

WATER RESOURCES PROBLEMS AND OPPORTUNITIES
ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS

by

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The increase in population and leisure time in the United States has created substantial demands on the available surface water resources. People want nearby areas to participate in the water contact sports; large population centers need more water to meet the requirements of the homes and industry; more irrigation water is needed to meet the increased demand of food; and often, flow augmentation is necessary during low stream flows to help simulate the waste discharge from industry and municipalities. These various water-use needs have created pressure on the different state and federal agencies involved with developing water resources to incorporate numerous purposes in the water development projects, i.e. multiple-purpose impoundments as an example.

Until PL-566 was passed in 1954, the Soil Conservation Service had two main purposes in developing watershed plans. These were flood prevention and land treatment. PL-566 added authority to plan for additional purposes, including recreation, fish and wildlife, drainage, irrigation, and municipal water supply. Therefore, when the conditions permit and the desire is present from the local people, some of the Soil Conservation Service impoundments are developed for multiple purposes. The authority to plan other purposes in the flood control projects made the water development projects more flexible, but when efforts were extended to apply the additional purposes to many of the drainage areas, difficulty was experienced in locating suitable water quality for either public water supply or recreation purposes. The water quality criteria for these two purposes are fairly stringent, especially recreational purposes for water contact sports. The water quality criteria for irrigation water is not stringent and can usually be met in most drainage areas.

Since public water supply and recreation waters have a stringent water quality criteria, the water resources problems associated with these two purposes will be discussed in more detail. At this point, the controlling water quality criteria for Mississippi should be reviewed generally to understand the many parameters involved in selecting a site for either public water supply or recreation waters. The public water supply criteria has eleven water quality parameters that must be met before the impounded water can be classified as a public water supply. The recreation classification has seven parameters that must be met. Of this group of water quality parameters, generally the bacteria limitation has been the most difficult to meet even in the rural area. The bacteria limitation for recreation purposes involving water contact sports is more stringent than for public water supply.

Since most of the Soil Conservation Service projects have several sites available in a watershed project to use for a multipurpose impoundment, considerable effort is made to choose the best site available in the planning stage.

The drainage areas are reviewed by a visual survey to determine what the conditions are above the impoundment area. It has been found that a visual survey of the drainage area with possible pollution sources marked and labeled on a drainage area map can be very helpful in obtaining a rough idea of what the water quality may be. The visual survey is the first step made to locate the best possible site for constructing a multipurpose impoundment. Of course, this survey does not definitely define the probable water quality, but it definitely eliminates a lot of guesswork.

To illustrate the importance of this brief visual survey, consider the following two examples. First, let us consider a near ideal drainage area condition. The drainage area above the impoundment would be virtually a virgin area with practically 100% vegetative cover, very few homes, and minimal number of roads crossing the area. This is about as near the ideal condition as one can expect in this state. But, surprisingly, we still have a few drainage areas of a substantial size that approach this ideal condition. With a drainage area similar to the ideal one described, a person should not have a problem with water quality prior to construction.

The second condition to consider is a drainage area with an industry. Usually, a person will be able to determine the nature of the industry and thus be made aware of the anticipated pollution problems that could be associated with the industry. Since the industry will employ people, problems related to sewage may be anticipated, and the number of people involved at the industry and the available waste treatment facilities should be investigated. Of course, if an industry is present in the drainage area, one can also expect communities to develop around the industry and probably some communities are already present. This presents additional problems. If plans are very definite to construct a reservoir in this drainage area for purposes of water supply and/or recreation, the site should have a very detailed water quality survey conducted to determine the magnitude of the problems. This is another reason why a visual survey should be made to determine what analysis needs to be made. The water quality analysis would indicate what degree of control would be necessary in the drainage area to assure the water quality in the impoundment would meet the state's criteria for the planned purpose.

The above two conditions touch on the conditions one may encounter in a drainage area above an impoundment. The two illustrations bring into the picture each end of the spectrum of water quality problems. There are numerous problems that fit in this spectrum, and some combination of these problems may develop problems more serious than the problems discussed in the second illustration of an industry and a town.

To bring the problems more into the focus of water quality, consider the problems that can be anticipated in Mississippi.

A. Oil Wells

Most people are aware of problems associated with oil wells. The primary problems are the oil, sulphur, and salt water spillage that happens to occur frequently during drilling. A lake used for water supply or recreation would be of little value after receiving a significant discharge of this material. After the drilling process has been completed and the well is put into use, a potential problem still exists of oil spills and possibly sulphur odor problems around the well. The oil that the well produces is either stored in steel tanks and later transported by truck, or the oil is transferred by small pipe lines to a central storage area. Either transferring system is subject to accidents and possesses a history of creating some severe water quality problems.

B. Municipal Discharge

If the municipal sewage is not receiving any treatment, it is definitely causing a health, aesthetic, and possibly a wildlife problem to the receiving body of water. The degree of the severity depends upon the receiving stream size, condition, and the quantity and quality of the sewage. Under the best conditions, the sewage would receive primary, secondary and possibly advanced treatment and definitely the effluent would be chlorinated. If several variables, i.e. impoundment volume versus effluent volume are favorable, it is possible the impoundment could be used for water supply or recreation, but only, after a thorough analysis of the many parameters in the water quality criteria have been made. The recreation waters would be in the most critical position. The criteria of state waters for recreation states that the bacteria quality of the impoundment can not be dependent upon adequate disinfection, on the theory that any interruption of the disinfecting process would contaminate the impoundment. With the best conditions, it would be difficult to classify an impoundment as water supply or recreation that is receiving a discharge from the municipality.

Another problem associated with a municipality is storm runoff. Studies have found very high fecal coliform concentrations in storm runoff and this source of contamination would definitely have to be considered.

Also, the solid waste disposal and collection system would warrant a review.

C. Industrial Discharge

It would be impossible to bring the various specific problems associated with an industry into this discussion. It should be sufficient to say a review of the industry should be made to understand the problems that can be expected and the adequacy of the industry's treatment and disposal system, especially from the viewpoint of how susceptible the treatment and disposal system is to accidents or mechanical failures. For instance, constructing an impoundment below a carpet mill, one could expect various chemical discharges in the impoundment and possibly discoloration if the treatment and disposal system had a failure due to a power shortage or mechanical breakdown. If the impoundment is large

enough, the treatment failure may not influence the water quality substantially, but this should be investigated before the impoundment is built.

D. Agricultural

Agricultural farming operations of substantial magnitude have a very definite effect upon the water quality. I shall bring out a few of these problems that have been experienced in Mississippi.

1. Confined Animal Operations

The farms of the past grew the food that the family required in small units and any excess was sold to the public for some cash. Farms of today specialize in producing a specific produce for profit and purchase the necessary food for the family from the grocery store like his urban friends. Animals are now penned in a confined unit for producing large quantities at a minimum of labor and feed cost. Of course, these operations generate huge volumes of waste that have to be disposed. If the material is incorporated into the soil, very little of the waste should leave the area, but if the material is not incorporated into the soil and intensely spread on the land, a flushing rain may transport much of the material into a stream. The waste material could produce the same problems in a stream as municipal sewage. A confined animal operation in the drainage area of an impoundment for water supply or recreation use would warrant a water quality analysis of the water from the drainage area. In some areas of the state, this is a pertinent problem due to the concentration of the confined animal units. The waste may not be of significance in removing oxygen from the water, but would have a definite bacteriological effect and possibly a nutrient effect on the impounded water.

2. Pesticides

In areas where substantial use of pesticides occurs, it can probably be eliminated as a good site for water supply. With the present controversy about the use of pesticides, the limitation criteria may vary at a later date, but the present criteria varies from 100 ppb for organic phosphates to 1 ppb for Endrin. A water supply impoundment can be built and receive some pesticides, but the quantity will have to be very small.

The above sources are definitely not an exhaustive list but merely illustrates some of the problems a person may encounter in selecting a site for the purpose of public water supply or recreational water for contact sports.

To further discuss problems associated with recreational lakes, assume the proper water quality is available and a dam is being designed. At this point serious considerations should be given on the anticipated volume of sewage that will be generated by the recreation area and how the sewage will be treated to not pollute the lake with high fecal coliform counts. Small package treatment plants are available on the market that will provide good treatment of the waste and could be built in the general area of the recreation facilities, i.e.

comfort stations, camp sites, etc. The effluent from these treatment plants should not discharge into the lake. If a failure occurred within the disinfecting chamber, the lake may have a very high bacteria count and even disease outbreaks may occur.

It has been the policy of Mississippi Air and Water Pollution Control Commission and the Mississippi Board of Health to require the waste to be discharged behind the dam by gravity flow sewer lines if possible. The waste could be treated before or after the material is transferred behind the dam. Soil Conservation Service has followed this policy and sewage generating facilities are located according to the necessary elevation needed to assure gravity flow on past the dam and treat the waste behind the dam. Pump stations are not used on the lake side of the dam because a power failure or mechanical failure would cause the sewage to enter the lake directly and defeat the planned pollution fail safe system.

To carry the development of the recreation lake further, consider the structure has been completed, the lake is in use for swimming, water skiing, and various other activities, and the supporting facilities have been completed. What will happen to the adjoining land areas adjacent to this beautiful lake? Probably, a narrow strip of property surrounding the lake will be owned by the lake management, but much of the land will still provide a scenic site for homes or commercial facilities. The development around some of the lakes may not be of a sufficient magnitude to warrant apprehension, but large developments may occur and cause problems if not controlled. It is not the intent to try and stop development in the area, but some organization or political body should regulate the growth and not allow the development to cause pollution problems. This could possibly be controlled by zoning with subsequent ordinances and a permit issuing system. This area needs greater attention in the near future on various legal opportunities available or needed.

It has been the primary purpose of this discussion to illustrate some of the problems associated with developing impoundments for water supply and recreational water contact sports in addition to the other water use purposes. The criteria for these two purposes are more stringent than for other water use purposes and were used to illustrate the water resources problems. Usually, no water quality criteria problems are associated with purposes of flood storage, storage for flow augmentation or irrigation unless unusual circumstances exist in the drainage area.

Using impoundments for more than one purpose definitely has some benefits. The stored water is being used for more than one purpose and the public is receiving the full benefits of the stored water. Water provides outdoor sports for the family as well as providing a necessary element to a wholesome environment. The demand will continue for additional areas and more purposes will have to be augmented in the impoundments in the planning stages, but it should be recognized that many drainage areas are not suitable for some of the desired uses of the water.

Some structures in the future could conceivably contain storage for

flood control, recreation, water supply, irrigation, and flow augmentation. In fact, one impoundment presently exists in the state with all of these purposes except irrigation storage. Impoundment structures, especially larger impoundments, will have more purposes planned for the stored water than one single purpose.