Presidential Address

DONALD V. LEE

Coordinator
Aquatic Plant Research and Control
Louisiana Department of Wildlife & Fisheries
Baton Rouge, Louisiana

Insufficient quantities of water in recent years has clearly demonstrated that water is becoming the most precious and limiting resource in many parts of the World. Agriculture, industrial and urban development, navigation, and recreation have been limited in many areas because of deficiencies in quantity and quality of available water. Your attendance at this conference could be related directly to increasing public concern over aquatic weeds that are wasting water and interfering with the many economic uses of this extremely valuable resource. We are aware that the presence of plants are as essential to the aquatic environment as they are to the terrestrial environment. In water, they provide the basis of the food chain for many types of aquatic life and form the habitat for much of the aquatic fauna. Vital as they are, excessively large populations or masses of aquatic plants become highly detrimental to other aquatic organisms and reduce the usefullness of water for many other purposes. The importance of aquatic weed management and control is therefore closely related to the importance and value of the water in which the weeds occur.

There are over 150 species of aquatic plants known to interfere with water resource use and management. These weeds cause losses or create nuisances in aquatic areas in many ways. They clog drainage and irrigation ditches, obstruct navigation channels, limit fishing, hunting, boating and swimming, provide breeding places for insects and other pests, contribute to the collection of sediments, cause damage to bridges and other structures, cause breakage of canal banks, affect the health and comfort of people and livestock by causing undesirable odors or tastes in potable water, and they interfer with proper sewage disposal and stream sanitation. Many emersed aquatic weeds transpire large quantities of water causing serious losses in areas of water shortage.

Current and reliable statistics on economic losses due to aquatic weeds are almost non-existent. According to the U. S. Bureau of Reclamation, the cost of weed control on irrigation projects with which that agency has contractual relations was nearly $10 million in 1975. This figure represents 30 percent of the total operations and maintenance budget for these projects which involved a total of 56,000 miles of waterways and served 9.4 million acres of irrigated land. Costs for weed control on the projects averaged $178 per mile of channel, or $1.06 per acre of irrigated land.

Information compiled by USDA:ARS indicates that 20 million dollars was spent in Florida in 1976 on the control of water hyacinth and hydrilla. The cost of control programs conducted in Louisiana by the Louisiana Department of Wildlife and Fisheries ($1.59 million) and the Crops of Engineers amounted to $2.9 million. Texas spent $300,000 on its control program conducted by the Texas Parks and Wildlife Department.

Other estimates of losses in the United States due to aquatic weeds range up to $110 million annually. These estimates do not include losses due to crop failure, interference with navigation on streams, degradation of recreational facilities, deterioration of wildlife and fish habitats, drastic depression of property values, or injury and disease to man and animals from reptiles, and disease carrying vectors and hosts harbored by the weeds. In 1965, the direct losses to agriculture caused by aquatic weeds amounted to $52 million. The net productive value of lost water alone was estimated at $91 million.

Aquatic weeds are most noticed by the public in lakes over 40 acres in size. It is in these water bodies that the greatest demands will arise for improvement in the environment through management of aquatic weeds. While these inland waters serve many purposes, the most important industry supported by this resource is recreation. The extent to which aquatic weeds influence or affect recreation has never been determined. In numerous instances, major recreational resources have been completely eliminated by unrestricted growth and spreading of such weeds as hydrilla, water hyacinth, and alligatorweed. For the year 1975, the U. S. Fish and Wildlife Service provides information on the beneficiaries of wildlife programs and the magnitude of the recreation industry. During that year, 20.6 million hunters devoted 478.6 million recreation days to hunting at a cost of over $5.8 billion. Waterfowl hunters alone spent more than 87.7 million hunter-days at this sport at an average cost of $233 per hunter. In addition, more than 49 million persons devoted a total of 1.5 billion recreation days as bird watchers, wildlife photographers, and nature walkers. These activities are critically dependent upon aquatic areas and are of vital concern in aquatic weed control research and management programs.

Fishing as a recreational pursuit exceeds all other outdoor sports dependent upon water. Excessive and unmanaged aquatic vegetation is particularly destructive to fisheries habitat and the quality and economic value of fishing as a sport. During the year 1975, the U. S. Fish and Wildlife Service reported 53.9 million fishermen spent more than 1.3 billion recreation-days at this sport with an expenditure of 15.2 billion or about $282 per angler. By the year 2000, it is estimated the total inland fishing waters will increase to about 92 million acres, primarily in the form of warm-water reservoirs where aquatic weed problems can be more severe. At the same time, it is estimated there will be 63 million fishermen. Much of the additional water required to satisfy the needs of fishermen must come from existing water sources by rehabilitating large areas of water now unfit for fishing because of eutrophication and the often accompanying infestations of aquatic weeds.

We have discussed briefly some of the many problems caused by aquatic weeds along with the available economic assessments and relations, however, there is one statistic we seldom consider as a completely independent entity when we discuss aquatic weed control. That statistic is the actual number of individual people who are benefactors of aquatic weed control programs. How many people receive direct benefits? How many receive indirect benefits? Computing figures to compose this statistic is very much like computing the related economic values. What limits do you place on indirect benefits? How much overlap do you have within benefactor groups? For example, How many fishermen are also trappers or waterfowl hunters or land owners or vice versa, How many trappers and waterfowl hunters and land owners are not fishermen? Several months ago, each state agency in Louisiana was directed to identify the client population receiving the benefits, direct and indirect, of the programs provided by the agency. In Louisiana, the client population which receives direct benefits from the aquatic weed control program include fishermen (sport and commercial), trappers, waterfowl hunters, individual boat owners, shoreline property owners, municipalities which depend on lakes and reservoirs for domestic water supplies, individuals whose livelihood depends upon service to listed benefactors, i.e. recreational equipment manufacturers and distributors, resort owners, etc., and water oriented recreation participants such as swimmers, canoers, campers, picnickers, skiers, and others. This population in Louisiana is estimated at 2,311,740 people.

Client population which receives indirect benefits from the aquatic weed control program include nearly all agricultural interests that are dependent on aguatic weed control to maintain channels for irrigation and drainage, residents of low lying parishes for flood control drainage, oil companies which operate in inland aquatic situations, commercial navigation and water transport interests, commercial industrial plants and generating facilities which depend on water from reservoirs and streams for cooling and fire protection, and general public health which benefits from the reduction of areas which harbor insect pests and vectors of human diseases. This client population is conservatively estimated at 250,000 additional individuals. Louisiana has a population of approximately 3.5 million people. It is estimated that 2,561,740 individuals or 73% of the population of Louisiana receives benefits from the aquatic weed control program conducted by the state, and we must conclude that the aquatic weed control program is extremely important to the people of our state. We also feel a similar parallel could be drawn for any aquatic weed management and control program in the United States and many foreign countries.

A quick review of the history of aquatic weed control in the United States shows us the construction of two "crusher boats" built by the U. S. Corps of Engineers in 1900 was the first major attempt at destroying large infestations of aquatic weeds, namely water hyacinths. These boats were abandoned in 1902 because of their inability to keep up with the rapid growth of the hyacinth plant. From 1902 to 1937, sodium arsenite was used rather extensively in several parts of the country for aquatic weed control, particularly water hyacinth control in Louisiana and Florida. We find that copper sulfate, still our most widely used algaecide, was used as early as 1904. Sodium arsenite was being used for control of submersed weeds in lakes and ponds as early as 1926. In 1937, mechanical weed control techniques again emerged as the primary effort against water hyacinths. In the early 1940's chlorinated benzenes were used to some extent in eastern ponds and lakes and in western irrigation canals. In the mid 1940's, the development of 2,4-D shifted the major efforts of water hyacinth control back to chemical applications. The interest and emphasis toward development of aquatic weed control techniques and methodology as a separate weed control discipline did not begin until 1957. During the past 20 years, wide spread interest in the control of aquatic weeds has led to development of a range of control techniques more commonly referred to as the intergrated approach. These control techniques include biological, preventive, mechanical, and chemical methods.

Biological control agents such as the alligatorweed flea beetle (*Agasicles*), vogtia moth, two species of weevils and a moth which attack water hyacinths, the white amur, and several plant pathogens are becoming more important with each passing day as potential biological control agents.

Preventive control usually involves the careful planning in the construction or renovation of ponds, reservoirs, irrigation canals, and drainage ditches. Preventive control techniques can be used to excellent advantage in preventing aquatic weed problems or facilitating other control techniques.

Mechanical techniques employ physical forces to remove aquatic weeds or alter the environment so that the plants cannot become established, or cannot survive if already present. Most aquatic weed control managers usually classify the practice of water manipulation as a mechanical control technique. This practice can be used successfully in systems where it is possible to raise or lower water levels, or where water can be removed completely from the stream or impoundment. Although chemical control of aquatic weeds has replaced mechanical methods in many situations, improved mechanical techniques are still being used extensively and have certain advantages. Some of these advantages are the lack of direct hazards to fish, wildlife, livestock, or humans. However, such methods are slow, expensive and often laborious. Most of the time they provide only partial and temporary control, and they often increase the spread of submersed weeds. The development of technology which will allow for economically feasible utilization of aquatic weeds will be a definite advantage for mechanical removal operations.

Presently, most programs for management and control of aquatic weeds are accomplished primarily with herbicides. This method has the advantage of being easier, faster, usually longer lasting, and generally less expensive than mechanical control. *Most* of the herbicides now used for control of aquatic weeds have low toxicity to humans and other warm blooded animals, are harmless to fish at concentrations necessary to control weeds, and will not injure crops if used in accordance to the label. Nevertheless, the use of herbicides is greatly restricted. Since 1968, the number of herbicides registered for domestic aquatic uses has been drastically reduced. Most of those remaining have been

retained largely because of developmental work carried on or financed by federal agencies.

We have seen many advancements in the aquatic weed control discipline within the past few years, however, it is readily evident that new technology is still required to provide meaningful control methods for many of the submersed weed species, particularly hydrilla. It has been reported that the technological advances in control and management of aquatic weeds have not been sufficiently adequate during recent years to solve existing problems. The increased concern on the affects of control operations, particularly herbicide applications, on the aquatic environment has diverted most of the available manpower to environmental safety studies designed to retain control methods currently available. Also, we have been involved in a long and painstaking period of development of new criteria which will regulate the development of new chemical products. These two things have been the major reasons for the seemingly limited development of new technology for aquatic weed control. It should be pointed out that even though chemicals for aquatic weed control are generally termed a "minor market" by the chemical industry, some of our more responsive chemical industry people are aware that aquatic plant management and water conservation have the potential to reduce the demand for agricultural chemicals.

It is imperative that extensive fundamental research be continued. Without the knowledge derived from this research, it will be impossible to develop the aquatic weed technology needed to cope with the problems caused by aquatic weeds. It has been reported the Florida Department of Natural Resources anticipates the cost of aquatic weed control to increase to $100 million per year in that state in 10 years unless there are substantial improvements in control technology. Nationwide, the potential monetary benefits from this research probably exceeds those in any other area of weed control. The principle objectives of this research should continue to be: (1) to retard or prevent the spreading of aquatic weeds, and (2) to reduce current weed infestations to levels that are commensurate with the principal use of the water. If we are successful in this research, some of the things we could expect include: (1) safer, more economical, and longer lasting control, (2) reduced losses to agriculture, (3) more selective types of permanent weed control, (4) larger areas of water that provide high quality recreational opportunity, (5) expansion of benefits of control to previously inaccessible areas, (6) increased understanding of the behavior and fate of herbicides in water which could lead to broader latitudes for herbicide usage, and (7) improved means for assessing beneficial and detrimental effects of aquatic weed control. This list could go on an on, however, I think we can see that aquatic weed control research, and the development and implementation of management and control programs are an extremely important and necessary service that we, as professional aquatic weed managers, are providing to the people of this country and the world.