PRACTICAL APPLICATION OF THE ROTARY DITCHER IN POND CONSTRUCTION[1]

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ABSTRACT. The cost of permanent mosquito control has increased in the recent years. The development of new equipment (rotary ditcher) and its application in water management methodology can decrease overall costs of permanent control without detrimental effects to the ecosystem.

Open marsh water management (OMWM) (Ferrigno and Jobbins 1968, Ferrigno et al. 1975) objectives are to eliminate mosquito breeding while increasing salt marsh-estuarine food web components without the use of pesticides. OMWM incorporates the utilization of tidal ditches, ponds and pond radials which are comparable to the major natural features of the salt marsh tidal creeks and salt marsh ponds.

The construction of ponds for the elimination of concentrated mosquito breeding depressions in salt marshes was started in 1907 by J. B. Smith (Candeletti et al. 1977). During the 1930's, variously shaped and sized ponds were constructed in Manahawkin, N. J. (Mulhern 1938). Ferrigno et al. (1976) stated that in recent years pond construction has improved considerably from the 3 ft deep dragline ponds with 3 to 4 ft spoil piles to current combination rotary ditcher-dragline ponds with spoil limited to less than 6 in. The rotary ditcher (Quality Marsh Equipment Co., Thibodaux, LA) digs the outline of the pond with 3 ft deep ditches, which serve as a reservoir for killifish. The amphibious dragline then removes approximately 6 in. of marsh from between the ditches. Spoil is subsequently squashed by the rotary ditcher to eliminate spoil banks for ecotonal vegetation. These ponds are rectangular in shape which has been criticized by some conservationists, even though shape does not affect wildlife utilization.

Although pond construction is expensive (Hansen et al. 1976) the combination of tidal and standing waters on the salt marsh surface is imperative if water management for mosquito control is going to simulate natural salt marsh conditions. Costs associated with water management for mosquito control vary according to 1) amount of mosquito breeding in a given area of salt marsh; 2) type of equipment utilized in the construction of the alterations of the marsh; 3) types of management, either ponding or ditching (Hansen et al. 1976).

Costs of ponds constructed using a dragline are shown in Table 1. Variations in costs occur since they were determined differently by each county superintendent. These costs did not account for depreciation of the machine, and repairs or movement of the machine from site to site. The incorporation of 2 pieces of equipment totaling over $150,000 ($75,000 rotary ditcher + $80,000 amphibious dragline) makes the initial cost more than many mosquito control com-

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Table 1. Pond construction costs utilizing an amphibious dragline in several counties in New Jersey.

County	Size of Pond	Shape	Time (days)	Cost
Cape May	147′ x 81′ x 0.5′	rectangular	3.00	$295.77[1]
Cumberland	160′ x 60′ x 0.5′	"	2.50	112.50[2]
	70′ x 40′ x 0.5′	"	2.00	90.00
	200′ x 60′ x 0.5′	"	3.00	135.00
Ocean	88′ x 58′ x 1′	"	1.50	300.00[3]
	80′ x 93′ x 1′	oval	2.00	400.00
	100′ x 78′ x 1′	"	2.25	450.00
	45′ x 96′ x 1′	crescent	0.75	150.00
	60′ x 60′ x 1.5′	round	0.75	150.00
	95′ x 95′ x 1′	"	2.00	400.00
	76′ x 44′ x 1.5′	teardrop	0.75	150.00
	47′ x 75′ x 1′	triangular	0.75	150.00
	22′ x 48′ x 4′	oval	0.75	150.00
	105′ x 55′ x .5′	"	0.50	50.00*

* Utilizing a John Deere 350 (rental costs of $100/day)
Dragline costs
1. two men's salaries+fuel+oil=$88.59/day
2. one man's salary+fuel=$45.00/day
3. rental cost including operators salary+fuel=$200.00/day

missions can justify in their permanent mosquito control budget.

New Jersey has been utilizing various types of equipment in increasing the acreage of standing water on the marsh surface. The incorporation of the rotary ditcher in the New Jersey marsh management scheme has increased the amount of permanent water management that can be accomplished. The finished project has been necessary in order to achieve the best from an ecological and mosquito control basis. Recent acceptance by New Jersey fish and game authorities and the Eastern Flyway Commission of the methods developed in New Jersey and recommendations for the utilization of the rotary ditcher in permanent mosquito control management makes it imperative that management plans include permanent water systems on the marsh instead of just constructing ditches that drain the marsh.

The utilization of the rotary ditcher in pond construction can increase effectiveness for mosquito control and decrease the cost compared to earlier methods. A lo-

Table 2. Pond construction costs utilizing an amphibious rotary ditcher in several counties in New Jersey. Cost is figured at $86.98/day including the salaries of two men, fuel and oil costs; it does not include the cost of the machine.

County	Size of Pond	Shape	Time (hr)	Cost
Cape May	30′ x 50′ x 1′	rectangular	0.5	$ 5.44
	30′ x 40′ x 1′	triangular	0.5	5.44
Ocean	66′ x 38′ x 1′	rectangular	4.0	43.49
	63′ x 54′ x 1′	"	4.0	43.49
	45′ x 36′ x 1′	"	3.0	32.62
	90′ x 20′ x 0.5′	"	3.0	32.62
	15′ x 10′ x 0.5′	"	0.5	5.44

calized mosquito breeding area in the past would have been treated with just a series of parallel ditches at various distances apart in order to drain the marsh (Fig. 1B). This usually allows depressions between ditches to breed mosquitoes and requires continual chemical treatments. The technique is to construct the pond deep enough to hold fish during dry spells which permanently eliminates the breeding. (Fig. 1C). Utilization of the rotary ditcher to construct a series of parallel ditches close enough together to remove approximately 6" to 1' of marsh will permanently eliminate mosquito breeding depressions (Fig. 1D). After removal of the marsh surface, a fish reservoir is cut to a depth of ca. 3 ft to support fish during dry periods. The depth of the reservoir will vary according to its size and location on the marsh. Recently, Lesser et al. (1977) reported that natural potholes increase in depth as their location elevation on the marsh is increased; therefore smaller, deeper potholes should be cut in higher marsh elevations.

Costs for this type of management are shown in Table 2. These are actual ponds that were constructed in the marsh in the fall of 1976. The costs are about half those for dragline ponds when figured on a cubic foot basis.

Several important considerations have developed from construction of ponds with a rotary ditcher; 1) only one piece of equipment is needed, 2) cost of construction is about half of that of dragline construction, 3) increased operator skills are required, 4) more precise alterations to breeding depressions are possible, and 5) less time is required for pond construction.

While initial results are promising, total evaluation of the method will require several years.

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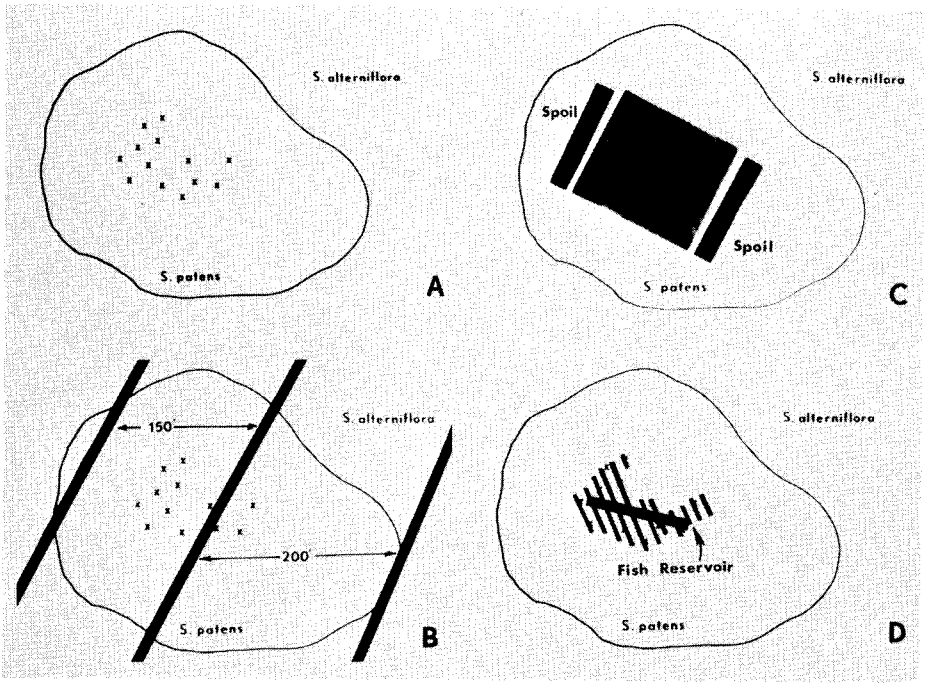

Fig. 1. Various methods of water management for mosquito control: A) X's indicate breeding depressions; B) parallel ditch system; C) pond construction utilizing a dragline and a rotary ditcher; D) pond construction utilizing only rotary ditcher.

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