

A NATIONAL FOREST WATER QUALITY PROGRAM

by

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Introduction

Every day, our cities, industries, and farms withdraw large quantities of water from the surface and subsurface water sources of the Nation. Our society is demanding that the streams, lakes, and coastal waters, in addition to serving obvious water supply needs, be fit for recreational uses such as swimming and boating, and also be pleasing to the sight and smell. To serve all the purposes we make of our water resources, adequate quantities of water of satisfactory quality must be available. Achieving satisfactory quality is the objective of water quality management.

Water quality requirements vary with the intended uses of water. To be suitable for municipal water supply and for recreational uses such as swimming and fishing, the water must be reasonably free from health endangering chemicals and bacteria as well as objectionable tastes and odors. Industrial water supply needs vary widely among industries; usually they must not contain damaging concentrations of corrosive or deposit or slime forming chemicals. In many cases, high concentrations of dissolved solids render water supplies unsuitable.

Water quality management problems hinge on whether or not existing or potential water uses are being or will be impaired. Today I'm going to talk mainly about surface water originating on, or used on, the National Forests in terms of quality suitable for specific uses on the National Forests and of a program assuring that the quality of water flowing from the Forests is suitable for use for most important purposes with only reasonable treatment.

For several decades, we in the Forest Service have been generally aware of the beneficial effects of well-managed forest upon water quality. We've tried for the most part to keep the Forest, the watershed, in good condition - and where it had been damaged, to restore it to a condition that would produce orderly flows of good water. This has always been a basic goal of National Forest administration. In all candidness, I believe I can say that a good job, a comparatively good job has been done. Compared to quality of water in many streams outside the National Forests, the quality of National Forest water is on the high side of good. As recently as five years ago I believe a similar report would have contained more glowing terms. Much has been included in the term "quality" since that time.

The Federal Water Quality Act of 1965 brought into focus a growing awareness of the vital importance of protecting and improving the quality of one of the Nation's most essential resources. We too in the Forest Service are taking a second critical look at our responsibilities and opportunities in regard to water quality. Suddenly we are aware that "good", compared to other water may not be good enough.

Nation-wide, the National Forest System encompasses approximately 190 million acres of watershed lands. Most of this land blankets the headwaters of our principle rivers. It is made up of mountain ranges with shallow rocky soils and steep slopes. Most of it supports a cover of trees, shrubs and grass. Most of the National Forest land receives more precipitation than the surrounding lands. In the west, the contrast between the 10-15 inches received in the valleys, and the 40 to 60 or more in the mountains is striking. In these cases, life in the valleys is dependent to a very large degree on how well the mountain lands perform their hydrologic or watershed functions of receiving this precipitation and delivering it as orderly flows of good quality water. How well the mountain land performs these services depends on a combination of natural factors and the kind of management it receives. In most cases, the natural factors are difficult and require considerable management skill to maintain or enhance natural water yield and water quality characteristics. Whereas maintenance of status quo, where satisfactory, has been a reasonable objective in the past, enhancement is becoming more and more essential to the future. We are studying a variety of ways to do this from sea level Pocosin in South Carolina to the 14,000 foot high snowsheds in Colorado.

Our National Forest program is a practical one of conservation thru multiple use; that is, a production of compatible outputs of timber, recreation opportunities, wildlife habitat, forage for livestock, and to do this in a manner that will protect the water resource from undue damage by these uses. Particularly here in the well-watered South, we've too often taken water for granted. Our second look is revealing that in more areas than we'd realized, we must have a progressive program for water management. In many situations, our principle concern may have to be to produce water of satisfactory quality in dependable and orderly flows. This will not mean elimination of the other uses, (Multiple use will continue), but it will require more conscious effort directed toward water as a product, more skill in coordination, more determination in applying guidelines and standards aimed at protecting soil and water resources.

National Forest responsibilities in water quality

In the Southern Region, the Forest Service is responsible for the quality and flow characteristics of a water crop averaging about 18.2 billion gallons or 56,000 acre-feet per day from the approximately 12 million National Forest acres which comprise the 14 National Forests in 13 Southern states. For the most part, these lands are the headwater tributary watersheds. We are aware that this water must be good or the downstream rivers don't have a chance. The problem and opportunities vary widely from one situation to another, but a common denominator is the increasing importance of water quality considerations everywhere.

Our present program objectives are modest -- obviously they must fit a budget.

Inventory--

--we need a more adequate inventory of the water resource in order to manage it intelligently. We must know where it is, how much, its seasonal variations in quality and quantity.

--we are concerned with the quality of water flowing from the National Forests (to the extent that this is subject to Forest Service control), to assure that it meets downstream need.

--we must see that water used on the Forests by visitors is in fact suitable for the use allowed - drinking, swimming, skiing, fishing, etc.

Management Planning-

--we must prevent contamination of streams by Forest Service uses or developments, sanitary wastes from administrative sites, and recreation areas, as well as logging, road building, spraying, grazing, etc. We have years of research to guide us here.

--we must strive to protect water quality from damage by permitted activities of others, such as mining and oil and gas extraction, over which the Forest Service has only limited control. The Water Quality Act with related legislation and rulings are proving helpful in this area, providing muscle that was not available before.

Research--

--Must be accelerated and towards this objective a new laboratory was dedicated in this state last October by the Chief.

Realization and implementation of these responsibilities is bringing changes in priorities and value ratings in many situations. It presents a tremendous challenge for conservationists in multiple use management to enforce practices that will provide adequate long-range protection of soil and water values without serious curtailment of the several traditional uses, each of which is also of increasing economic and social importance.

A Water Quality Program for National Forests of the Southern Region

As we contemplate the significance of the Water Quality Act, the conditions that made it necessary, and the part that the National Forests must play in the overdue resource management revolution touched off by the Act, we find that we must in effect, add a new dimension to forestry. Technical knowledge of water chemistry, aquatic biology and bacteriology is relatively scarce among foresters, but we're on the way to acquiring a good bit of it. We find also that aside from our own forest research folks no one else is in a position to help us much in this multi-million acre resource program.

Much of the technical knowledge needed is available among other disciplines --but its application in the National Forest environment is up to us. We're making good progress, although for lack of sound, long-term inventory type data regarding the water resource, we're having to feel our way rather cautiously.

Our program is designed to take full advantage of all pertinent information available from State agencies, the Weather Bureau, Geological Survey, TVA, Health Services, and others. In this way, our costly and time consuming field work can be limited to filling in the blanks. Unfortunately, we find that in many cases, especially in the mountainous parts of the Region, investigations by others are concentrated in the flatlands below the National Forests.

Water has natural quality characteristics that result from factors such as geology, soils, vegetation and climate. For example, streams arising as springs from limestone caverns have different quality characteristics from those fed by seepage from a forested watershed underlain by granitic materials, or from those draining the black-water swamps of the coastal plains.

Natural quality characteristics of water in a stream tend to remain fairly constant through the years though they may vary significantly during each year according to season, weather, stage, and other recurring factors. The most consistent quality condition occurs at base flow stage when practically all the water comes from subsurface sources. Data from base flow is most valuable for quality type mapping. Natural quality characteristics not only determine suitability of water for particular uses, but also to some extent influence its "buffering" capacity or ability to absorb or neutralize certain additives without serious impairment.

As land managers, we can't do much about the natural water characteristics although we do need to know about them. We can do something, in many cases, about what gets into the water from other than natural sources. In this case, we need to know what it is, where it comes from, its significance to water quality and usefulness, and what can be done about it.

Determination of acquired characteristics is a big and endless job. Opportunities for water to acquire impurities are so numerous that we can't possibly anticipate them all. Here we'll have to depend in part on informed and alert opportunism, to complement the more routine inventory items for which we can plan ahead.

Acquired impurities may enter at a point or concentrated source such as a sewer outfall, an oil well or mine opening, or from dispersed sources such as pastures and fields, insecticide spray jobs, forest fires, or road ditches. Timewise, the source may be instantaneous, temporary, intermittent, regular or irregular or relatively constant. Some impurities are dumped or flushed directly into streams regardless of stage or weather, while others such as sediment and fertilizers, get in mainly as a result of direct surface runoff during rainstorms. Some come as seepage, as from sanitary drainage fields, sewage lagoons, mines, etc., on a rather constant basis. Some tend to permeate streambanks and sediments so that their effects are longlasting, while others flush through cleanly leaving little trace. Some retain their characteristics indefinitely while others change chemically or physically to form other compounds which may be either better or worse than the original.

The range of possible impurities with which we might be concerned is as long as your arm. We've tried to classify and sort them on the basis of probability of presence, seriousness as pollutants, those that provide clues to possible

presence of others, and other considerations, trying to reduce the number of essential determinations to something we can handle. Altogether, we may be concerned with around 50 impurities for which we should be alert in certain situations. In most cases, tests for 25 or less constituents will give adequate indication of water quality. Frequency or persistence of sampling will vary for different constituents and situations. The variety of possible situations is so great that we have not prescribed a detailed or uniform procedure at this time. Rather, we have established objectives, principles and guidelines and encouraged each Forest organization to study their situation, watershed by watershed, and then develop a program to fit their specific needs.

Several types of situations are common to all Forests and will be treated similarly--

--Where the Forest Service provides drinking water, we must be sure through periodic analysis by State Health Departments, that the water meets Public Health Standards. This program on the National Forests is much older than the Water Quality Act.

--Water in swimming areas provided by the Forest Service must be of suitable quality to protect the public health. Here the concern is for possible disease causing agents, turbidity, and in some cases, pH. The program of monitoring water quality in swimming areas is being expanded and intensified this year.

--The tremendous surge in recreational use of the National Forests during the '60's has greatly increased the problem of properly disposing of human wastes in the forest environment. This, along with other considerations, is forcing development of larger recreational areas which bring people together in sufficient numbers to justify the high costs of providing modern scientific treatment for both drinking water and sewage disposal. Monitoring of streams receiving the treated effluent is essential. Bacterial and nutrient pollution are the principle dangers, but other factors such as biological oxygen demand, temperature, detergents and others may be important in some cases.

--Essential activities such as road construction and maintenance, timber harvest, administrative and recreation areas development, and others produce sediment that is detrimental to water quality. The Forest Service has traditionally strived to minimize these damages. We're much more critical of the "mininizing" criteria and striving for more effective methods of keeping sediment out of streams. We're also tightening up monitoring efforts to determine how much gets in, where it comes from and where it goes.

--The need for background information on natural water quality, and flow and yield characteristics is widespread. This knowledge is being gained through a combination of researching data available from others and field sampling to fill in the gaps.

Now that we have considered some of the broader National and Regional situations, let's get more specific and look at a fine local cooperative program. I'm talking about an excellent Environmental Health Survey of Chewalla Lake Area which the Mississippi State Board of Health has recently

completed (January 1969), in cooperation with the Forest Service.

The main objective of the survey was to study the environmental health and water quality situation in the watershed above Chewalla Lake in Marshall County. Chewalla Lake was designed and constructed by the U S Soil Conservation Service in cooperation with the Tippah River Drainage District of Benton and Marshall Counties and the Tallahatchie River Soil Conservation District. The lake is located on the Holly Springs National Forest. The Forest Service contributed construction funds to provide additional water for recreation use and is developing needed recreation facilities.

The environmental health survey and report included--

--a sanitation survey of the watershed. This directed attention to and evaluated unsanitary conditions related to living conditions on some of the privately owned lands, to certain problems along major roads which cross the watershed, pollution sources from agricultural activities and from National Forest lands.

--examination of water in tributary streams and the lake. Water samples from tributary streams and the lake were analyzed for physical, chemical and bacteriological qualities. Several laboratories cooperated in the analyses. Pesticide determinations were made by the State Chemist at Mississippi State University.

--Vector control needs. This aspect of the study, though it concentrated on insects, other arthropods and rodents which transmit disease from lower animals to man or from man to man, also gave attention to other pests such as bees and wasps that hamper enjoyment of recreational activities.

--Water quality aspects of recreation development. This area received special attention in all phases of the environmental health survey. Items considered were water supply, sewage collection and treatment, and garbage management. The swimming area was checked for hazards and water samples were analyzed for bacteria. Vector problems in this high use area received special emphasis.

This report on environmental health presents thirteen key program recommendations worthy of serious consideration in any comprehensive program concerned with improving rural environment. These recommendations are:

1. Adequate waste disposal facilities should be required for all new development in the watershed. Particular attention must be given to assure that adequate sewerage facilities are constructed for all new cabins.
2. A program is needed to encourage or require the construction of satisfactory means of domestic waste disposal for all existing homes.
3. A continuing policy of inspection and enforcement of regulations is needed to assure that waste disposal facilities are properly operated and maintained.

4. The dumping of garbage and refuse along the roads and into gullies in the watershed should be prohibited. Some public agency or organization should provide facilities for proper disposal by incineration or landfill.
5. Residents in the basin should be encouraged to provide the proper type of garbage storage containers to prevent a build-up in the fly and rodent population and to transport the garbage to a proper disposal facility.
6. A program is needed to rid the area of abandoned automobiles.
7. All dilapidated and abandoned houses and sheds in the basin should be removed as the Forest Service has done on National Forest land.
8. A housing code or regulation is needed to prevent the construction of sub-standard housing. This, in turn, will tend to reduce the creation of other unsanitary conditions.
9. A program is needed to eradicate or suitably control the beaver population. Sample results indicate that elevated bacteria counts can be expected where the beaver population is highest. This action will also decrease the extent of possible mosquito breeding areas.
10. An adequate number of camps with proper facilities for garbage and human waste disposal should be provided at desirable locations in the forest for hunters and fishermen. Camping should be prohibited except in these authorized areas.
11. A continuing program of surveillance of water quality in the tributary streams is needed. Samples should be taken at different times and under different flow conditions. The results of further tests may indicate the need for preventing pollution of the tributaries by livestock wastes. It is recommended that fairly complete physical, chemical, and bacteriological analyses be performed on these tributary streams on a once-a-year basis by a qualified laboratory. Periodic field tests by Forest Service personnel could be made on a more frequent basis as supplemental information.
12. Periodic examination of the effluent from the lake is needed to determine the effect of storage and the quality of the water as it reaches the receiving stream. Sampling should be carried out as proposed in Recommendation No. 11.
13. A control program is needed for mosquitoes and deer flies. Suggested measures are:
 - (1) Adulticiding the entire shoreline in one continuous operation with a swath width of 200 feet inland,
 - (2) Larviciding in critical areas,
 - (3) Maintaining the lake at the optimum depth to minimize insect breeding in shallow water and marshes.

Many of the recommendations can only be accomplished through State and County action since private land problems are involved. Our folks here on the ground will continue to cooperate with local authorities whenever possible to provide the needed action programs.

We in the Forest Service who have studied this report are enthusiastic about the results of the survey. It pioneers in a vital area of State - Forest Service cooperation that we hope to develop steadily here and throughout the Region. Several other States have already indicated similar eagerness to cooperate in various ways to help us protect the health of National Forest visitors and to meet some of our other responsibilities in water quality. I'm sure that with the fine cooperation and concern that we have learned to expect from our colleagues, and as demonstrated by the Chewalla Lake study, we'll make continued progress in this vital area.