WATER - HOW IT SHOULD BE USED IN THE ENVIRONMENT

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You have probably heard about as much as you want to hear about Wyoming's water situation in this conference today, and so tonight I am going to switch signals somewhat and talk about a word which is becoming increasingly fashionable in Washington right now.

No, the word has nothing to do with the changing administrations. It relates to our commonplace surroundings, our environment. I want to discuss environment and its various meanings to various people and particularly how it relates to you and me and to the development of our water resources.

Webster identifies the biological meaning of environment as "the aggregate of all the external conditions and influences affecting the life and development of an organism." This is plain and simple language from which it is easy to comprehend why certain flora and fauna flourish here and not there or there and not here. The character and quality of life depend on the physical environment, the growing conditions.

The character and quality of an environment in turn also provide an explanation of why we do not have dinosaurs and other prehistoric mammals and birds roaming the world today as they did millions of years ago. All living creatures/ every living thing/ must adapt to these changes/ or die.
But Webster gives a second and larger definition of environment, a definition which relates to the science of the origin and evolution of society. This sociological definition of environment, according to Webster, may be divided into (1) the physical or inorganic environment, comprising such factors as climate and soil, (2) the biological environment relating to wild animals and plants including bacteria, and (3) the social environment comprising modifications of nature attributable to human activity.

The first two of these categories, the physical and biological environment, are simply a restatement of Webster's first definition, but the third is vastly different because it relates to Man's responsibility in a changing environment. The forces of nature and geodynamics are constantly at work, even though their processes are so slow, they are rarely evident in one lifetime or even a thousand lifetimes. And all growing things, plants and animals, including that superanimal called Man, generally adapt themselves and change to fit the environment.

The great difference is that Man is a thinking and reasoning animal, one that not only can adapt to the changing environment but, by his own hand, can and has altered that environment. There are those who argue that Man's changes are basically bad, while others contend that Man has improved the environment as he has used his intelligence to create a modern civilization.

There is, of course, no pat answer. There are few absolutes of black or white in environmental planning. There is only the great gray area between the opposite poles where we must seek to maintain an environment most
SUITABLE TO THE REQUIREMENTS OF AN ONRUSHING CIVILIZATION AND, FAILING THAT, TO AT LEAST MAINTAIN AN ENVIRONMENT THAT MAKES POSSIBLE OUR VERY SURVIVAL.

THE ASTRONAUTS CIRCLING THE MOON, CAME BACK TO EARTH WONDERING ABOUT THE ROMANTIC SONGS AND STORIES WHICH HAVE BEEN WRITTEN ABOUT OUR SINGLE SATELLITE, A CONSTANTLY CIRCLING THE EARTH, A MERE 240,000 MILES OUT IN SPACE. AS SCIENTISTS HAVE PREDICTED, THEY VERIFIED THAT THE MOON IS COLORLESS, SPHEROID, A POCKMARKED BY CRATERS EVIDENTLY CAUSED BY METEORS. IT APPARENTLY IS TOTALLY LIFELESS.

THE MOON AND THE EARTH ARE GEOPHYSICALLY SIMILAR IN THAT THEY ARE BOTH SOLID BODIES. A MAJOR DIFFERENCE IS THAT THE WORLD HAS WATER — WATER BOTH IN LIQUID AND SOLID FORMS ON THE EARTH AND AS A VAPOR, IN THE VEIL OF ATMOSPHERE WHICH ENCIRCLES THE EARTH. ALL ARE INTEGRAL COMPONENTS OF THE ENVIRONMENT. ALL ARE CRITICAL COMPONENTS OF LIFE ITSELF.

THUS, MY TOPIC THIS EVENING, "WATER — HOW IT SHOULD BE USED IN THE ENVIRONMENT" IS NOT SIMPLY AN EXERCISE IN SEMANTICS. IT IS A DISCUSSION WHICH RELATES TO OUR CIVILIZATION AND, IN FACT, TO OUR VERY SURVIVAL.

environment, man simply moved on -- or perished. civilization had not progressed to the point where man had the intelligence to do something on his own to counteract a naturally changing environment.

but as man's knowledge increased, he found that he could do something with water besides pray to the great one to cause the rain to fall in sufficient quantities to fulfill the needs of the day, but not in such quantities that it would cause floods. the wheel may be man's first great invention, but surely right alongside it must be man's realization that by putting a couple of logs together, he could walk on water, so to speak.

he thereby transformed a natural resource which was a barrier to man's travel and progress into a useful highway. for many, many centuries waterways were man's principal avenue of travel and transportation. indeed, even today, water transportation is still a principal means of world commerce.

man also slowly learned that he need not sit helplessly by a free flowing river while crops burned up from insufficient moisture. he learned that he could divert water from its natural source and transport it by ditches, pipes, and aqueducts.

he found that he could carry it to his home by pipeline easier than he could haul it in buckets. and he found he could use it as a carrier to take away sewage and waste.

he found that he could smooth out the peaks and valleys of seasonal and cyclical variations in flow by construction of dams and reservoirs. and
In these ways he fitted the resource to the need. He utilized his intelligence and ingenuity to become the master of the waters of the rivers. Over the centuries, he has done much to harness this great resource and make it his servant.

But in so doing, he has altered the environment in many ways. And here we come again to that gray area between black and white. Some of the man-made environmental changes were and are necessary. Others could have been or can be avoided.

There is certainly no unanimity of opinion. It depends pretty much on the individual, his philosophy, and his personal knowledge of the situation. There are those who believe every environmental change brought by the hand of man since the dawn of history has been essentially bad.

On the other hand, there are those who would ruthlessly push onward with the exploitation of our available resources without regard to the future as it relates to environment or anything else. The realistic answer, of course, is somewhere in between the opposite poles of preservation and exploitation.

To achieve a happy meeting of the minds as to how we should use our natural resources, people need to understand the complexities of our environment, the interrelationship and indeed, the interdependence of water with all other factors involved in our daily lives. And we must know and understand human aspirations for the great things of tomorrow as well as yearnings for the good old days of yesteryear.
We all want rapid and convenient transportation, but we deplore paving over millions of acres of land for highways and airports. We want the convenience of processed and prettily packaged goods, but can't understand why we can't do something about the mountain of insoluble, rustproof, plastic containers which face the trash collector every day - and with which thoughtless folks litter the landscape. In our society of planned obsolescence, we want a new automobile every two or three years, but are not concerned about the junk cars that are piling up everywhere. Some of us are happy with a child or two or three to bless our households. But much to the dismay of demographers and some preservationists, there are many of us who enjoy family life in households of six, eight, or ten or more children, all of whom need room to live.

And as far as we, in our particular business of water development are concerned, the public wants an unlimited supply of high quality fresh water wherever and whenever it is needed, but at the same time it also wants wild, free, uncontrolled, clean rivers unmarked by the works of man.

This is a commendable but not wholly realistic objective, for I doubt that, with the exception of Alaska, there is a single major river in the United States which has not felt the hand and influence of Man. The Congress took a commendable action in the Wild Rivers bill, but you will find that for the most part, the Wild Rivers being set apart are principally sections of rivers. And the water flowing through these wild sections has usually been altered by Man in one way or another.

Sometimes it is upstream control structures which have changed the flow pattern. Sometimes it is diversion which has curtailed the annual flow.
Sometimes it is pollution either from industry or from Man himself as he utilizes the uplands for camping and hunting and fishing. Or in some instances, over-protection of wild game or too many domestic animals have resulted in range depletion and erosion and stream pollution. And in some cases the offenders may be the very people who want a wild river in the first place. They find it is such a delightful place that they spread the word to their friends and their friends spread the word to other friends, and so on, until you get an overcrowded situation and the wild river suddenly is no longer wild.

A good example is the Snake River which heads up right here in Wyoming. From its headwaters in Yellowstone National Park, it flows into Jackson Lake in Teton National Park. Both parks are among your greatest tourist attractions. But few of the tourists who have listened to the television programs or read the newspaper and magazine articles damning Reclamation dams and reservoirs, realize that Jackson Lake is actually a Bureau of Reclamation reservoir in which primary storage rights are held by waterusers far downstream in Idaho. In fact not one nickel of its cost is allocated to recreation, flood control, or any other function except irrigation.

Nevertheless, the downstream years, we manage to operate Jackson Lake and Palisades reservoir downstream in such a way that Jackson Lake is kept full during most of the tourist season. Only during the late season is it drawn down significantly.

Downstream from Jackson Lake there is a beautiful stretch of the river, used for float trips during the tourist season, but how many of those tourists realize that the water which is keeping the river so full and beautiful is being artificially controlled and released for irrigation purposes many miles downstream?
And many more miles downstream, after the water is used and reused primarily for irrigation purposes all through southern Idaho, the river heads into the Hells Canyon on the Idaho-Oregon border where, for 50 to 75 miles, it again becomes a relatively wild and natural river after it passes through the three reservoirs and powerplants of the Idaho Power Company at the head of the canyon.

And, of course, from Lewiston, Idaho, the river is almost totally controlled in a series of stairstep multipurpose dams and reservoirs that take it and the Columbia River nearly down to tidewater.

Thus, as man takes over and manages resources for his benefit and the advancement of civilization, he alters the changing pattern of nature and it becomes a managed environment. It puts our future pretty much in our own hands. And you as the planners, designers and builders of the future, will probably have as much to do with it as anyone.

Not that I think we, in the Bureau of Reclamation, have done too badly with the water resources of the West in the nearly seven decades which have passed since the Reclamation Act of 1902 was enacted by the Congress. We have changed the dry unproductivity of millions of sagebrush-covered acres to fruitful farmland. This, of course, is altering the environment. It won't take time to quote statistics of accomplishment. But ask the farmer, who may be the third or fourth generation of homesteading pioneers and who is making a good living off of the land, if he objects. Or the nearby banker or merchant whom he supports with his wealth-creating activity in this changed environment, or the far away manufacturer of hard goods which he must buy for his operations.
Or ask the fisherman or camper or other recreationist who uses one of Reclamation's 213 reservoirs for leisure time activities. Or the hunter who finds ducks and other wildlife in the marshes or among the groundcover of farm fields made possible by Reclamation construction. Or for that matter, ask the scientist concerned with stream pollution if he objects to the changed environment from an altered stream regime which gives him more regulated water to help dilute and carry away waste materials. Our objective should be better handling wastes before disposal rather than mere dilution. There is none among them, I assure you, who will find much to argue about in the environmental changes resulting from Reclamation operations. I am not claiming that Reclamation's performance has been perfect. Foresight is never as good as hindsight, but nevertheless use of foresight is basic to progress. We have come a long way from those early days when the single objective was to build a dam and distribution works with a single objective in mind—to supply irrigation water to desert land.

No one thought much about environment then, when we altered the natural flow of the rivers by putting the flood waters in storage reservoirs and evened out the river flows for man's economic use. Changed somewhat nature's environmental regime. Some of those early reservoirs are among the most picturesque lakes and favorite fishing holes in the West today. And a regulated river that neither floods nor dwindles to a trickle isn't a bad asset either.

I am reminded of a showing of colored slides in the Commissioner's office a few years ago by one of our regional directors who was also a top official at the time in the Wilderness Society. He was ecstatic over a pack trip he had made into the high Uintahs of northern Utah and southern Wyoming with
A group from the society. Of particular interest were the numerous little ponds and lakes which were the center of attraction in many of the pictures. But a close look at the pictures revealed that many, if not most of these lakes were not works of nature. They were manmade, the result of dams built by early Mormon pioneers who introduced irrigation as a way of life and means of survival in the desert West. And I am reminded today also that some State Fish and Game Departments are actually constructing small dams and reservoirs on the high mountain streams to improve the fishery resource.

These manmade facilities are the result of people-pressure just as our much larger structures fulfill a need for people. But in the opinion even of the preservationist spokesman, they do not seem to be objectionable or harmful to the environment. More than any place else in the United States, the West and the people of the West are dependent for survival and continued economic growth and prosperity upon the way they conserve and use their water resources.

In Reclamation's earliest days, only a single purpose, the supplying of irrigation water, was officially recognized. The others, hydroelectric power production, flood control, development of a water supply for municipal and industrial purposes, recreation, fish and wildlife enhancement, and others, have become official purposes as the benefits, or potential benefits, like Topsy, just happened in the course of construction and operation, or as the need was realized and the multiple purposes were carefully planned into the project.

Today no project is formulated without considering all the multiple purposes that can be served. They are not always fully compatible, but usually the differences are reconcilable and the final package looks pretty good.
In the same manner, environment and ecological balance are now receiving greater consideration in the planning, development, and operation of water projects. In construction, we seek to blend our facilities into the natural landscape and require our contractors to protect and restore that landscape to the highest degree possible with a minimal change in the environmental scenery. Where possible, we seek to smooth out the surges from hydroelectric power water releases through our dams by reregulating dams downstream. We are financing fish hatchery construction to enhance the fishery not only in our reservoirs but in the flowing streams above and below the dams. We are working with the Fish and Wildlife Service and state fish and game organizations in the creation of wildlife refuges and in operating the project systems in such a manner that the refuges will be enhanced.

All these efforts are manmade and man-controlled in a managed environment. I see no prospect of a total reversion to "let nature take its course." Let's face it. Man is here to stay unless and until he becomes extinct by his own hand. That is no idle possibility, unless we maintain the environment and ecological balance in a manner favorable to man and nature.

Our challenge of the future is to undo the mistakes of the past which have and are changing the environment in a deteriorating and dangerous manner. However, we must at the same time maintain an orderly development program for "use without abuse" to meet the needs of the future.

We need particularly to consider the potential in environmental changes in our search for and development of new water supplies to meet the needs
of the future. The combination of more people, wider range of water use, and increased consumption per capita points to an increasing demand for water proportionately greater than the projected population growth.

To meet this need there are four major potentials. One is the established process of controlling riverflows and storing the excess from periods of high runoff for later use. I have discussed the environmental changes which have resulted in the past. We may expect such changes to continue in the future from this activity, but for the most part these changes are/or can be made to be positive— not negative.

A second potential is greater use of the established process of developing and using groundwater, either singly or in combination with other water sources. Another change of the future is extension of these known processes of control and storage beyond the basin of use. This involves diversion and transportation of water from one basin, where there is a clearly defined surplus, to another basin where there is a clearly defined shortage with no foreseeable means of supply not already in use.

Transbasin diversion probably poses more political problems than it does changes in the environment inasmuch as any river basin may be expected to retain essentially all the water it can put to useful purposes. Thus, no damaging diminution of supply nor consequent possible adverse change in the environment should be expected. This has been our experience and philosophy.

Of course, if such far-reaching proposals as that to bring river-size quantities of water from Canada and Alaska occur, it would require a new look at the environmental situation. Such a system obviously would not be limited to utilizing present streams and reservoirs, but new waterways and
INTERMEDIATE RESERVOIR SITES WOULD HAVE TO BE DEVELOPED AS WELL.

Two other principal sources of water appear to be the heavens and the sea. The Bureau of Reclamation is now involved in a major Atmospheric Water Resources Research program and our sister agency, the Office of Saline Water, is seeking economic processes for purifying salt and brackish water.

Although we have done very little in the way of cloud seeding and this only in small and carefully restricted areas for test and research purposes, we are already receiving letters expressing fear that we are changing the upper atmosphere and that we are milking the clouds to make it rain in one place and thereby depriving another. Few people realize that over 47 billion acre feet of water pass over the U.S. annually in the atmosphere. One percent of that would be 470 million acre feet, which is 3 1/2 times as much as our entire country could consume. I remember that when the program was first announced some years ago, we were promptly blamed for causing a drouth in eastern Colorado, beyond the east slope of the Rockies because of cloud seeding west of the Rockies. Actually, we had done no seeding at that time and besides, as any self-respecting meteorologist knows, most moisture in the plains area comes up from the Gulf of Mexico or slides down the east slope of the Rockies from Alaska and the Pacific Northwest.

We believe artificially modified precipitation does have great potential and it also contributes to considerable environmental change and must be carefully controlled. This is one of the reasons the Bureau of Reclamation is undertaking research in this field—to determine if, and under what circumstances we can make it rain and to provide a yardstick for operational efforts.

Simultaneously, we are sponsoring ecological research to develop all possible knowledge of relationships between atmospheric water and the environment.
As an example, we have contracted for cloud seeding in the Flathead River Basin above Hungry Horse Reservoir in Montana, but operations for this year have already been halted because a normal snow cover is building up and it is probable the basin will supply all the water needed without a further assist from the hand of man.

Here again, it appears that no major environmental change can be expected with the possible exception that the periodic drought cycle may be eased somewhat, either by added precipitation in that year or by added holdover storage from previous years. It should be noted that the most favorable atmospheric circumstances for artificially induced precipitation are the same as those under which natural rain or snowfall may be anticipated.

The big hope is to trigger storms which have not yet started or to add a small increment of precipitation to storms already in progress.

As for seawater desalination, this operation by its very nature will occur along the seacoast, and offers great potentiality for the future. Whether temperature variations resulting from operation of a large-scale desalting plant will be sufficient to cause a thermal pollution problem in the immediate vicinity of the plant is not yet known, but is being considered as research in this field progresses.

Thus, in summary, I would say this in regard to the use of water by man and its effects on the environment:

1. The environment, through the processes of nature, is constantly changing regardless of deliberate efforts of man.

Along with research studies to learn more about weather modification, we simultaneously are sponsoring ecological research to develop all possible relationships between weather control and the environment.
(2) Man in his living processes and utilization of the available natural resources, can and often does deliberately make major additional changes in the environment.

(3) Not all changes in the environment caused by man's efforts are necessarily bad.

(4) Man, who has used his superior intelligence to turn natural resources to his advantage in achieving a superior civilization, must also use his intelligence to protect a favorable environment, enhancing it where possible and guarding at all times against deteriorating influences which change the environment to such a degree that the living forces of nature are threatened.

One last observation, the benefits of water resource development have been tremendous and the total program looks good from almost any angle you view it.

This reminds me of a story told by the preacher in our little church in Welease, Va.

Dress — style, fit, color — all excellent
Price tag — too much

Could not resist temptation
Get these behind me Satan.

Watched — whispered from the other shoulder
It looks good from here also.