FISH AND WILDLIFE VS. WATER MANAGEMENT—SOME BASIC CONSIDERATIONS*

HAROLD E. ALEXANDER
Arkansas Game and Fish Commission

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This paper is an attempt to review, in a general way, some of the problems with which we are confronted, originating from the present systems of water management, as they effect those fish, wildlife and recreational resources with which we are professionally and personally concerned. These systems and patterns are altering and changing the habitats which are essential to the perpetuation of these resources; and because we are earth-bound creatures, living in the world of our surroundings, the vast changes imposed by these systems of water management are altering the environment in which we live, and thereby changing us.

Today, water management is based on established patterns and precepts, many of which originated in an early period of our development. They are the result of concepts of laws and priorities extending far back to the ethnic groups from which we originate; and based on early use patterns in a pioneer society. They are, likewise, the result of priorities for management, delegated to long established agencies, organized for limited purposes and objectives. They are often dominated by these limited or single purposes, and by that pattern of social thought which defines change and progress as synonymous terms. They are too determined by the changing patterns imposed by increasing human populations, by the huge sums of money derived from our material wealth and systems of taxation, by a political and monetary structure which is often subject to the influence of those more concerned with personal gain than the welfare and purposes of a healthy society, and by our own ignorance and the narrow view of the values and interrelationships of the world in which we live.

As "shareholders" in America's future, and as biologists professionally concerned with resources important to our obligations and way of life, the kind and type and scope of water management which is changing the environment around us is our concern. The drainage of wetlands, the impoundment and alteration of water cycles, and the vast changes effecting land and water resources of all types which often destroys habitat essential to wildlife and changes the patterns of biotic relationships, has had and will have an immense impact on our future. Clawson and Fox (1961), commented, "Most land and water investments are terribly permanent. What is done cannot be undone "by us or our children."

Today, in view of the patterns established for water management and their impact on resources, and the kind of world we will have in the future, we are in a "now or never" situation. Today, the overriding need in water management is a broadening of the socio-economic base for those policies applied to water use. The narrow limits of declared management purposes—flood control, power, navigation and irrigation—are no longer sufficient to meet the needs of society in the long years ahead.

Our water policies and plans to be adequate to the needs, must include considerations for preservation as well as development. The protection of age-old habitats essential to wildlife and man, and the recognition and perpetuation of recreational, historic, esthetic and intangible values is essential if we are to satisfy our cultural as well as material needs. In view of the "developments" already finished, and the water management plans prescribed for the future, we are in an era of "last chances." Management plans on the drawing boards and readied for action will drastically change the world of the future. Consideration for the kinds of environment we will have in the future,

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and the range of values and opportunities available to us, necessitates our immediate concern with what is being done about water resources —now. Let us look at some of these problems.

PROBLEMS

The difficulties we face are large. They include immense costs to ourselves and financial burdens to those yet unborn. It has been stated that the cost of projected water developments will eventually total 70 billion dollars, a large share of which must be paid by our children and their children. The 1964 "Budget in Brief" lists allocations of 1,750 million dollars to "land, water and power developments," the "land" category of which is defined as "Indian land." This 1964 Federal budget set up additional items such as "water transportation" and appropriations to U.S.D.A. budgets, among which are sums allocated to water "developments." But beyond the monetary considerations we are at this time mainly concerned with perpetuation of an environment serving all our needs, in the changes wrought in human environment and the values we place on things lost to limited development purposes. Let us examine a few of these.

For those of us concerned with wildlife resources, drainage is a major concern. The impact of drainage on waterfowl is a most conspicuous example. These effects are highlighted by the steady reduction in waterfowl and shorebirds, to the point where they may, like the buffalo, only be of interest to the sightseer who views them on protected reserves. We are informed that five and one-half million acres of nesting habitat has been drained away in the past seven years (*Outdoor News Bulletin*, 1962). Much of this loss has been due to drainage carried out through farm subsidy programs which has created more agricultural land. A recent Fish and Wildlife Service report lists 60,440 acres in 93 counties in the north central states, drained under the A.C.P. cost-sharing program in a period of four years. At the same time, additional lands were placed in the Conservation Reserve (28.7 million acres by 1960) to take lands out of production (Secretary of Agriculture Report, 1962), and stockpiles of wheat and other surplus products were stored at public expense. The inconsistencies of such a program are obvious, but the loss of habitat for a dwindling and important resource is critical. We are draining (and flooding) ducks out of existence—trading them for things that are overabundant. We have hardly concerned ourselves with the drainage of wintering grounds, but the loss of these in the southern states imposes further reductions of a habitat essential to ducks and geese and other birds and mammals, and to traditional and valued uses of water.

Throughout the United States, there is concern over the impact of vast impoundments on other resources. Justification for these structures is largely based on the limited objectives we have listed, but their impact on other resource uses is immense. In the Pacific northwest, the salmon runs are disappearing as the result of blocking of their age-old migrations, with high barriers of concrete. Battles are under way to save even a few of the remaining spawning grounds for anadromous fishes.

Today, only seven and one-half per cent of the 2,466 mile-long Missouri River remains unaltered; and there are plans to cover that remaining small percent with impounded water, covering up the famed and scenic Lewis and Clark camping ground, and the natural wonders and isolation of this remaining stretch of river. (Anon, 1963) One dam in this vast Missouri River complex of impoundments, the Oahe, will extend along 250 miles of river and will cover 227,000 acres of alluvial plain, the ancestral habitat of myriads of waterfowl, cranes, shorebirds and other wildlife.

In California there are efforts to save just one fork of the Feather River, a famed fishing stream. Vast water developments for irrigation and to supply the bathrooms of increasing numbers of people will, it appears, take precedence over all other uses.

Vast plans for dams on the Colorado will cover much of the remaining scenic Grand Canyon, Dinosaur Monument, and other scientific and historical areas.

In the east, sixteen large impoundments are planned for the Potomac, which will cover villages, farm lands, and historically significant areas. These plans are accompanied by other developments and watershed structures. Cost of plans for construction of the principal dams proposed run to estimates of more than $479,000,000. (Potomac Committee Report, 1961.) One purpose of these plans is to dilute pollution, yet relatively little consideration is given to abatement of pollution sources, and annual appropriations for this purpose have been less than the cost of a single dam. And in the Ozarks, the northeast, central, western states, and elsewhere, efforts are being made here and there to preserve a few of the remaining clearwater streams for their fishing, floating, scenic, recreational, historical and other values. For such waters it seems axiomatic that their inherent values, beyond their potentials for lighting bulbs, or the picture tubes in TV sets, should be recognized, but when monetary considerations only are applied, other values lose out because they cannot be counted or tabulated nor produce the emotions associated with hard cash.

The watershed program, hailed at its inception as a boon to all forms of land use betterment, has developed trends and side effects which have been questioned by fish and wildlife interests. (Statement to S. E. Assn., 1962.) The principal concern is the loss of wildlife habitats as the result of conversion of marginal land to agricultural uses. Also of concern are the plans for extensive channelization of streams, which will alter the character of habitats essential to fish and their associated biota, making drainage ditches out of meandering small waterways, with their pools and rifles and cool waters. The loss of stream side vegetation, warming of waters in impoundments, and elimination of wetlands are also matters of concern to those who seek to preserve wildlife forms now and in the future. Nine hundred and one applications for watershed projects involving 50,800,000 acres, and 2,684 miles of channelization had been planned in fourteen southeastern states by 1962, which provides an index to the ultimate scope and possible effects of this program. The basic principles of watershed management are sound. They need revision to include preservation of all the values land and water have for us.

These are a few examples. There are many others. Seventy million people use polluted waters, and there is relatively little effort to solve this problem. The loss of underground water, historic, scenic, scientific, varied and diverse recreational opportunities limits our inheritance for the future. The conspicuous need is for an appraisal and recognition of all values associated with water, and their perpetuation. The fact that developments have ". . . most frequently had single (or limited) objectives in view . . . suggests that something less than a harmonious civilization has been in the making." (Heckscher, 1962.)

Ernest Swift commented that "the magic word of the day is progress, yet few people can clearly define what we are progressing toward." One of our problems is to redefine the word "progress" in water management.

THE PLANS

It has been stated that 33 separate federal agencies engage in the management of water. These include the Corps of Engineers, Reclamation Bureau, T.V.A., Southwest Power Administration, U.S.D.A., among others. Agency plans often are based on limited and prescribed objectives conditioned by limited authorities. The machinery does not leave much room for choice among "the reasonable alternatives"; or concern with the soundness of the investment; and "each (management) agency tries to see how its accepted traditional prerogatives will fit into a particular situation." (Clawson and Fox, 1961.)

Water management plans for the future formulated by the principal agencies to whom these responsibilities are delegated, are vast, and include the manipulation of almost every drop of standing and running water. These plans are, basically, limited to long established jurisdictions and are based on the narrow concepts of what constitutes the proper and acceptable uses of water and prerogatives of the agencies involved.

The Corps of Engineers, a major development agency, proposes the construction of 300 reservoirs over the next 20 years. Within that period, it plans to construct 13,000 miles of new (or improved) inland waterways, and 11,000 miles of flood wall and channel improvement (Weber, 1963). A need for one and a half to two and one-half billion dollars annually for construction funds to carry out these objectives, is postulated. Their 1962 annual report covers over 1,200 pages, and analysis of the losses or benefits to wildlife of these developments defies any generalized summation or analysis.

In the West, the Bureau of Reclamation (Ann. Rept., 1962) is in the process of constructing the vast Colorado River Project, and many other projects throughout seventeen western states. The 1962 Bureau Report lists expenditures of $347 million in 1962, and approval of contracts totaling $182 million. Many of these projects are constructed, primarily, for irrigation. The advisability of creating more cropland, at costs estimated as high as $900 per acre is questionable, when we note that cereals grown on irrigated land totaled 2,413,227 tons in 1962. Rep. Avery of Kansas has recently observed that 25% of crops grown on irrigated lands "consisted of surplus crops backed by Federal price supports and subsidies." He questioned the advisability of creating lands at public expense to grow crops already in surplus. Production returns on irrigated lands are as low as $36.36 per acre (Recl. Bur. Rept., 1962). Problems for conservationists related to all these plans include the loss of salmon and trout streams (Columbia and central Utah projects), the loss of scenic grandeur along the Colorado and elsewhere, the channelization and innundation of lands essential to wildlife, and the loss of stream side vegetation. (Recent proposals include eradication of what is described as "phreatophyte vegetation," which utilizes water.)

Creation of mass type recreation facilities is listed as an objective of these developments, but the rarer, less common and intangible values are being ignored and lost.

Among the detailed and extensive plans for the development of water are those formulated by the United States Study Commission for portions of the southeastern states (U. S. Study Comm. Proposed Rept., 1963). These plans are detailed, are the work of many cooperating agencies, and represent a sincere effort on the part of this commission to evaluate all the possible uses of land and water, and plan for their "development." The main criticism that one can make of these plans, as they are presented in preliminary reports, is that they leave *little room for alternatives or choices in the future.* They do, for example, include considerations for preserving hunting, fishing and recreational opportunities, but at the same time (in one river, and in one basin alone), these plans provide for construction of 203 dams and locks, 23 large reservoirs, drainage for agriculture or other uses of 1,000,000 acres of land, and, currently, 29 watershed projects for which applications have been made. It has numerous contradictions. For example, it lists streams in the highland segment of this project which are described as exceptional for their trout fishing, floating and scenic values, but on these streams eight major dams are proposed. Just how one can preserve the values inherent in these natural streams, and at the same time cover them up is an unanswerable question. The standardized cost benefits ratios, in monetary terms only, are used to evaluate these projects. Intangible benefits are "described," but are, apparently, lost amid the "Count Down" of dollar values. Wildlife and recreation are assigned dollar values in terms of "user days." The values prescribed for man days of hunting and fishing ($1.50 to $6.00 per day) are inadequate to compete with monetary values defined for other land and water resources. For other recreational pursuits, values as low as $.50 per day are listed.

There are other plans for water. There are state, community and private plans. The evaluation of all these plans in terms of their impact and the changes they will effect in human environments, is beyond any brief analysis.

One thing is certain, however, in making an effort to review even a small segment of these plans, one feels as though he had been pro-

jected into George Orwell's world of 1984, in which "Big Brother" has so organized the world that there is little room for new ideas or diversity and in which intangible values and emotions are prohibited to prevent deviations from the authorized "paths of progress."

Recently, these water management agencies have expressed the desire to consider both monetary and intangible values in project plans. The preservation of the intangibles does, however, necessitate leaving some resources as they are, rather than attempting to incorporate them into plans designed for other limited purposes.

That there are conflicts and uncertainties in many developments and plans for water is suggested by obvious inconsistencies. For example: Flood damages have increased in spite of billions expended to alleviate them. (White, 1962.) Although one objective is to create more agricultural land, the Secretary of Agriculture has stated we will need 50 million acres less in crop land in 1980 to satisfy our needs. We continue to have large crop surpluses and excess crop lands on which production is prohibited.

Although we talk about water shortages, various authorities state there is no shortage, only wasteful use. There needs to be more economical use of existing supplies. (White, 1962.)

Projects for which large benefits were calculated are not delivering the expected results. Estimates of expected navigation use on the St. Lawrence Seaway have been about two-thirds the tonnage on which cost-benefit ratios were based. (U. S. News and World Report.)

At the same time, the ducks, geese, wildlife habitats, and scenic areas and what can be called "quality recreation potentials" are being sacrificed for purposes having as objectives the creation of "benefits" already in surplus.

THE FUTURE

In concluding these remarks and prescribing needs for the future I would note, first of all, that most of what has been said has been repeated many times. But repetition is essential to the revision of ideas and concepts.

Systems of management in practice have been criticized, but criticism is an essential part of the democratic process, and is necessary to the revision of ideas and alteration of traditional systems, which become obsolete as times change and circumstances are altered. The impact of expanding population alone, necessitates new approaches in the management of resources on which increasing numbers of people must depend for the satisfaction of all their needs and desires.

There are changes in policies and practices that should be given attention; and courses of action that deserve attention. Fundamental to these is recognition in our resource management of the principle that material devolpments cannot and will not satisfy all human needs and desires, and that all values cannot be expressed in dollar terms. We must forego some material things if we are to preserve space, enjoyment, peace and our mental and emotional health. We need to preserve a world in which we can have opportunities for "diversity," and in which future generations have opportunities to make choices as to the kind of world they would like to have about them.

It has been said that it is the quality of a resource that makes it important. "Quality" is a word that seldom appears in the plans we presently have for water management. We should give more attention to quality and cultural values which are our heritage.

Attention should be given to the following considerations, and the ideas are not all mine:

1. We need to redefine "progress" and its meaning for us.
2. Recognize that the social, cultural and intangible values of water resources are as important as its use for navigation or carrying away sewage.
3. Give more attention to the quality and cultural values which are our heritage.
4. Include education in quality values in our conservation education program.
5. Revise water laws to include rights to uses not now recognized, including established recreational and esthetic values.

6. Make plans which provide opportunities for "choice" along all the reasonable alternatives.

7. Recognize that the vast developments we plan are irreversible, and leave opportunities for decisions in the future.

8. Base our decisions on broad concepts which consider all the values involved.

9. Raise the monetary, man-day evaluations we place on fish and wildlife. They are inadequate in relation to values postulated for other resources.

10. Recognize the essential worth of esthetic values and give them precedence over material considerations.

11. Include preservation of existing resources as a "purpose" in water management.

12. Recognize that we are in a "now or never situation," and give more attention to water problems.

13. Other suggestions include establishment of a board of review, evaluation of benefits on a single project basis, and revision of the present systems of evaluating losses and benefits.

Clawson and Fox commented ". . . the basis for decision making is too limited for the kinds of decisions now in prospect," and Nace commented, ". . . traditional concepts of protection and development are naive in relation to the complex nature of land and water problems in a mature society. . . . Its inadequacies will, in fact, be dangerous in the future." We need accurate assessment of trends of the needs of society, and correct prediction of the needs and problems of the long future ". . . there is a critical need to re-evaluate criteria for determining what is in the public interest . . . what is the public good. The fact is that monetary value is not the total substance of public worth . . . and the fiscal yardstick could lead us into a cultural desert where all the signposts are dollar signs."

This pretty well summarizes what I have been trying to say. The things we do and actions we take will determine what happens to those qualities of environment we need to save, the kind of world we live in tomorrow.

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METHODS OF CAPTURING, MARKING AND SEXING ALLIGATORS

BY
ROBERT H. CHABRECK
Louisiana Wild Life and Fisheries Commission
Grand Chenier, Louisiana
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Southeastern Association of Game and Fish Commissioners
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A study was begun in April, 1958, to gather information on alligator (**Alligator mississipiensis**) growth and movement. For the purpose of the study it was necessary to live capture, mark and sex alligators of all size classes in bayous, canals and shallow impoundments.

Very little information was available in the literature regarding the handling of alligators and considerable time was spent developing the technique used during the study. The purpose of this paper is to present the various methods used to capture, mark and sex alligators and to discuss the techniques found most effective. From the beginning of the study through September, 1963, over 1,600 alligators were captured.

The study was conducted on the Rockefeller Wildlife Refuge at Grand Chenier, Louisiana. The refuge is owned by the Louisiana Wildlife and Fisheries Commission and as a result of rigid protection, supported a very large alligator population. Also, a large segment of the specimens were captured on the Sabine National Wildlife Refuge at Hackberry, Louisiana. Alligators were found on all portions of the areas that afforded suitable habitat.

Capturing Alligators:

Alligators were captured both at day and at night, but in general night hunts proved more successful. Not only was it possible to capture more alligators at night but also a wider range of size classes.

The principal method of capturing alligators was basically the same as that used by McIlhenny in 1927 (McIlhenny, 1935). This consisted of night hunting in a boat with a headlight and a strong wire slip noose attached to a stiff bamboo pole. Small aluminum hulls powered by 18 horsepower outboard motors were used in most cases during my study for night hunting. An airboat was used in shallow impoundments. One man sitting in the bow of the boat located the alligator by shining its eye with a 6-volt headlight. The alligator was then captured by slowly maneuvering the boat up to the animal and placing a snare mounted on a stout pole, around its neck, then quickly tightening the snare. Kleflock swivel snares as manufactured by Animal Trap Company of America were used during the study. Alligators less than six feet long were captured with the No. 0 snare and placed in regular burlap sacks until tagged. Those over six-feet long were captured with the No. 3 snare and immediately towed to the bank, marked, measured then released.

An alligator less than three feet long was easily captured at night by quickly grasping it behind the neck with one hand as it swam along the surface of the water, then pulling it into the boat and grasping the tail with the other hand to prevent the animal from twisting.