Monitoring The Effects Of Wide-Scale Application Of 2,4-D For Milfoil Control[1]

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As part of TVA's effort to gain control of the invading macrophyte Eurasian watermilfoil (*Myriophyllum spicatum* L.) in shallow water areas of Nickajack and Guntersville Reservoirs, approximately 17,000 surface acres of the two reservoirs were treated during April-June 1969 with about 170,000 gallons of dimethylamine salt of 2,4-D at the rates of 20 and 40 pounds 2,4-D acid equivalent per acre.

These wide-scale applications over large reservoir areas necessitated the initiation of an intensive and thorough monitoring program. Representative habitat types were selected and sampled before treatment and at intervals after treatment of 1, 8, and 24 hours; 1 and 2 weeks; 30, 60, and 90 days; 6 months; and 1 year. The habitats sampled were all in Guntersville Reservoir. They included an embayment which was landlocked except for a low flow through a road culvert; an island and pass overbank area exposed to main river flow by and through the treatment zones; a large side embayment with moderate flow-through from a tributary stream; and an overbank slough area enclosed between riverbank islands and the shoreline. This slough had little crossflow but received moderately high inflow from a treated tributary stream and from the upstream untreated Tennessee River.

Each habitat was sampled for 2,4-D content in water and plankton and for zooplankton and phytoplankton identity, distribution, abundance, change and response. Productivity of the phytoplankton was estimated by carbon-14 methods, while standing crop was estimated by chlorophyll and cell number determinations. Determinations were made of water quality changes, response of other marginal plants to the herbicide, milfoil control, and physical and chemical parameters of areas cleared of milfoil. Population dynamics of macroinvertebrates in the milfoil beds and in the normal reservoir habitats were evaluated. Concentrations of 2,4-D in fish and commercial mussels were determined – fish samples were from the treated reservoirs and mussels from untreated downstream reservoirs. Water entering municipal water intakes was carefully monitored at all water treatment plants.

Treatment with liquid DMA 2,4-D applied at a rate of either 20 or 40 pounds per acre to milfoil beds achieved excellent control within 3 to 4 weeks but did not control other submersed aquatics and most marginal plants. No harmful or distinguishable response to the herbicide was observed in zooplankton, phytoplankton, benthic macroinvertebrates, or fish. Water from treatment areas continued to be used for all domestic purposes during this period of study. This was true even though monitoring revealed some concentrations in the nearby landlocked embayment to be high and of relatively long duration.

Since the lower rate of application achieved good results, it was concluded that reduced amounts of liquid 2,4-D may be used effectively in applications over large areas, provided that careful planning takes into consideration the hydraulic flows and other characteristics of milfoil habitats. Dimethylamine 2,4-D appears to be a noncumulative, nonconservative herbicide in that it is not translocated along and through food chains or food webs. Degradation or immobilization occurred within the aquatic subecosystems studied.

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