section

The meeting plan

The following outline suggests a format that can be used for each meeting.

A. **Water** is an important element in the lives of most plants and animals, yet relatively little attention is given to its study. A lively group discussion could stimulate ideas for further study of the origins of clean water.

1. Water pollution is a potential threat to people everywhere. Discuss what pollution is, what factors influence it, and the difference between "point" and "non-point" sources of pollution.
2. Have members make a list of water sources for home use, citing the origin (well, river, lake, rainwater) and the effects of human activities (farming, road building, construction, timber harvesting) on the quantity and quality of water.
3. Have members document the uses and needs for water by various animals in the forest through personal observation. For example, members could pick out a watering hole to observe the drinking habits of different species.

B. **Wildlife habitat management** is important because only when the proper habitat is available can wildlife abound. Have members participate in an inventory study of birds and animals near their homes, in open fields and in meadows, and in woodlands. Then they should compare their lists.

1. Discuss why some animals are seen only in the woods and others only in open fields.
2. Discuss sources of food that each

bird or animal might use, and how the species might be beneficial to humans.

C. **Grazing livestock** on partially wooded areas is most prevalent in the western United States. Livestock grazing in the eastern United States is discouraged because of damage to forest trees and the soil's water holding capacity and non-nutritious forage. Group discussion with club members can be held on the principles involved in range management.

1. Have club members identify areas with soil compaction (places where people walk on the grass, i.e., church yards, school lawns, college campus lawns, home lawns, pastures, parks). Discuss the reasons for lack of grass or other vegetation on these areas and how could these areas be revegetated.
2. Have members collect as many different kinds of grass as they can find and bring them to a meeting. Have members display their grass on tables or on the floor. They should combine those grasses that are alike and record the plant shape characteristics of each group of grasses and where they were found.
3. Members may wish to observe the eating and drinking habits of grazing animals. Have members record the facts on each animal and discuss the effect these facts have on grassland management.

Suggestions for leaders

1. Weather permitting, conduct as many of the meetings as possible in outdoor settings.

2. Invite resource people to demonstrate wildlife habitat management and range management (where applicable). Consider such diverse sources as livestock farmers, foresters, rangeland managers, extension rangeland specialists, cattlemen's groups, environmental action groups, wildlife specialists and water resource people.
3. Visit the local offices of the Water Resources Department and Soil Conservation Service and obtain their free publications on water, soil erosion, water pollution and related water material.

Educational aids

1. Films and slide sets may be available from state forest services, Cooperative Extension County Agents, U. S. D. A. - Forest Service, Soil Conservation Service, state wildlife services, state water resources services and wildlife refuges.
2. Visit libraries and compile a list of publications on water/watershed management, wildlife and range management.
3. Contact the Chamber of Commerce for promotional materials relating to the three subjects.
4. Contact local professionals to discuss resource management and development. Write to professional and educational organizations contributing to water, wildlife and forage that are listed on this page.

Resources

FEDERAL RESOURCE MANAGEMENT

AGENCIES

National Park Service
 U. S. Forest Service
 Corps of Engineers
 Bureau of Reclamation
 Bureau of Land Management
 Tennessee Valley Authority
 Bureau of Sport Fisheries and Wildlife
 Bureau of Indian Affairs

FEDERAL AGENCIES PROVIDING TECHNICAL AND/OR FINANCIAL AID

Agricultural Stabilization and Conservation Service
 Soil Conservation Service
 SEA-Extension
 Department of Commerce
 Department of Defense

PROFESSIONAL, SERVICE AND EDUCATIONAL ORGANIZATIONS CONTRIBUTING TO WILDLIFE, WATER AND RANGE MANAGEMENT

Water Pollution Control Federation
 3900 Wisconsin Avenue, N.W.
 Washington, D. C. 20005

Water Resource Council
 2120 L Street, N.W.
 Washington, D. C. 20037

American Forest Institute
 Educational Materials
 1619 Massachusetts Avenue, N.W.
 Washington, D. C. 20036

National Rifle Association
 1600 Rhode Island Avenue, N.W.
 Washington, D. C. 20036

National Wildlife Federation
 1412 16th Street, N.W.
 Washinaton. D. C. 20036

Nature Conservancy
 1522 K Street, N.W.
 Washington, D. C. 20005

Izaak Walton League of America
 1326 Waukegan Road
 Glenview, Illinois 60025

National Audubon Society
 1130 Fifth Avenue
 New York, N. Y. 10028

American Forestry Association
 919 17th Street, N.W.
 Washington, D. C. 20006

Sierra Club
 530 Bush Street
 San Francisco, California 94108