THE WORK OF THE TVA IN RELATION TO THE WILDLIFE RESOURCES OF THE TENNESSEE VALLEY[1]

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The development of the Tennessee Valley by the Tennessee Valley Authority is an undertaking too well known to necessitate any detailed discussion here of the main program itself. However, I wish to take the opportunity afforded me at this meeting to present a line of activity engaged in by the Authority which is not so well known as the power-navigation phases, but to those interested in the types of problems presented, it is no less fascinating. I refer to the work of the Biological Readjustment Unit, a functional part of the Forestry Division of the TVA, which I have the honor to head. This unit was established for the sole purpose of rehabilitating the lands and waters of the Tennessee Valley. Its functions are valley-wide, hence, not confined to the actual land-holdings of the Authority. The unit was established in recognition by the Authority of the far reaching effects of dam construction and the relation of these effects to the peoples of the Valley itself. The damming of the great river system and the accompanying metamorphosis of the river into a series of great impounded lakes, presents a series of problems to the inhabitants of these river waters which they are in themselves unable to face or to solve. An organism in nature is a response to a given set of environmental factors and each organism is itself an answer to the problems imposed upon it by its environment. Thus the population of the Tennessee River as it existed prior to the interference by Man with the natural seasonal cycle of events, was a mass answer to the Tennessee River conditions, an answer brought forth through a tremendous period of time. Those organisms which were present in this river were present because they had successfully solved the problems which confronted them, while those organisms which were unsuccessful in solving these same problems failed to establish themselves in the Tennessee River system and hence were not to be found there. When a new set of conditions confronts an organism, that organism has, in truth, a very limited number of choices; namely, (1) it can adapt itself to these new conditions, or (2) it can migrate, or (3) it can perish. The degree of adaptability of most of our aquatic organisms is not great, and the profound change from a river to a lake and from a river

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system to a series of lakes, or better, impounded reservoirs, is in many cases far beyond the ability of the organism to successfully adapt itself and thrive. The same is true, but perhaps to a lesser degree, of the terrestrial animals, but it is no less evident that with the establishment of this new aquatic set of conditions the land animals find new conditions to meet. It is the function of this Biological Readjustment Unit to readjust the aquatic and game resources of the Tennessee Valley to these new environmental phenomena.

Before any work of a practical nature could be undertaken in the Valley, it became necessary to know something, at least, of the inhabitants of this area. So far as the past is concerned, there is little or no scientific data available upon which we can base any estimate of the fish or game conditions in Tennessee as it was originally. There exists a considerable amount of isolated information in various memoirs and ancient documents, which give scattered glimpses of the original Tennessee Fauna, and from these sources certain things are quite evident. The original Tennessee fauna was remarkably rich in what we now call "game animals." Deer seemed to have abounded almost everywhere from the Mississippi to the Smokies, and formed a large part of the food supply of the early settler who, however, it should be noted, did not kill to excess what was needed in the line of venison for food purposes; the slaughter came later. Bears were abundant, not only in east Tennessee, but throughout the state, and there is the tale of the killing of eight bears by Davy Crockett in a horseback ride of twenty miles, without going out of his path to dispatch the animals. Beaver were present, though never in great numbers, and there still remain a few widely scattered remnants of their dams. Tennessee also fell within the range of the bison, although these animals were early driven out of the region and exterminated from the Valley. Panthers were present, as were bobcats and a few lynx, but these, being highly carnivorous animals, were always scattered and usually solitary, and as they took heavy toll of the settler's cattle, they were early reduced to almost zero, and today there are but a few bobcats still to be found in the area. As with the early data, there are unfortunately no reliable data on the present day fauna. There is no record available, giving details of hunting or trapping for any single year, hence there is nothing accurate upon which to form an estimate of existing game.

When a doctor is called to visit a prospective patient, that doctor must first diagnose the ailment of his victim before he can conscientiously or scientifically prescribe for his ailment. In a similar way, I believe that the first function of my organization is to ascertain what wildlife still remains in the area for which we are responsible. With this end in view, I early began a valley-wide study with the objective of learning as accurately as possible just what wildlife is now present within the valley. Already comprehensive studies have been made of the fish life of the Norris, Pickwick and Wheeler Reservoirs. The

Duck River area has been studied, and during the coming summer the fish of the Hiawassee region will be added to our list of endeavors. This study is not merely a superficial hit-or-miss affair. Systematic collections have been made in all the tributary streams leading into, as well as of the reservoir itself, and these collections were made and will be made prior to the impounding of the waters concerned, so that we will know in the future exactly what the conditions were prior to the erections of the dams. This study is being made in collaboration with Dr. Carl Hubbs of the University of Michigan, and will, when completed, be published in the form of a large scientific and accurate bulletin dealing with the fish fauna of the Tennessee Valley, including, as it does, parts of seven states. Not only will this study yield us information as to what was here before the dams were built, but as time goes on and opportunity presents itself, we will know considerable about the food habits, parasites, size, growth rates, etc., of these fish. In a similar manner we proposed to make and are well started on a study of the mammals, birds, reptiles, and amphibia of the Valley, together with studies perhaps less comprehensive but no less detailed or accurate of various other groups, such as the crustacea and mollusks. In other words, we are attempting to carry out what has not been previously attempted, namely: A natural history survey of a great natural topographic unit without reference to political and state boundaries, and the results of our work will in due time be given to the public.

All this, of course, is necessary if we are to understand what effect the damming of the Tennessee River and its tributaries has upon the wildlife of the area. Then, knowing what this effect has been, we should be in a position to judge better and more accurately the necessary needs and developmental phases of our biological readjustment work. Furthermore, it is sincerely hoped that our efforts may prove of value as a guide to those who in years to come will undertake similar damming operations, and indicate to them the trend of events which follow impounding of great masses of water and its effects upon the native wildlife of the area concerned.

What I have said as to these studies forms but a background to what some people would call the "practical" phase of game and fish management, but to me this separation of "practical" from "scientific" is entirely unjustified, for we hope that our "practical" work will be no less "scientific" than our scientific work. Upon each reservoir area my unit will have an expert game technician, who will be charged with the development of the various game problems of his region, and these game problems will be the development under natural conditions of the native game species to which the area is best adapted. I do not favor the introduction of exotics, and I will not introduce exotic competition which will in any way endanger the success of the native game species which we know, because of their natural presence, to be adapted to the area and hence successful. Each reservoir will be in charge of

expert fisheries men who will be responsible for the investigation of all phases of aquatic biology associated with their reservoir area. This means a complete bio-chemical and bio-physical study of the water, a comprehensive study of the chemical, biological and limnological development of large impounded reservoirs, so that in the future we may know something of the early stages in the life history of these great man-made lakes—a study which is sadly lacking at the present time. Besides these studies, he will be responsible for the development of the fisheries within his area, and by this word "fisheries" I include not only the sport of fishing but the development of fish as a food for the thousands of people who have for generation upon generation depended upon the waters of the original Tennessee River for their food or livelihood. We hope in time to carry out studies dealing with the clam-shell industry in an attempt to rehabilitate the pearl button shells which are bound to suffer a serious, if not a fatal, setback as a result of the manipulation of their optimum environment.

From the foregoing remarks it becomes evident that the work of my unit is both diverse and complicated, not to say extensive. Yet I would go just a step further and indicate very briefly and sketchily some of the phases of our activities which may clarify somewhat the picture I am trying to present. Roughly speaking, our activities may be divided into two general phases: those associated with aquatics, the fisheries problems, and those associated with terrestrials—and to some extent perhaps aerials—the game management problems.

Among the fisheries activities there is, as has been mentioned, the work of aquatic chemistry, involving all phases of the study of impounded waters *per se*. Then there is a small but important group of physical problems, involving such phenomena as turbidity, stream improvement, hydrography and allied subjects. Among the zoological problems are all the many problems centering around the fish themselves—the problems of food, distribution, ecology, abundance, diseases, parasites, growth rates, etc. In this connection we are also building fish hatcheries for the production in quantities of suitable fish species. These hatcheries are built by the TVA in cooperation with the United States Bureau of Fisheries, and when completed are to be operated by this Bureau as an integral part of its program. One such hatchery is completed at this time below Norris Dam, for the sole purpose of restocking Norris Reservoir. For this reservoir is a storage reservoir, and will have a fluctuating water level of around 50 to 60 feet during the year. The effects which this fluctuation must have on the fish life need no emphasis; they are self-evident. A second and much larger hatchery is now being designed to take care of fisheries problems associated with the so-called "lower lakes": Chickamauga, Gilbertsville, Pickwick, Wilson, Wheeler and Guntersville. Associated with these hatchery projects we are creating permanent level rearing ponds where, under controlled conditions, the fry can

be raised during the summer to a size sufficiently great to ensure their safety when liberated into the great competition which awaits them in the body of the lake itself. Four such have been completed; two more are under construction and others will follow this summer. Among the aquatic problems are a great variety associated with the zoo-plankton and bottom faunas, these being very important to the food of fishes. Then there are the problems of aquatic botany: the problems of aquatic vegetation and the type involved: emergent, floating, submergent—and all the problems of phytoplankton, bacteria and aquatic fungi. Which brings us to the last of the aquatic problems with which we are associated though for which we are not responsible but in which we are interested: the problems of pollution, silting, and mosquito control. These latter problems are important to human life, and through the methods used in their control, important to wildlife itself, hence our interest in them.

The management problems depend upon the physical features of the reservoirs, for upon these features lie the answer as to what use we shall make of the available lands. Norris is primarily interested because of quail and deer and later wild turkey possibilities; Wheeler for its wonderful migratory waterfowl potentialities. Aside from the local limiting factors, the game problems may be divided into those associated with mammals and those with birds. Among the former we have the rehabilitation of the deer, which has already begun on Norris where we now have a wild herd of seventeen, and there are plenty of management problems in this connection. We hope to get into the fur-bearers shortly and to seriously tackle problems of muskrat, mink, raccoon and possibly later, beaver. Upland game birds are highly important and we are dealing with quail and grouse particularly. Not by hatchery methods, but by improvement of the environment—the planting of suitable food and shelter plants. This spring we planted 164,300 such shrubs and trees. We are working now on the migratory waterfowl refuge areas on Wheeler Reservoir, where we plan to create some 54,000 acres of refuge, not to stop duck hunting, but to increase it—to increase it by affording protection from shooting which will insure a greater survival for reproductive purposes, yielding more ducks. Insectivorous birds, as well as the birds of prey will be studied, and the problems associated with them treated as the exigencies of the situation shall direct.

This, then, summarizes very briefly the work of the Biological Readjustment Unit of the TVA, and I hope that it has left with you the impression of sincerity of purpose with which we are undertaking our work. It is a sincerity of purpose directed at but one objective—the success of our efforts—with the hope that these efforts will yield results beneficial to the people of the Tennessee Valley. If we succeed, we will be happy.[2]

[2]During the interval which has elapsed between the presentation and the publication of this paper, certain changes have occurred which should be noted, certain

advances made which should be listed: (1) the Biological Readjustment Unit has now been advanced to the status of a Division in the Department of Forestry Relations; (2) active cooperative agreements have been signed by the TVA and the Bureau of Fisheries, Biological Survey, and the Conservation Commissions of the States of Alabama and Tennessee, assuring active cooperation in the field of wildlife rehabilitation; (3) the large Elk River Fish Hatchery has been started in northern Alabama; (4) a full summer's study has been completed on Norris, and has yielded information of great interest; (5) a fully equipped laboratory boat will be studying the Chickamauga-Gilbertsville waters before this paper appears.

COTTON PICKER GETS THE COTTON BUT DAMAGES LINT

The greatest difficulty to be overcome in the development of a satisfactory mechanical cotton picker is the failure to harvest existing varieties of high quality seed cotton without serious damage to the lint. This is the conclusion of Charles A. Bennett, of the U. S. Bureau of Agricultural Engineering.

Spinning tests of cotton harvested with the newest type of mechanical picker show that "even with the use of full batteries of gin cleaners and extractors the machine-picked cotton was of appreciably lower grade and yielded much more manufacturing waste than hand-picked cotton from the same field."

Machine-picked cotton, he said, is matted, carries much green leaf and occasionally has green stains on the fiber; it contains fragments of bark, stems and long grasses.

From the standpoint of picking the cotton, Bennett said, the spindle-type mechanical pickers do a fairly good job as they gather about 90 per cent of the open cotton and only from 3 to 8 per cent is knocked to the ground.

He summarized the objectives of mechanical harvesting as follows:

1. To replace entirely manual harvesting by mechanical methods, or

2. To supplement manual labor continuously during the cotton picking season, or

3. To clean up all late-season portions of open cotton remaining after defoilation of the cotton plants.

The production of high-grade mechanically-harvested cotton, Bennett said, probably will be difficult until the plant breeder has developed cottons of suitable pickability. In his opinion the problem is threefold, its solution lying within the domains of plant breeding, agricultural engineering and cotton ginning.