MANAGEMENT OF NEEDLERUSH MARSH AT THE CHASSAHOWITZKA REFUGE

By KENT E. MYERS
U. S. Fish and Wildlife Service

The purpose of the work reported on in this paper is to develop practical management methods for direct use on the Chassahowitzka Refuge. We have been concerned with results instead of scientific data and, therefore, this should be regarded as an account of findings from management tests rather than a sicietific research report.

Needlerush (*Juncus roemerianus*) covers many thousands of acres of brackish coastal marshland from Maryland to Texas. The total area occupied by this species exceeds one-half million acres. On several National Wildlife Refuges, including the Chassahowitzka and St. Marks Refuges in Florida, it dominates at least three-fourths of the native marsh.

Ordinarily, needlerush deserves to be regarded as a serious weed, occupying much space without providing many benefits. In dense, undisturbed stands, it produces very little seed and in general its food value for wildlife is limited. Locally, the plant does have some value as cover for marsh dwelling species such as the Clapper rail and certain ducks.

Work on needlerush control at the Chassahowitzka Refuge was begun on a limited scale in 1952. The program is now in its fourth year, and through findings are regarded as largely preliminary, success has been obtained in transforming more than 100 acres of needlerush marsh into good waterfowl territory. Whereas the area treated attracted no waterfowl previously, the transformed marsh has been used by large numbers of these birds.

Mowing and spraying are the principal measures that have been successfully used for needlerush control thus far, but recent combination procedures appear particularly promising. These include mowing and spraying, burning and mowing, burning and spraying, and mowing followed by disking.

Once the best method of needlerush control is determined, there will still be much to be learned about management of the resulting marsh. In particular, it will be necessary to find the most effective ways to maintain the desirable plants that replace needlerush.

A summary of principal steps and findings in the work thus far follows:

HERBICIDAL CONTROL

Herbicides tested on needlerush at Chassahowitzka include 2, 4-D, CMU, Ammate, Maleic hydrazide, CIPC, TCA, 2, 4, 5-T, Polybor chlorate and Dalapon. Of these nine herbicides, 2, 4-D proved to be the most effective in control obtained, each of application and cost. Preliminary tests were made with this chemical to determine best concentrations and dates for maximum kill at this station. Needlerush was found most susceptible to this herbicide during the period from February 1 into the time of flowering, about the first part of April. Treatments earlier or later than this period, at Chassahowitzka, invariably resulted in a lower degree of control, even when per acre rate of the herbicide was boosted.

The small plot studies begun in 1952 were followed by larger scale applications from a tractor and airplane. Although 2, 4-D sprayed from a tractor at 20 pounds of acid equivalent per acre and diluted to 46 gallons of spray resulted in a high percentage of control, the method involved two disadvantages, namely: (1) Extent of area which can be treated effectively by a tractor is limited by brief duration of the optimum period of needlerush treatment; and, (2) the tractor had to be transported by barge to the work site, thus increasing the cost per acre.

For aircraft spraying, a Piper PA-18A airplane equipped with a Piper spraying unit was used. Application rates approximated 16.7 pounds of acid equivalent per acre, and the commercial formulation was not diluted. The total volume of spray per acre amounted to only five gallons, yet results in kill of needlerush varied between 95 to 99 percent.

An indication of per acre costs involved in the herbicidal treatments is $11.50 spent for materials, and approximately $1.00 spent in applying the herbicide by aircraft. Ground applications would run slightly more in material and application costs.

MOWING

Tests on small, hand-mowed plots showed that needlerush can be eliminated or largely controlled by cutting. These preliminary findings were followed by larger scale mowing operations made feasible by the comparatively firm marsh at the Chassahowitzka Refuge. A rotary mower was used on 10 acres, making a 40 percent reduction in the needlerush by a single mowing. Three additional mowings in 1954 and two in 1955 brought the total acreage thus managed to 105, and resulted in a 99½% prcent reduction of the needlerush stand.

Following the elimination of needlerush by mowing, saltgrass (*Distichlis spicata*), which was present sparsely prior to control operations, invaded and dominated the area with a nearly solid stand. This 105 acre tract of saltgrass received good use by waterfowl during the winter of 1954-55, though such use was negligible when the area was covered by needlerush. It is not known whether the increased utilization of the tract is due to food made available by seeding of the saltgrass and other plants, or the birds are attracted to the site because of other factors. The possibility that food might be attracting waterfowl to this area is supported by the fact that in the summer of 1955 it was noted that saltmarsh bulrush (*Scirpus robustus*), together with some Olney three-square (*Scirpus olneyi*), sand sedge (*Fimbristylis castanea*) and (*Eleocharis* sp.) were present among the saltgrass that succeeded needlerush. The saltgrass seeded heavily during 1954 and 1955.

Cattle grazing on the area where needlerush has been controlled by mowing has been intensive, and suggests a practical possibility of converting this kind of marsh to valuable grazing use.

The use of 2, 4-D to prevent reinvasion of needlerush in the mowed area is being tested and good results are indicated. It is already known that the strength of 2, 4-D used to kill needlerush does not seriously injure saltgrass.

BURNING

Burning has been tested as a means of controlling needlerush, both as a measure by itself and in combination with spraying and mowing. Within zones where Olney three-square is a competing subdominant, burning in early spring (January-February) tends to increase this useful plant. However, the use of fire as an independent tool of management in pure stands of needlerush does not appear to change the marsh composition appreciably.

Burning of needlerush makes mowing operations easier, since it eliminates the excessive accumulation of rough. Herbicidal treatment on regrowth, following burning, appears to offer very effective control. Burning of sprayed needlerush within eight weeks after treatment reduced the effectiveness of the herbicide and resulted in 20 percent greater regrowth than in unburned areas. Burning after spraying was beneficial when delayed until October.

In short, burning can be used as a supplemental tool in conjunction with both spraying and mowing operations, but timing is important. Except in the transition zone, it does not provide any definite benefits when used alone.

PLANTING IN CONTROLLED AREA

In 1953 and 1954 a series of plots were sprigged and seeded with saltmarsh bulrush and Olney three-square in the needlerush zone. Initial results were encouraging, but by the end of 1955 the greater percentage of the growth from sprigging had died due to competition from other species. Untreated seed of saltmarsh bulrush planted in July and August at a depth of one-half inch germinated the following spring giving a good stand of seedlings. These soon died from unknown causes. The results from planting have been unsatisfactory, but the need for additional work is indicated.

MANAGEMENT OF SALTGRASS

Saltgrass is reported to have some value for waterfowl, and the seed are known to have been used by ducks. (Martin and Uhler.) Locally its use may be fair. Because of the use obtained at Chassahowitzka on areas which had been converted to saltgrass in 1954, and because of this plant's tendency to invade all areas freed of needlerush, it was believed important to learn more about its management and control.

Plots of saltgrass were sprayed with Dalapon. Others were mowed throughout the summer months to determine effect upon seeding. Results of the spraying indicate that it will require a very heavy application rate to kill saltgrass, and its control by this method may not be practical. Results from mowing show that mowing after June 1 will reduce the amount of seed produced.

EQUIPMENT USED IN NEEDLERUSH WORK

Special equipment is needed for management operations on needlerush marsh. The problem of transporting materials and equipment to management sites was solved by the construction of a barge using two steel pontoons measuring 7 feet by 35 feet each. Power for the propulsion and sterrage was provided by an airplane motor mounted on a revolving base located on the stern. This barge transported 6 tons in about 7 inches of water at a rate of 8 miles per hour.

Because of the boggy terrain, a tractor with good floatation characteristics was needed. An Oliver OC-3 equipped with extra wide treads was used. The cleats were 4 inches wide, and constructed from 3 x 4 gum material. The tractor was used to pull a single blade rotary mower capable of cutting a swath six feet wide. The OC-3 is rated at 20 H. P., and this not sufficient power to operate a mower in heavy growth taking a full cut. A unit with more power is needed, but the weight ratio as relating to bearing surface on the tracks must be favorable. About 6 pounds per square inch is the maximum pressure which can be used efficiently. An OC-6 tractor, similar to the OC-3 but with a 50 H. P. rating, should provide the power and floatation required.

Both rotary and sickle type mowers have been used. If the heavy rough is first reduced by burning, the sickle type mower will cut the regrowth in a satisfactory manner. Otherwise, the initial cut must be made with the rotary type. The beating and shredding action of the rotary mower is believed to have a more effective killing action than the clean cut obtained with the sickle type. This, however, is a factor which will need more investigation.

The airplane is an indispensible piece of equipment for spraying. Under marsh conditions such as on Chassahowitzka Refuge, the operation of ground equipment is time consuming and costly. For spraying operations, the airplane can be used to treat large areas with minimum expenditures of time and labor, and in most instances with lower cost.

There is a need for development of tractors and other better adapted equipment for use in managing such marsh areas.