

AQUATIC PLANT MANAGEMENT PROGRAM
CURRENT STATUS AND SEASONAL WORKPLAN
1993

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AQUATIC PLANT MANAGEMENT PROGRAM

CURRENT STATUS AND SEASONAL WORKPLAN

INTRODUCTION

The objective of the TVA Aquatic Plant Management Program is to support in an environmentally and economically responsible manner, the balanced multiple uses of the water resource of the Tennessee Valley. This is accomplished by following an integrated approach to prevent introduction and spread of noxious species, documenting occurrence and spread of existing species, and suppressing or eliminating problems in designated high use areas. It is not the TVA objective, nor is it biologically feasible and prudent to eliminate all aquatic vegetation. Aerial photography, helicopter reconnaissance, and field surveys are used to assess distributions and abundance of various aquatic macrophytes. Water level fluctuations are supplemented by herbicide applications to control undesirable vegetation. Investigations are conducted to evaluate water level fluctuation schemes, as well as biological, mechanical, and alternative chemical control techniques which offer potential for more environmentally compatible and cost-effective management operations.

CURRENT STATUS

Plant Colonizations

Table 1 shows acreages of aquatic plants on each reservoir since 1987 as determined by aerial photography and ground truth data. Total acreages on all reservoirs since 1977 are shown in Table 2. Aquatic

Table 1. Aquatic plant acreages and percent colonization on nine mainstream and two tributary TVA reservoirs since 1987^a.

Reservoir	1987 Acreages		1988 Acreages		1989 Acreages		1990 Acreages		1991 Acreages		1992 Acreages	
	Acres	% Colonized	Acres	% Colonized	Acres	% Colonized	Acres	% Colonized	Acres	% Colonized	Acres	% Colonized
Kentucky	7,112	4	6,145	4	5,718	4	2,106	1	2,813	2	2,616	2
Pickwick	121	T	120	T	120	T	25 ^b	T	25 ^b	T	105 ^b	T
Wilson	30	T	30	T	30 ^b	T	30 ^b	T	<1 ^b	T	5 ^b	T
Wheeler	9,650	4	9,843	14	5,991	9	1,981	3	3,462	5	4,412	6
Guntersville	15,909	23	20,242	29	14,166	21	7,891	12	5,166	7	5,993	8
Nickajack	1,200	11	1,200	11	1,111	11	800 ^b	8	832	8	583	5
Chickamauga	6,845	19	7,455	21	3,492	10	2,127	6	680	2	387	1
Watts Bar	613	2	675	2	675	2	80	T	10 ^b	T	10 ^b	T
Tellico	44	T	103	1	941	6	368	3	340	3	240	2
Fort Loudoun	50	T	50	1	50	1	25 ^b	T	25 ^b	T	25 ^b	T
Melton Hill	<u>150</u>	3	<u>150</u>	3	<u>150</u>	3	<u>100^b</u>	2	<u>240</u>	2	<u>228</u>	2
Total	41,724		46,013		32,444		15,533		13,593		14,604	

a. Acres are calculated on the basis of aerial photography unless otherwise noted.

b. Acres are estimated on the basis of historical records, aerial reconnaissance, and surface surveys.

T = Trace: less than one percent of total reservoir area infested.

Table 2. Summary of total aquatic macrophyte colonization and herbicide acre-treatments, FY 1977-1992.

<u>FY</u>	<u>Total Macrophytes</u> (acres)	<u>Herbicide Acre-Treatments*</u>
1977	9,602	4,380
1978	10,153	5,106
1979	10,987	4,560
1980	15,961	5,199
1981	23,731	4,288
1982	25,407	5,422
1983	24,266	5,844
1984	22,904	6,368
1985	24,814	7,095
1986	35,019	7,658
1987	41,724	8,046
1988	46,013	5,026
1989	32,444	6,374
1990	15,533	2,586
1991	13,593	601
1992	14,604	520

*Includes multiple herbicide applications to some areas.

vegetation acreages were determined from aerial photography made after priority areas had been treated with herbicides; therefore, reported acreages do not include acres controlled by annual herbicide treatment. The photographic technique used to monitor aquatic plant populations is described in Appendix A.

Aquatic plant acreage on all reservoirs totaled 14,604 acres in 1992, an increase of 1,011 acres from 13,593 acres in 1991. Most of the increase occurred on Wheeler and Gunterville Reservoirs.

In 1992, the dominant plant species on all reservoirs was the exotic species Eurasian watermilfoil (Myriophyllum spicatum L.). In 1992, hydrilla [Hydrilla verticillata (L.f.) Royle] which colonized 2,900 acres on Gunterville in 1988, covered less than one surface acre on Gunterville Reservoir and only scattered plants and fragments were found on Wheeler, Chickamauga, and Nickajack Reservoirs. Although surface coverage of hydrilla has declined dramatically since 1988, it is still believed to pose a serious threat to the reservoirs of the Tennessee River system.

Other problematic species, including spinyleaf naiad (Najas minor All.), southern naiad [Najas guadalupensis (Spreng.) Magnus], and coontail (Ceratophyllum demersum L.) occurred at reduced levels in 1992. Other species present that may cause localized problems include small pondweed (Potamogeton pusillus L.), Uruguayan waterprimrose [Ludwigia uruguayensis (Camb.) Hara], giant cutgrass (Zizaniopsis miliacea (Michx.) Doell and Ascherson), Brazilian elodea (Egeria densa Planchon), Canadian elodea (Elodea canadensis Michx.), muskgrass (Chara zeylandica Klein ex Willd.), and filamentous algae, primarily the blue-green Lyngbya sp.

Operational Control

Water level fluctuation plays a significant role in TVA's operational program to control excessive aquatic vegetation. The generalized scheme of fluctuation on TVA mainstream reservoirs, primarily for other purpose such as flood control, entails a drawdown beginning in the summer or early fall months. A minimum pool level is attained by early January and maintained until late March when reservoirs are refilled to summer pool by spring rainfall. This fall and winter drawdown exposes plants and propagules of perennial aquatic macrophytes to drying and freezing (figure 1). The fluctuation scheme is very effective in preventing perennial macrophyte establishment in reservoirs with drawdowns greater than 10 feet. In reservoirs, with more stable pools, such as Gunter'sville, control is primarily limited to perennial species that reproduce vegetatively and have underground root crowns and rhizomes in the exposed drawdown zone. Only minimal control is obtained for the naiads and other macrophytes which produce seed prior to the late summer and fall drawdown and survive the drying and freezing in the seed stage. Summer drawdowns (discussed later) have been used primarily for operational control of annual species.

On Melton Hill Reservoir, rather than a continuous recession from early January to March, two special deep fluctuations of one or two days duration are conducted during the months of October through March. When possible, the drawdown is planned to coincide with predicted cold weather. This has proven to be effective in reducing or suppressing colonies of Eurasian watermilfoil.

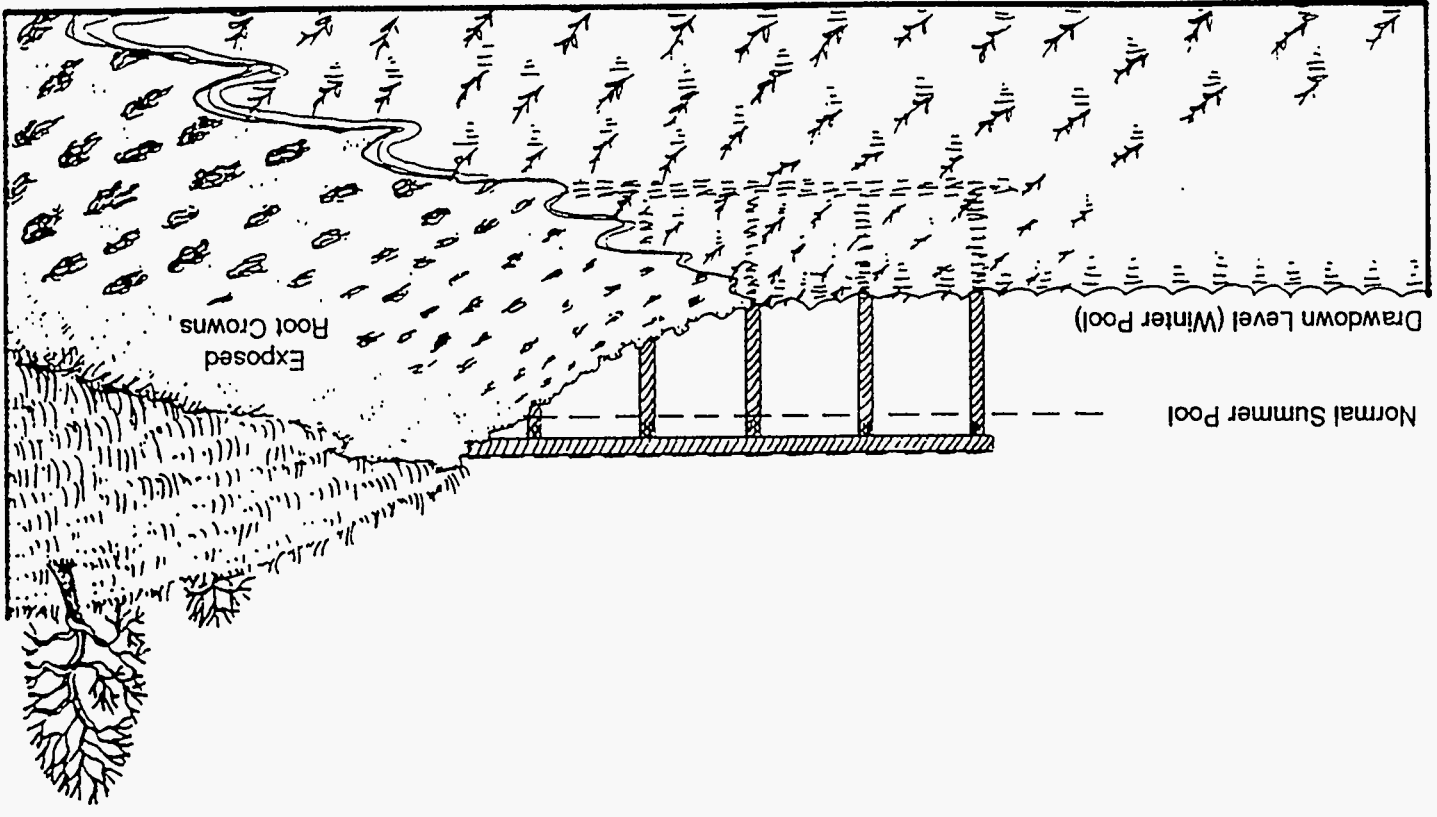


Figure 1 Water level drawdown effects on aquatic plants.

At present, timely herbicide treatment in priority areas is the most feasible operational supplement to water level fluctuations. Table 2 shows acre treatments* of herbicides since 1977. In 1992, only 520 total acre-treatments were required to maintain designated priority areas free of excessive vegetation (table 3). This was the lowest level of herbicide treatment in over 20 years.

Figure 2 shows the herbicide use pattern on TVA reservoirs since 1980. The most economical herbicide is 2,4-D and is used primarily for control of watermilfoil. It is ineffective on other problem species such as naiads, hydrilla, and pondweeds. In the 1980's, these species were prevalent in designated treatment areas requiring the use of other broad spectrum herbicides, such as endothall, diquat, and fluridone (Sonar®). These more expensive herbicides increased the cost of chemical control significantly during this period.

*Includes multiple herbicide applications to some areas.

Table 3. Herbicide acre-treatments in FY 1992.

<u>Reservoir</u>	<u>2,4-D</u>	<u>Aquathol K</u>	<u>Diquat & Komeen</u>	<u>Aquathol Granules</u>	<u>Other¹</u>	<u>Total</u>
Kentucky	82	66	0	0	0	119
Pickwick	0	10	0	0	0	10
Wilson	0	0	0	0	0	0
Wheeler	0	0	0	0	0	0
Guntersville	123	75	20	2	5	225
Nickajack	3	45	1	0	0	49
Chickamauga	0	60	3	0	0	63
Watts Bar	0	0	0	0	0	0
Melton Hill	23	0	0	0	0	23
Fort Loudon	2	0	0	0	0	2
Tellico	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>5</u>	<u>0</u>
Total	233	256	24	2	5	520

¹ 4 acre experiment with Triclopyr, 1 acre Cutrine plus granules

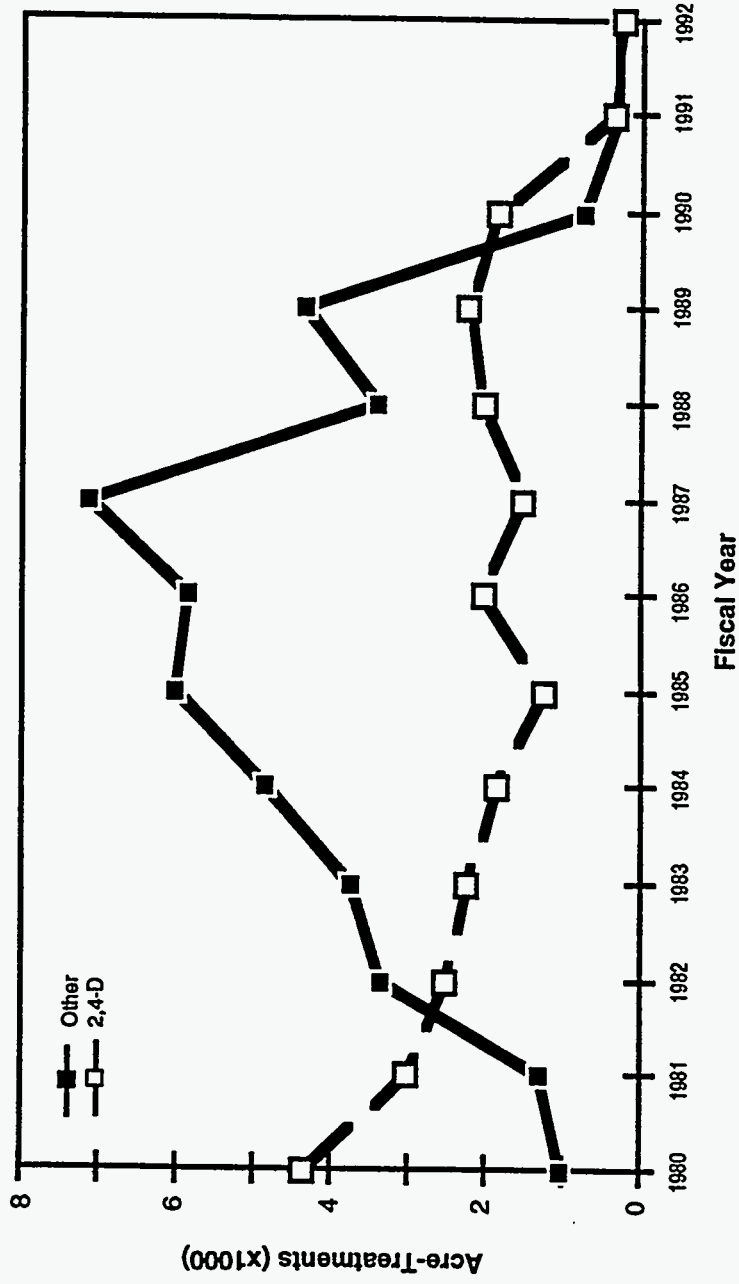


Figure 2 Herbicide use pattern on TVA Reservoirs from 1980 to 1991.

Biological Studies - Grass Carp Release

The final environmental assessment for the stocking of grass carp into Guntersville Reservoir was completed in March 1990. The stocking was a special demonstration within the Joint Agency Guntersville Project (JAGP) to test the utility of grass carp in managing aquatic vegetation, especially hydrilla, in a large reservoir system. Any decision to include grass carp as a routine component of TVA's ongoing aquatic plant management program will be made only after a full evaluation of the special demonstration and will be preceded by additional environmental review in accordance with TVA's procedures implementing the National Environmental Policy Act.

From April through July 1990, TVA released 100,000 sterile (triploid) grass carp into Guntersville Reservoir. This initial release was equivalent to a stocking rate of about seven fish per vegetated acre (based on the number of vegetated acres in the reservoir in 1989). Because vegetation has been at relatively low coverage (about 5,200 to 8,000 acres) since 1990, TVA has no plans to release additional grass carp into Guntersville Reservoir in 1993.

A monitoring program to evaluate changes in aquatic vegetation and the effect on fisheries, water quality, waterfowl and wetlands wildlife, and endangered species was implemented in 1990. The monitoring results will be used to determine whether more grass carp should be released in Guntersville Reservoir and to make future decisions on the use of the fish in the TVA system. Results of the monitoring will be published in a series of JAGP reports as the work is completed.

Chemical Control Evaluations

In 1992, chemical control evaluations continued to focus on concentration/exposure time studies in the flumes at the Aquatic Research Laboratory (ARL) at Browns Ferry Nuclear Plant and field demonstrations on Gunterville Reservoir using Rhodamine dye to predict herbicide exposure times, and dissipation rates for specific sites. Results of these studies will be published in reports as part of the Joint Agency Gunterville Project.

The University of Mississippi Biology Department continued herbicide monitoring studies on Gunterville Reservoir which began initially in 1990. Herbicide residues in water, sediment, plants, fish, and mollusks were monitored following operational applications of diquat and komeen. Residue analyses are being completed and a final report is expected in early 1993.

SEASONAL WORKPLAN

The primary focus of the operational program in 1993 will be directed toward chemical control of undesirable vegetation in designated high priority treatment areas. Since aquatic plant levels have declined significantly the past few years, control operations will be initiated only on a complaint basis. Chemical treatment will not be made in nondesignated areas except in special situations, and then only upon review and approval of botanists in the Vector and Plant Management Program responsible for aquatic plant control operations. Criteria for designating priority areas, herbicides and rates recommended for specific plants, application procedures, and safety precautions are discussed along with specific plans for each reservoir. These plans and procedures will serve as a guide for spray boat operators and other personnel in Operations and Maintenance directly involved with the aquatic plant control program. A training program will be conducted at the beginning of the treatment season to review plans, procedures, and the safety aspects of pesticide application and handling.

A. Priority Area Designation

Areas that receive the greatest social and economic benefits from herbicide treatment of excessive aquatic plant growth have been designated as high priority treatment areas. The priority treatment concept is shown in figure 3. This strategy has been developed to minimize problems caused by excessive vegetation in high use areas and preserve the beneficial effects of vegetation for fisheries, waterfowl, and other wildlife by not treating vegetation in undeveloped areas. This enables more efficient use of limited resources to achieve maximum benefits. Only a small portion of the total aquatic plant acreage is designated for herbicide treatment. Designated priority areas for each reservoir

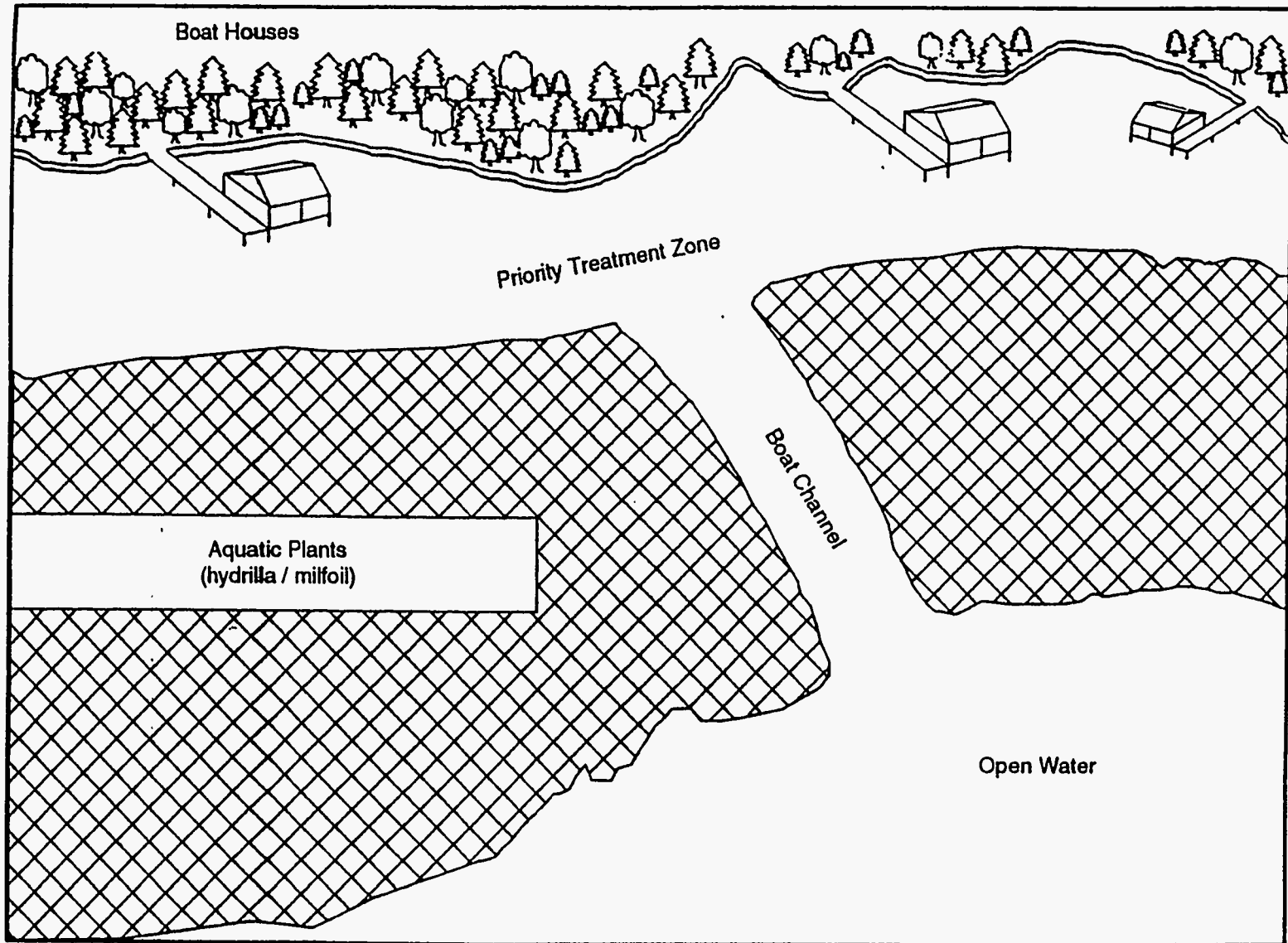


Figure 3 Chemical control treatment concept for designated use areas.

are shown in figures under specific reservoir plans presented in a following section of this workplan. The actual area of treatment in most priority areas consists of a swath about 150 feet wide along the developed shoreline. In areas where main channel access is restricted, boat lanes may be chemically treated to improve access. High priority areas include:

- high-use recreation and public access sites
- reservoir areas adjacent to seasonal and permanent lakeside residences, resorts, camps, and commercial marinas
- boat lanes to provide access to ramps, docks, and marinas.
- areas with dense plants and associated mosquito populations which show tolerance to conventional mosquito larvicides where reduction of aquatic weeds diminishes the habitat for mosquito production.

In addition to designated priority areas, special problems occur at times that require unscheduled treatments. For example, treatment may be required in the vicinity of screened-water intakes of TVA power plants to prevent clogging of intake structures by plant debris. Small, expanding colonies of exotic plants that have potential of becoming major problems also may require special treatments. Treatment is often needed to reduce dense aquatic vegetation in areas to be sampled for fish populations and in swimming areas within TVA public use areas. Small test plots outside priority areas may also be treated to evaluate new control methods. Efforts will be made to comply with requests for special treatment for TVA or state agency programs and to coordinate control activities with other TVA program interests. All special treatment requests should be coordinated with and approved by appropriate Vector and Plant Management staff.

B. Herbicides and Rates

Herbicides and rates of application approved by EPA and recommended for aquatic species in the Tennessee Valley reservoir system are discussed below and listed in Table 4.

2,4-D - A tolerance of 0.1 ppm 2,4-D in potable water and 1.0 ppm in fish flesh has been established by EPA. For Eurasian watermilfoil, apply the liquid dimethylamine salt (DMA) to achieve an initial concentration of 2.0 ppm. In water with an average depth of six feet, use 2,4-D at 10 gallons per acre (GPA), undiluted. For more shallow water, dilute concentrated 2,4-D proportionally with water. For example, if water depth averages three feet, apply a 50:50 mixture of 2,4-D and water total volume of 10 GPA.

When used for control of emergent species, such as American lotus, mix 2,4-D at the rate of 1.0 gallon of 2,4-D concentrate per 100 gallons of spray. Add a surfactant (Cide Kick[®]) and drift control agent to the spray mix to minimize drift to non-target areas and improve spray coverage. Completely cover foliage of emergent vegetation with herbicide spray. Do not apply 2,4-D within 0.5 mile of potable water intakes.

Endothall Products - Hydrothol[®], Aquathol[®], and Aquathol K[®] are currently labeled for use in TVA reservoirs based on an interim tolerance limitation of 0.2 ppm in potable water. The primary formulation used by TVA will be the liquid formulation Aquathol K. Apply a 50:50 mixture of Aquathol K and water in a total of volume of 10 GPA to water with an average depth of four feet to give an approximate concentration of 2.0 ppm of dipotassium endothall. Adjust the ratio of concentrate to water in the spray mixture proportionately for deeper or shallow water

Table 4. Herbicide recommendations for the TVA reservoir system.

Plant Species	Herbicide and Rate/Ac	Remarks
Eurasian watermilfoil	2,4-D - 10 gallons <u>DMA - 2,4-D</u>	Use in areas where over 50% of infestation is milfoil. Rate given is to provide a concentration of approximately 2.0 ppm in water with an average depth of 6 feet. Adjust rate proportionately in more shallow water.
Spinyleaf naiad	(1) Endothall - 5 gallons <u>Aquathol K</u>	(1) Rate given is to provide an approximate concentration of 2.0 ppm dipotassium endothall in water with an average depth of 4 feet. Adjust rate proportionately in more shallow water.
Southern naiad Mixed infestations dominated by plants (>50%) other than milfoil	OR	
Other submersed species except hydrilla	(2) Diquat - 1 to 2 gallons <u>Diquat</u>	(2) Use 1 gal/Ac for naiad control. Use 2.0 gal/Ac for pondweeds, coontail, and mixed naiad and milfoil infestations. <u>Do not use in muddy water or treat in a manner that would create muddy water.</u>
Hydrilla	(1) Endothall - 7.5 gallons <u>Aquathol K</u>	(1) Rate given is to provide an approximate concentration of 3.0 ppm dipotassium endothall in water 4 feet in depth. Adjust rate proportionately for different water depths.
	(2) Diquat - 2.0 gallons + Komeen-5.0 gallons	
	(3) Fluridone - 40-60 lb (2.0-3.0 lbs ai/Ac)	(3) Follow label guidelines.
	(4) Komeen -- 10.0 gallons	(4) Use alone if closer than one-half mile to water intakes. Reduce rate to 5 gallons and mix with diquat (2 gallons) or Sonar AS (2 quarts) in other areas for improved control.

Table 4 (continued)

Plant Species	Herbicide and Rate/Ac	Remarks
Waterprimrose American Lotus	2,4-D - 1/2 gallon <u>DMA - 2,4-D</u> / 50 gallons water	Handgun application. Apply when leaves are fully developed above the waterline. Spray to wet foliage. Do not drive boat over treated foliage or create waves that would wash herbicide from the foliage. Use a surfactant, such as Cide Kick, to improve wetting.
Alligatorweed Giant cutgrass Willows Other floating and emergent species listed on product label	Glyphosate - 3 quarts <u>Rodeo</u> /100 gallons PLUS Surfactant (Cide Kick) 1 to 2 quarts/100 gallons	Handgun application. Apply when plants are actively growing and foliage is well developed. For successful control of floating plants, most leaves must be above the water surface and treatment must be made without creating waves, or boat paths which would wash the herbicide off targeted leaves.
<u>Chara</u> sp.	Diquat 1.0 gal + Cutrine PLUS 3.3 gallons	Use this combination when <u>Chara</u> predominates in mixtures of aquatic plants.

ABD 384/1

treatment. For example, in water averaging 6 feet in depth, use 7.5 gallons of Aquathol K and 2.5 gallons of water per acre; in 2-foot depths use 2.5 gallons Aquathol K and 7.5 gallons of water. In specific situations, Aquathol K may be applied up to 300 feet from a potable water intake, but potable water monitoring will be required. However, do not apply within 0.5 mile of any potable water intake without prior approval of Vector and Plant Management personnel. Applications within the 0.5 mile exclusion area will be coordinated with water treatment plant personnel. Raw and finished water supplies will be monitored following such treatment.

Diquat[®] - Diquat, with new trade name of Reward[®], is approved for control of submersed and floating aquatic plants. A tolerance of 0.01 ppm diquat dibromide in potable water has been established by EPA. Apply Diquat at the rate of 1.0 gallon plus 9.0 gallons of water per acre for naiad control and 2.0 gallons plus 8.0 gallons of water for milfoil control. For hydrilla, apply 2.0 gallons of Diquat plus 5.0 gallons of Komeen plus 3.0 gallons of water per acre. Polymer may be added to sink and stick diquat sprays to submersed vegetation. Diquat is not effective in muddy water. Do not apply within 0.5 mile of potable water intakes.

Diquat plus Cutrine[®] - Use a tank-mix combination of 1.0 gallon of Diquat plus 3.3 gallons of Cutrine plus 5.7 gallons of water for control of muskgrass--Chara. Other tank-mix combinations may be recommended on a trial basis in an attempt to improve control of less susceptible weeds or reduce cost of herbicide treatment. Do not apply within 0.5 mile of potable water intakes.

Fluridone (Sonar)[®] - Sonar should be used only in special situations. Upon approval of specialists in the Vector and Plant Management program, Sonar pellets may be used in selected shallow coves

and shoreline areas where minimum water exchange occurs for control of hydrilla, milfoil, and other submersed species. Apply Sonar pellets (SRP) at rates of 30 to 60 lb/Ac. A minimum of 5.0 acres should be treated at each site. Because of the slow activity of Sonar, areas should be treated as early as possible in the growing season. Even with early treatment, an additional treatment with a contact herbicide may be necessary four to six weeks after treatment to provide acceptable control in water treated with Sonar. Since control effects from Sonar normally extend into the second growing season because of mortality of the root system for perennial species, not because of persistence of the herbicide (milfoil control is often better the second year than the first year), the same areas usually will not be treated with Sonar two years in succession.

Sonar may be used within 0.25 mile of municipal water intakes according to label provisions. A tolerance of 0.15 ppm has also been established by EPA for potable water. There is no swimming restriction in water treated with Sonar. Treated water should not be used for irrigation of ornamentals, lawns, or gardens for seven days after treatment.

Glyphosate (Rodeo®) - Use Rodeo to control giant cutgrass, alligatorweed, willows, and other emergent plants in priority areas. Mix at the rate of 3 quarts of Rodeo per 100 gallons of water. One to two quarts of surfactant (Cide Kick) per 100 gallons must be added to the spray mixture. Do not use in areas where spray or spray drift may contact lawngrass or other desirable plants. A potable water tolerance of 0.5 ppm has been established by EPA for glyphosate. Do not apply within 0.5 mile of potable water intakes.

Komeen[®] - Use alone at the rate of 10 gallons per surface acre or at 5.0 gallons per acre in combination with diquat (2.0 gallons) or Sonar AS (2.0 quarts) to control hydrilla and naiads. Komeen may be used alone adjacent to municipal water intakes; however, treatment is made only in cooperation with water treatment plant manager. The combination with Sonar should not be used closer than one-quarter mile and the combination with Diquat closer than one-half mile of intakes. Komeen may also suppress Chara and filamentous algae.

C. Sprayer Calibration

Sprayer calibration is the procedure used to determine nozzle size, spraying pressure, and boat speed required to deliver the desired volume of spray per acre. In order to simplify calibration and application techniques, herbicides should be applied in a total volume of 10 gallons per acre. This proven practice should be followed when possible. Boats should be calibrated for an application speed of 5 miles per hour (mph). This speed should be maintained during calibration and spray operations. Nozzles on booms should be spaced approximately 20 inches apart. At 5 mph, with nozzles on 20-inch centers, each nozzle should discharge approximately 21.5 fluid ounces per minute to apply 10 gallons per acre. Adjust nozzle output prior to initial treatment and check output daily thereafter. Once application rate is determined, herbicides should be mixed in the proper ratio to give the recommended rate per acre. Since boats do not have speedometers, operators should practice driving over a measured 1 mile course at 5 mph. It requires 12 minutes to travel 1 mile at 5 mph. Engine revolutions per minute (rpm) can be used as a guide for determining correct speed.

D. Application Methods

Airboats equipped with booms, trailing hoses, and orifices to inject herbicides under the water surface will be used for submersed vegetation control. Boats with five-nozzle transom-mounted booms have an effective swath width of about 8 feet. Outrigger booms on each side with three nozzles each extend the effective swath to approximately 18 feet. Care should be taken to prevent overlap or skips in treatment swaths.

For emergent vegetation control, use a hand gun to apply herbicides and always include a surfactant. A drift control agent should also be added to avoid drift to nontarget areas. Applications should be made when plants are actively growing and foliage should be thoroughly wet with spray. Care should be taken not to drive boat over treated foliage or create waves that would wash herbicide from the foliage.

E. Herbicide Safety

Only EPA approved herbicides will be used in the aquatic plant management program. EPA guidelines (Appendix C) for safe handling, use, disposal of pesticides and containers, and precautions and restrictions on specific product labels must be followed. Herbicide applicators must be certified or be supervised by commercial pesticide applicators certified in the State in which they operate.

To ensure established herbicide tolerance limitations in potable water are not exceeded, herbicide treatments will normally be excluded from areas within 0.5 mile of potable water intakes. If treatment closer than 0.5 mile is necessary, only herbicides labeled for such use (Aquathol K, Sonar, or chelated copper herbicides) will be used and the specified labeled exclusion area observed. Residue monitoring of finished water from treatment plants will be conducted at periodic intervals in conjunction with routine applications made just outside the

0.5 mile radius of potable water intakes to ensure tolerances are not exceeded, or during special operations with permitted herbicides inside the 0.5 mile radius.

To avoid injury to nontarget shoreline plants, herbicides for submersed species will be applied by injecting below the surface of the water. Care will be taken to prevent airboat propeller-wash from blowing treated water onto susceptible nontarget plants on shore or docks. When handgun or aerial applications are made, drift control additives must be used to minimize drift to nearby nontarget plants. Do not use Rodeo in areas where lawngrass or other desirable plants may be contacted by spray or spray drift. Hand gun treatment will not be used when wind conditions cause drift even with the drift control agents.

Treated areas will be posted with signs (figure 4) notifying the public of water use restrictions. Signs should be posted in locations such as on docks where they are readily visible. As a safety precaution, no herbicide application will be made while swimmers are within the targeted application area.

To ensure safety to applicators, each applicator will use appropriate personal protective devices when exposed to herbicides including coveralls, overshoes, rubber gloves, protective hats, special polarized or plain lens goggles, and respirators. Special care must be exercised in transfer, transport, and storage of herbicides to avoid accidental spills or contamination.

Protective levees will be maintained around large tanks and other storage facilities according to EPA requirements. Earthfill or concrete levees must have a storage capacity of 1.5 times the volume of the tank(s) being protected and have valve-controlled drainpipes to allow removal of collected rainwater if necessary. Storage tanks and valves will be inspected by Operational Maintenance staff on a regular basis and replaced or repaired if defective. Labels and warning signs will be

NOTICE

WATER WITHIN 150 FEET OF THIS NOTICE WAS TREATED FOR
AQUATIC WEED CONTROL ON _____

- DO NOT SWIM FOR 24 HOURS.
- DO NOT USE FISH FOR FOOD OR FEED WITHIN 3 DAYS OF TREATMENT.
- DO NOT USE WATER FOR HOUSEHOLD, DOMESTIC, OR IRRIGATION PURPOSES FOR 7 DAYS AFTER TREATMENT.

DO NOT REMOVE NOTICE UNTIL 7 DAYS AFTER TREATMENT.

TVA Division of Air and Water Resources Fisheries and Aquatic Ecology Branch
Muscle Shoals, Alabama 35660 Telephone (205) 386-2276

Figure 4 Sign posted in areas treated with herbicides.

affixed to bulk storage containers, transport tanks, and complete labels will be kept in transporting vehicles. Containerized herbicides will be kept in original labeled containers. Containers will be triple-rinsed immediately upon emptying and disposed of or stored for later disposal according to label instructions. The rinse water from the containers will be added to the spray tank and applied in normal spray operations.

Records and Maps

In order to maintain an accurate record of herbicide use in treated areas, maps are to be completed and submitted weekly to TVA, Vector and Plant Management staff, Water Management, Aquatic Biology Department, OSA 1B, Muscle Shoals, Alabama 35660. These maps should include areas surveyed and treated, plant species present, amounts and types of herbicides used, and identification of treatment crews. Master maps should be maintained at the field location and in Muscle Shoals. Photocopies of aerial photographs of each reservoir will be furnished, upon request, to aid the applicator in scheduling, treating, mapping, and reporting. Biologists from Vector and Plant Management have the responsibility of delineating priority areas, scheduling treatment, and making follow-up surveys. Unidentified aquatic plants, especially those resembling hydrilla, should be packaged and mailed to Vector and Plant Management staff for identification. Close inspections should be made around launch areas in order to facilitate early detection of plants such as hydrilla which are easily transported by boat trailers. Special attention should be given to ornamental water gardens adjacent to reservoirs, since shipments of aquatic plants from some aquatic plant nurseries could have infestation of hydrilla or other noxious species.

F. Complaint Forms

Complaint forms will be furnished to all offices of Operations and Maintenance. Personnel directly involved in aquatic weed control are instructed in completion of these forms. Accurate records of major complaint areas and problem-causing species are used to plan the control program to better serve the majority of the citizens.

G. Reservoir Control Plans

Aquatic weed control operations planned for each reservoir during the 1993 growing season are discussed in the following sections. Maps indicating high-priority treatment areas mutually agreed upon by Water Management and Operations and Maintenance and based on informal review by various user's groups have been prepared for Kentucky, Pickwick, Wheeler, Wilson, Gunter'sville, Nickajack, Chickamauga, Watts Bar, Fort Loudoun, Melton Hill, and Tellico Reservoirs. Priority treatment maps have been published for Kentucky, Gunter'sville, and Chickamauga Reservoirs (reservoirs that contain most of the treatment areas) and have been available for public and agency review for several years. There has been no indication that the priority areas are inappropriately designated.

Kentucky Reservoir - Total acreage of submersed aquatic vegetation decreased slightly in 1992, 2,616 acres compared to 2,813 acres in 1991. The predominant submersed plant was Eurasian watermilfoil. Only 148 acres were treated in 1992. In 1993, herbicidal control efforts will be restricted to priority areas where use conflicts occur (figure 5) and will be initiated upon customer complaints. No herbicide treatment will be made outside the designated priority areas without prior approval of the vector and plant management staff.

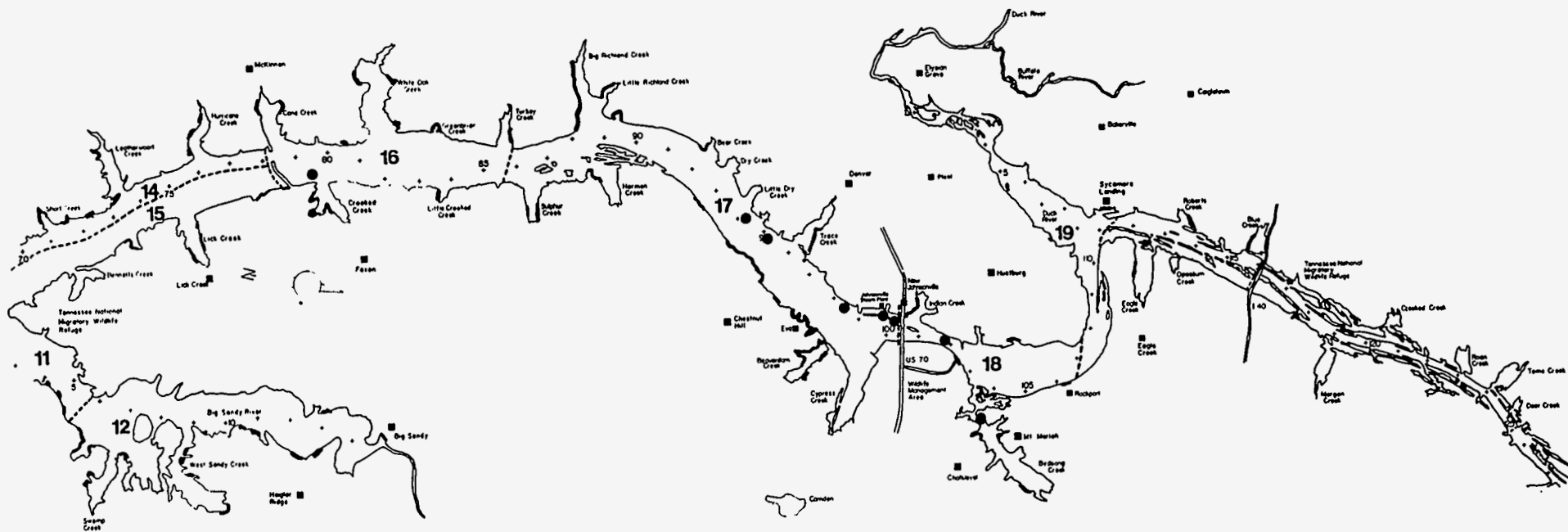


figure 5a. Kentucky Reservoir Aquatic Plant Management Priority Treatment Map

Pickwick Reservoir - Periodic surveys will be made in Pickwick Reservoir in 1993 for submersed aquatic plants, especially hydrilla and watermilfoil. Hydrilla fragments were found in Pickwick Reservoir in 1989, presumably flushed downriver from Gunter'sville and/or Wheeler Reservoirs during the 1989 spring and summer flood conditions. If established watermilfoil and hydrilla infestations are found, a control strategy will be developed and implemented. Spinyleaf naiad within the priority areas of Yellow Creek embayment (figure 6) or other priority areas may require treatment operations and will be based on customer complaints.

Wilson Reservoir - Beginning in late July, aquatic plant habitats of Wilson Reservoir will be surveyed by boat. Priority areas (figure 7) such as Shoals Creek, Lime Kiln Hollow, Turtle Point Slough, and Donnegan Slough where colonization has historically occurred will be treated if dense vegetation develops and complaints are received. The low population levels of watermilfoil on Wilson Reservoir during the last few years has significantly reduced or eliminated the need for herbicide treatment. If watermilfoil is found in areas such as Hog Island, it will not be treated since it provides submersed structure frequently used by fishermen; however, hydrilla would be treated if it is detected. Surveys will concentrate on detection of hydrilla.

Wheeler Reservoir - In 1992, 4,412 acres of macrophytes colonized Wheeler Reservoir mostly from TRM 313 to Browns Ferry (TRM 293) and in Flint Creek embayment. This was an increase from 3,462 acres in 1991, but was still well below peak coverage of over 9,800 acres in 1988. Hydrilla, which was discovered on Wheeler Reservoir in 1987, and colonized 266 acres in 1989, did not reach the surface in 1992. However, regrowth is expected when growing conditions become more favorable.

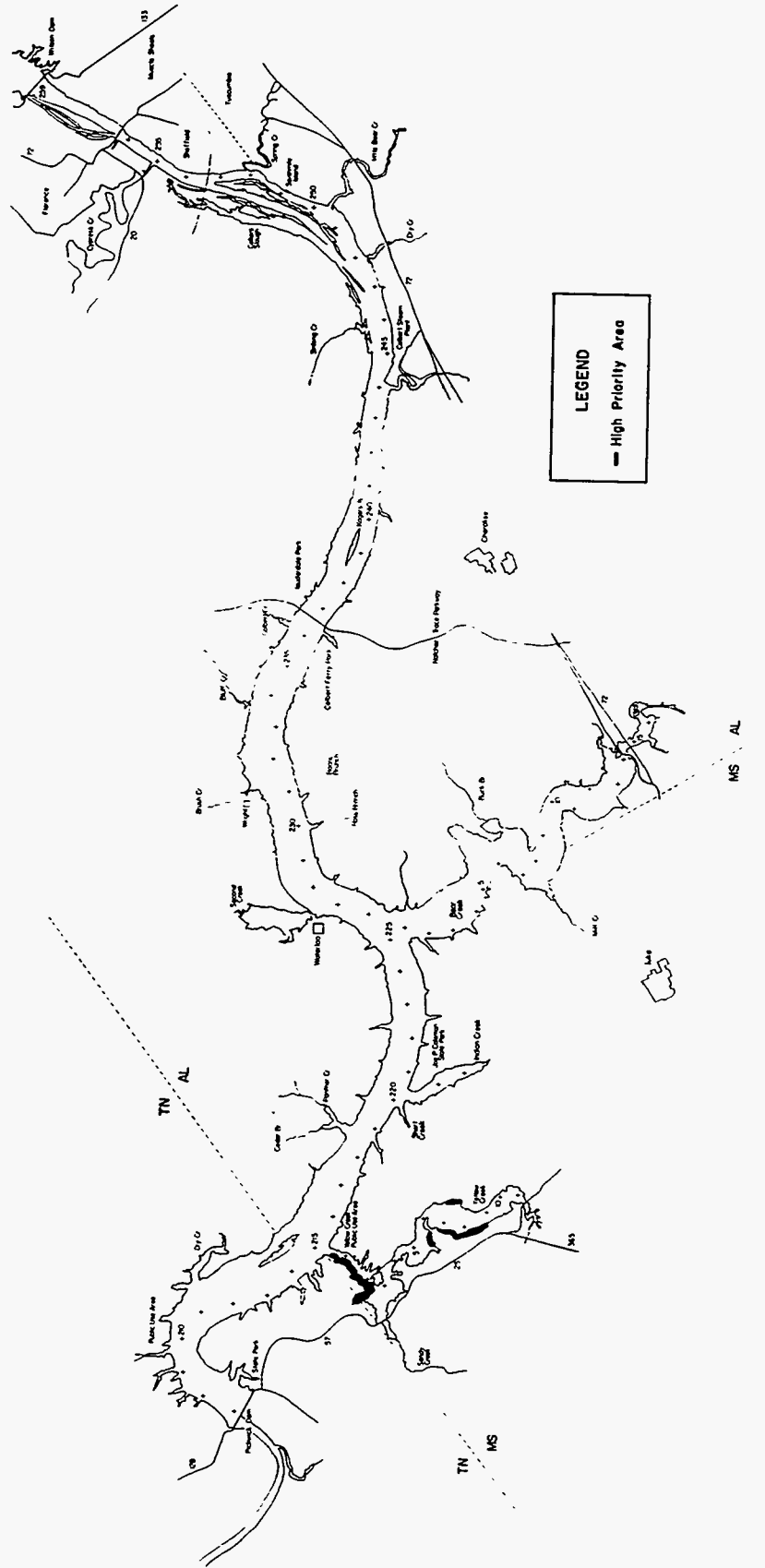


figure 6. Pickwick Reservoir Aquatic Plant Management Priority Treatment Map

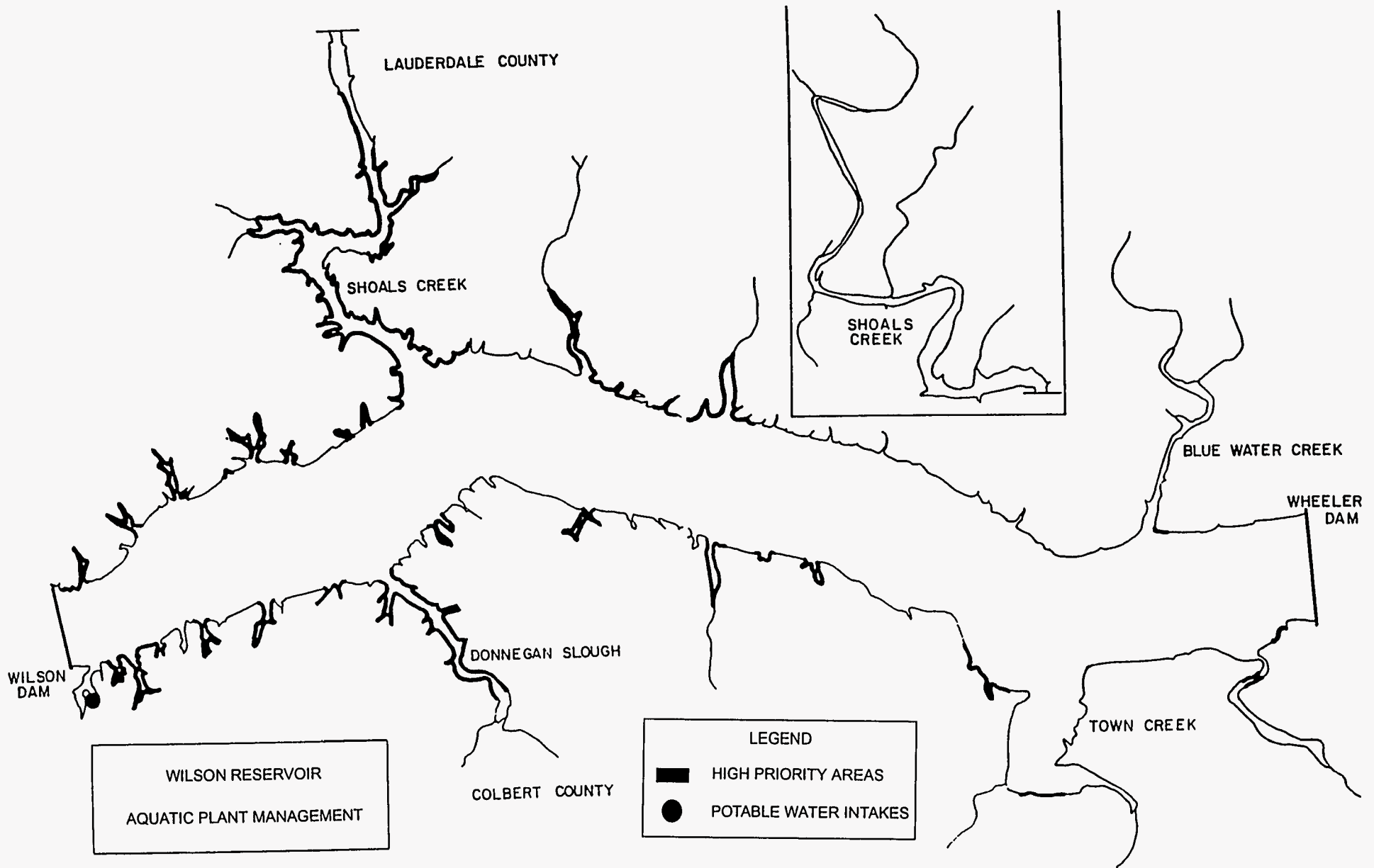


figure 7. Wilson Reservoir Aquatic Plant Management Priority Treatment Map

No herbicide treatment has been made on Wheeler Reservoir since 1989. Treatment in 1993 will depend on aquatic plant colonization in priority areas (figure 8) and customer complaints. Surveys will be made in early summer to assess the aquatic plant colonization. If treatment is necessary, boat crews will be scheduled to treat only in priority areas shown in figure 8. No treatment will be made within the boundaries of Wheeler National Wildlife Refuge without concurrence of the refuge staff.

Guntersville Reservoir - Submersed aquatic plants on Guntersville Reservoir increased from 5,166 acres in 1991 to 5,993 acres in 1992. Surface coverage of hydrilla was only about 1 acre in 1992 compared to about 2,900 acres in 1988. The amount of chemical treatment required in 1993 will depend on the extent of regrowth of aquatic vegetation in priority treatment areas. Regrowth is expected with favorable weather conditions; however, grass carp which were stocked in 1990 could slow regrowth and recolonization. Two boat crews will be available for treatment in 1993. However, herbicide treatment will be delayed until problems develop in designated priority areas (figure 9) and will be initiated based on customer complaints.

Several other Aquatic Plant Management activities, initiated on Guntersville Reservoir by TVA and the United States Army Corps of Engineers (USACE) as part of the TVA Joint Agency Guntersville Project (JAGP), will continue into the fourth year of the five-year project in 1993.

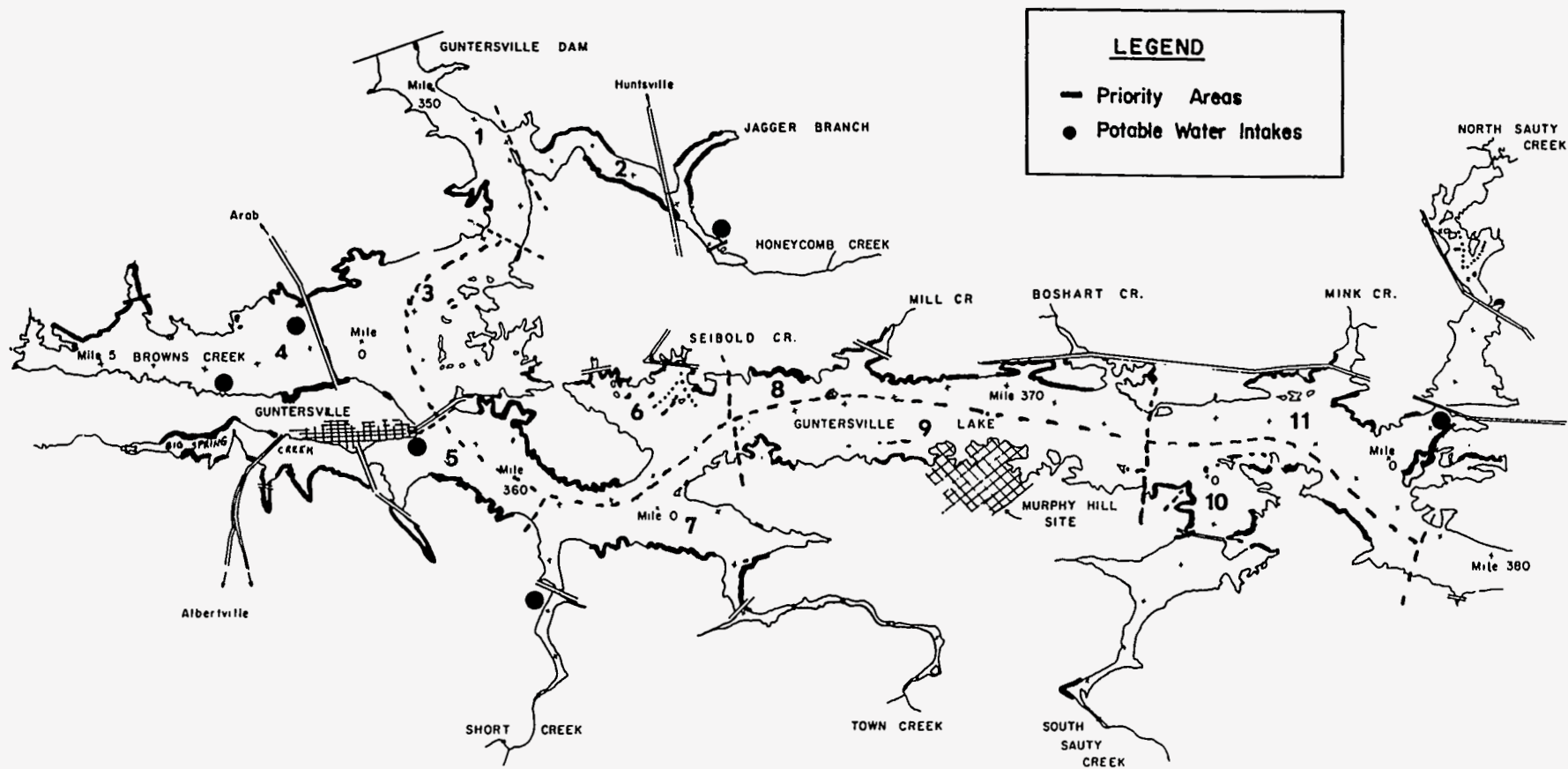


figure 9. Guntersville Reservoir Aquatic Plant Management Priority Treatment Map

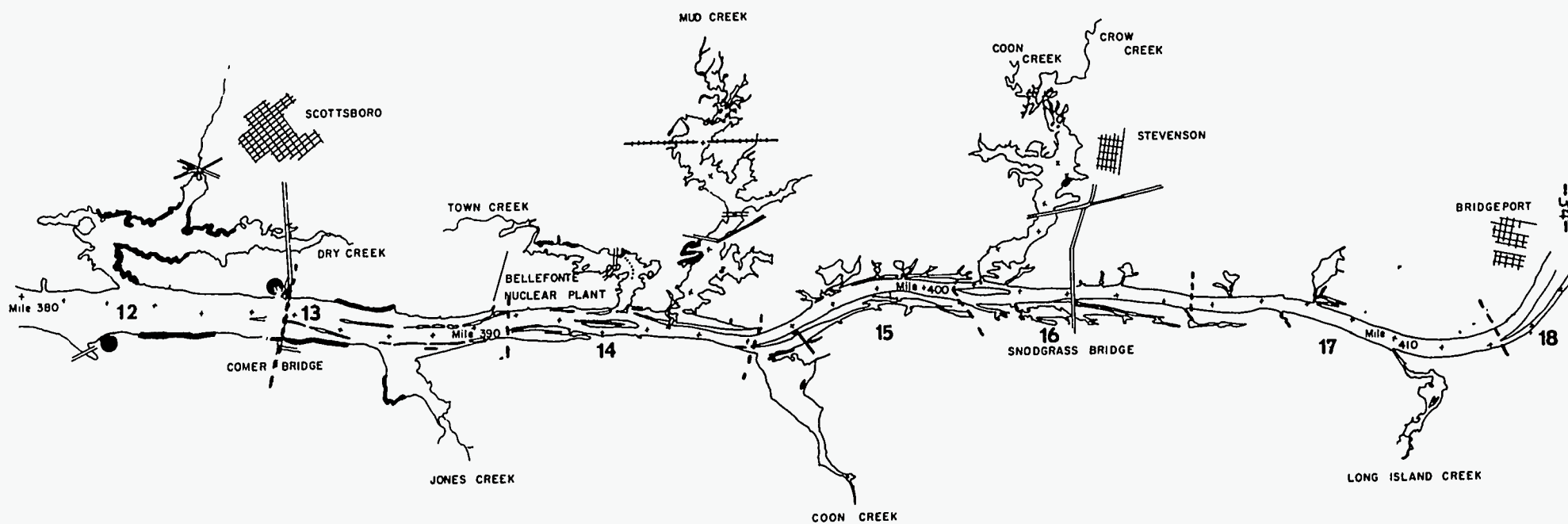


figure 9a. Guntersville Reservoir Aquatic Plant Management Priority Treatment Map

Copies of the detailed project plan are available upon request. In 1990, 100,000 sterile grass carp were released as a large-scale test demonstration. The effects and impacts of the grass carp on biological components are being extensively monitored. The decline in aquatic vegetation caused by other factors such as weather conditions is also being addressed.

In addition, other biological, chemical, and physical control technologies are being evaluated. An economic/recreation assessment relating to aquatic vegetation will be continued. No summer drawdowns are planned for Gunterville in 1993, but plans are to continue an extended summer pool level until September 1993.

Nickajack Reservoir - Aquatic plant coverage on Nickajack Reservoir was 583 acres in 1992, down from 832 acres in 1991. In 1989, hydrilla was discovered near the I-24 bridge. In 1992, no hydrilla colonies were visible from the surface; however, floating fragments were found. Only 49 acres in designated priority areas (figure 10) were treated with herbicides in 1992. Because of the decline in vegetation, no treatment is planned for 1993. However, aquatic plant distribution and customer complaints will be monitored in 1993. Airboats will not be used for survey work or to respond to customer complaints. In 1993, a MASTER PLAN for aquatic plant management will be initiated with public input for Nickajack and Chickamauga Reservoirs as a guide for future management activities.

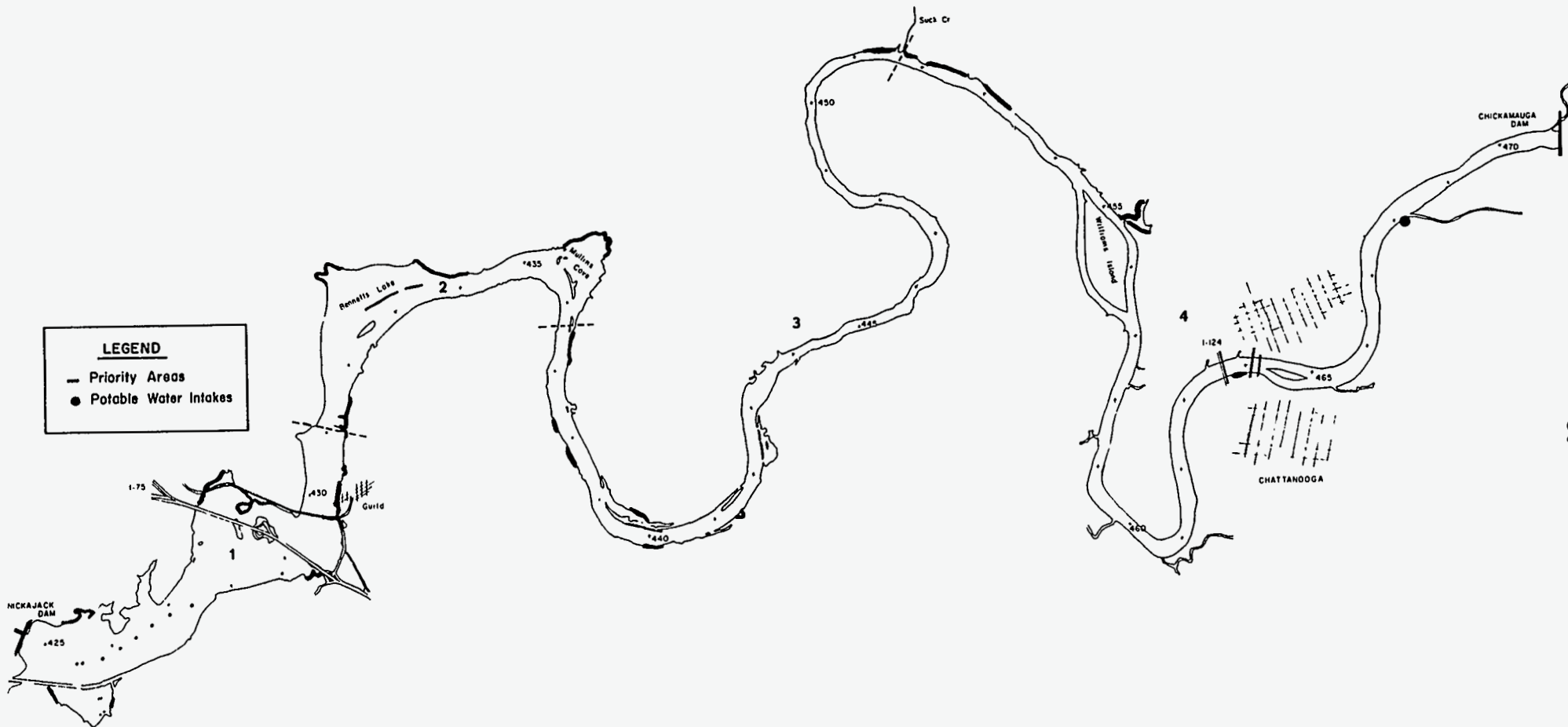


figure 10. Nickajack Reservoir Aquatic Plant Management Priority Treatment Map

Chickamauga Reservoir - Acreage of aquatic plants in Chickamauga Reservoir decreased to 387 acres in 1992. Only 63 acres in designated priority areas (figure 11) in the upper portion of the reservoir were treated with herbicide. Spinyleaf and southern naiad populations, which colonized from 5,000 to 6,000 acres in the late 1980's, declined to about 67 acres in 1992. No hydrilla was found on Chickamauga Reservoir in 1992.

Because of the recent decline in vegetation, no herbicide treatment in planned for 1993 and airboats will not be used for survey work. However, aquatic plant levels and customer complaints will be monitored in 1993. Vegetation within the boundaries of the state wildlife management areas will not be treated without the concurrence of the Tennessee Wildlife Resources Agency (TWRA). Aerial overflights will be used to survey aquatic plant distribution. In 1993, a MASTER PLAN for aquatic plant management will be developed with public input for Nickajack and Chickamauga Reservoirs as a guide for future management activities.



figure 11. Chickamauga Reservoir Aquatic Plant Management Priority Treatment Map

Watts Bar Reservoir - Aquatic plants were estimated at less than 10 acres on Watts Bar in 1992 with no known large colonies. No herbicide treatment was necessary. Treatment in 1993 is dependent on whether aquatic plant colonies develop in designated priority treatment areas (figure 12) but is expected to be minimal. Treatments of aquatic plants within the boundaries of State wildlife management areas, such as Paint Rock and Long Island, will not be made. Treatment will not be made during major scheduled fishing tournaments. Helicopter and boat surveillance will be used to assess aquatic plant distribution and abundance.

Melton Hill - In 1992, 240 acres of Eurasian watermilfoil occurred on Melton Hill Reservoir. In 1992, 23 acre-treatments were made in designated priority areas. In 1993, one boat crew will begin surveillance of priority areas (figure 13) in Melton Hill during the second week in June and will alternate surveillance of Fort Loudoun as needed. Treatment of aquatic plant colonies outside designated priority areas to suppress production of fragments capable of dispersion downstream will only be made after approval by Aquatic Plant Management Program personnel in Vector and Plant Management and no native plant colonies will be targeted unless causing major problems.

Observations on Melton Hill and assessment of aerial photography indicate that special water level manipulations during the winter months (two 5-foot drawdowns each month from October through March) over

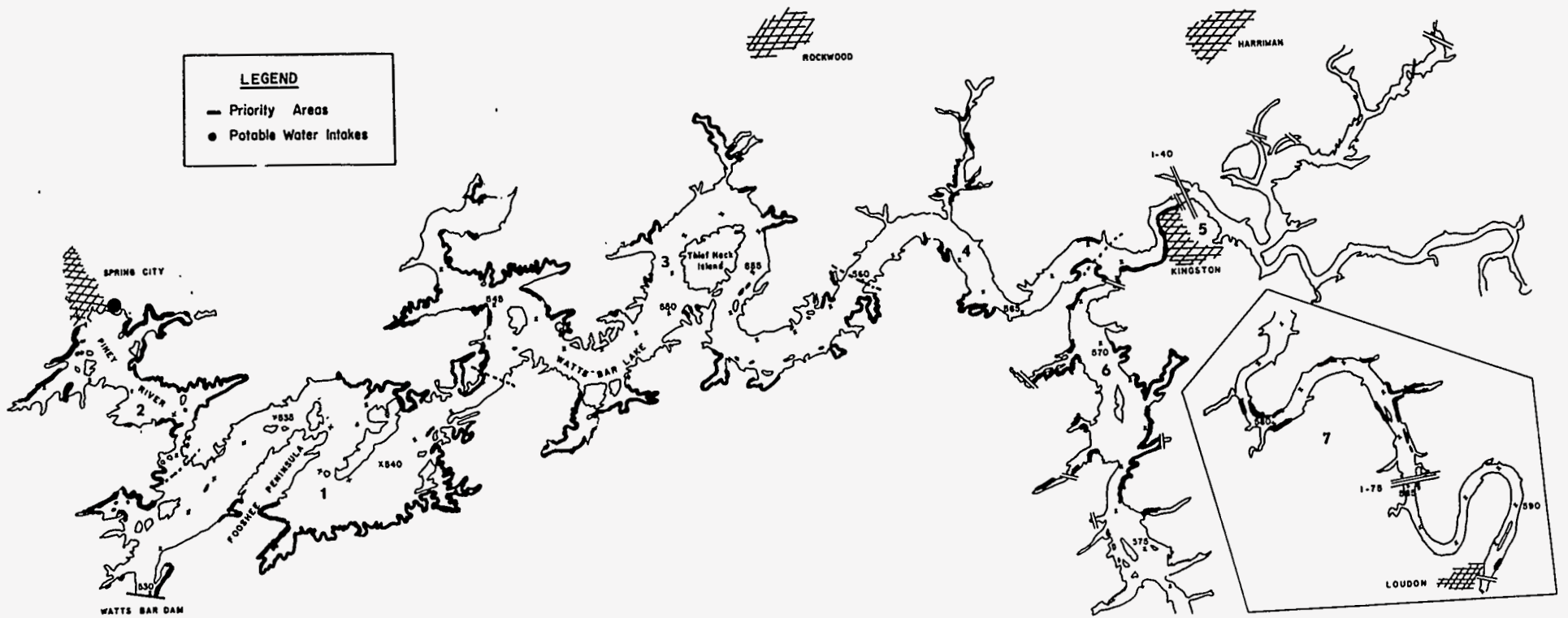


figure 12. Watts Bar Reservoir Aquatic Plant Management Priority Treatment Map

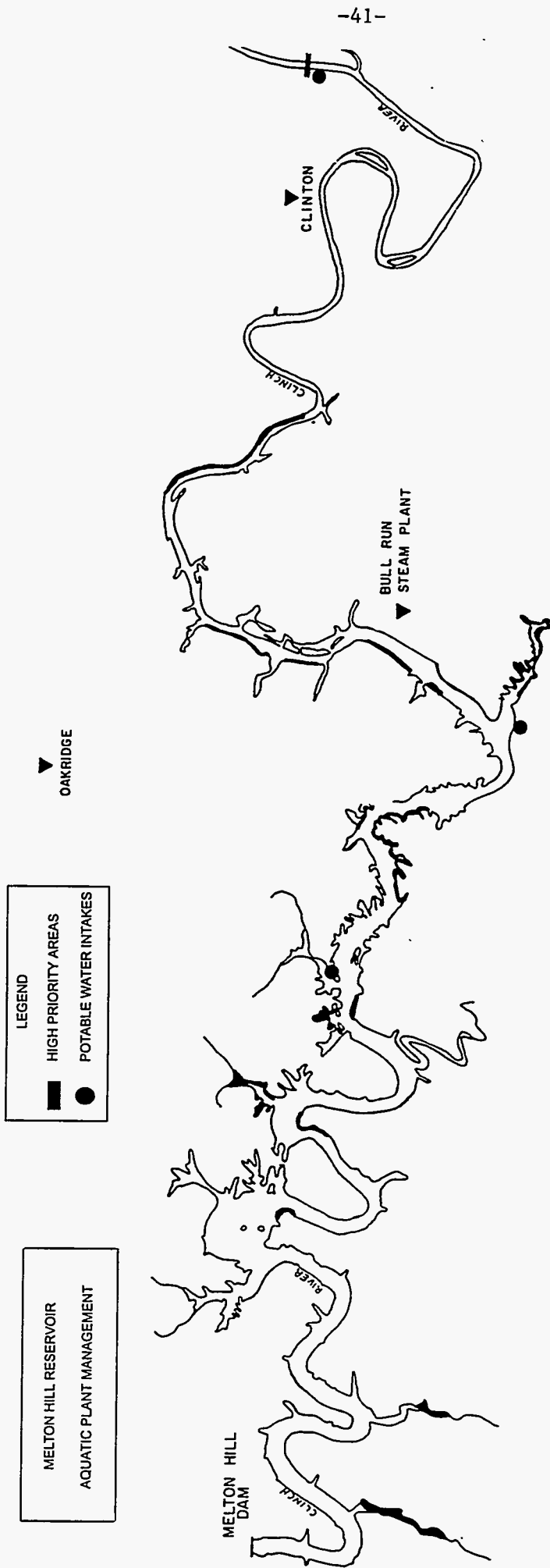


figure 13. Melton Hill Reservoir Aquatic Plant Management Priority Treatment Map

the past several years have reduced aquatic plants in the middle section of the reservoir and allowed herbicide treatment to keep most of the reservoir area at low plant densities.

Fort Loudoun - Eurasian watermilfoil is confined primarily to the upstream one-third of Fort Loudoun Reservoir. In 1992, only 2 acre-treatments were made in high priority areas. An estimated 25 acres of milfoil occurred in other areas. Other species, such as spinyleaf naiad, also have historically colonized shallow portions of Fort Loudoun, especially in the Little River area. To prevent these colonies from becoming more severe, the Melton Hill boat crew will survey the reservoir in late June or early July and treat infested areas (figure 14) within priority zones.

Tellico - Since its discovery on Tellico Reservoir in 1986, Eurasian watermilfoil has expanded and colonized 228 acres in 1992. The largest colonies of submersed macrophytes occur from the Jackson Bend area and in the Tellico River portion of the reservoir. The distributions and isolated nature of milfoil colonies indicate the possibility of planting of milfoil propagules presumably by sportsmen.

Boat surveys in 1993 will be conducted in the Jackson Bend area, Lotterdale Cove recreation area, and Notchy Creek and Toqua Creek recreation area since these areas have had previous infestations. These are priority treatment areas based on potential reservoir use conflicts between weeds and recreation and development. Treatment of priority areas (figure 15) will be made if excessive aquatic plants develop.

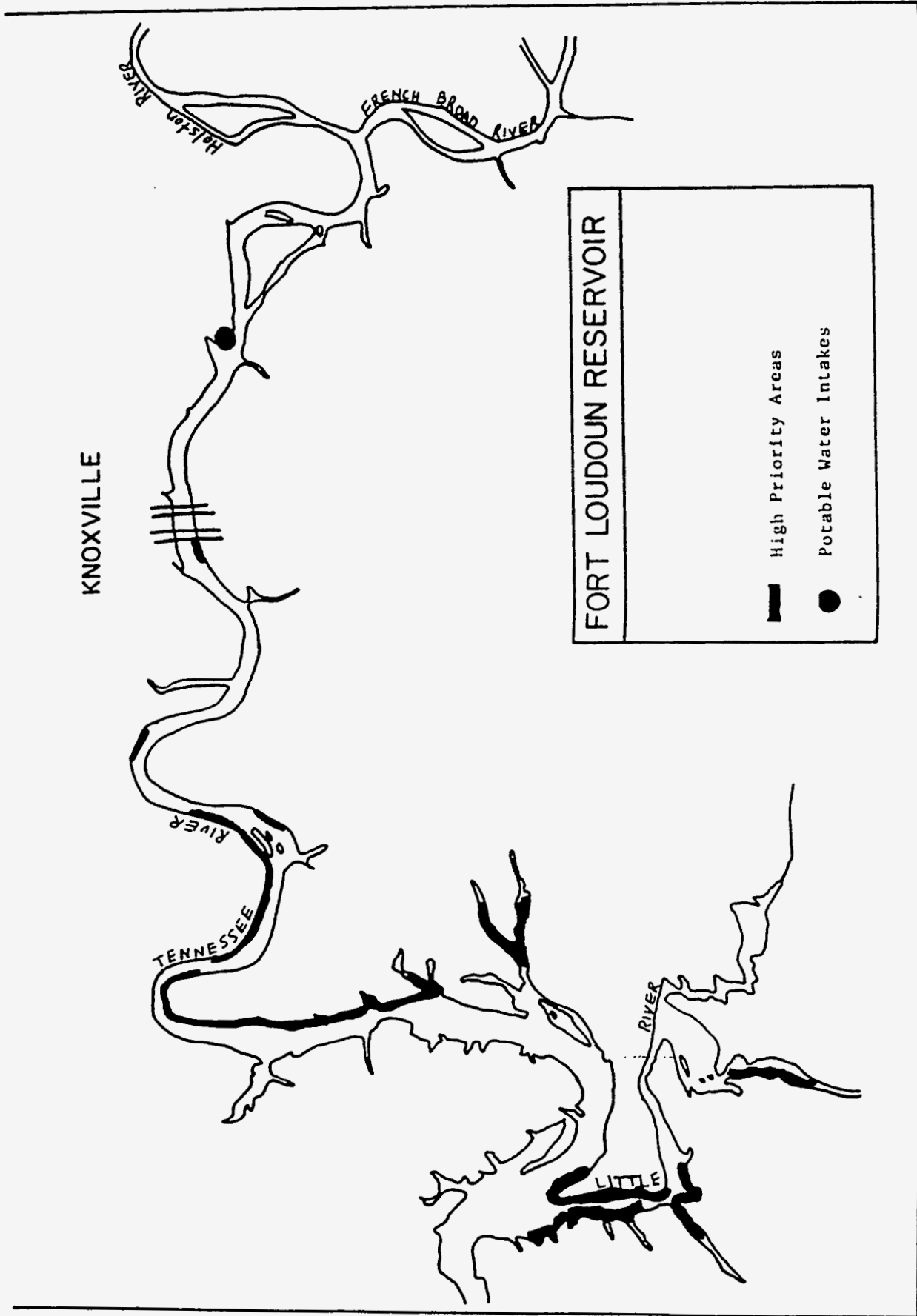


figure 14.- Fort Loudoun Reservoir Aquatic Plant Management Priority Treatment Map

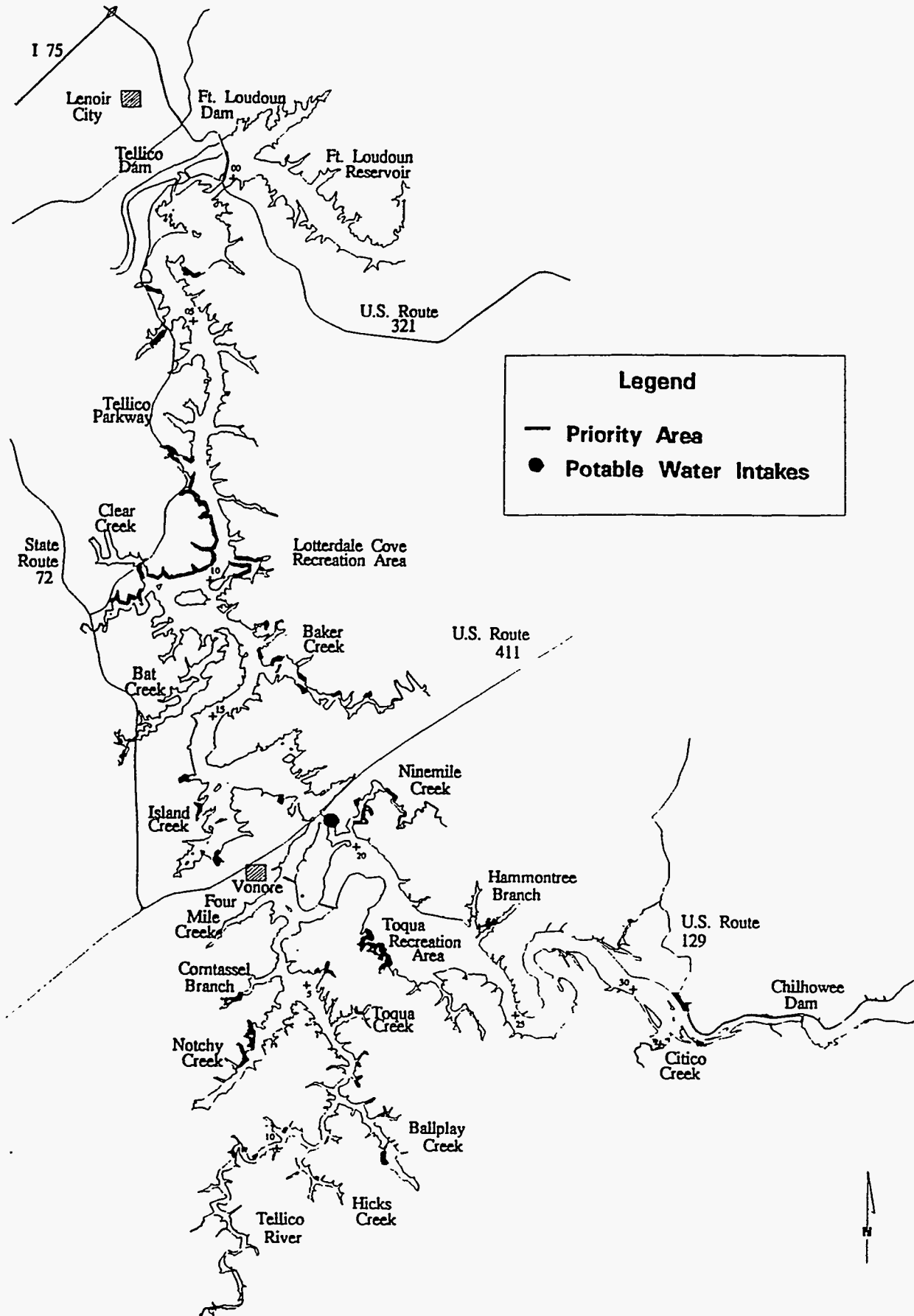


figure 15. Tellico Reservoir Aquatic Plant Management Priority Treatment Map

APPENDICES

Appendix A

Procedure for determination of Aquatic Plant Acreages from Color Aerial Photography.

Aerial photography is taken from a Beechcraft Aerocommander using a 9" x 9" mapping camera by the Mapping Services Branch of TVA. The processed negative film is then checked and prints ordered to allow coverage of the entire reservoir. The prints are then arranged in sequence and the reservoir divided into geographical sections to facilitate filing and handling. A transparent mylar overlay is attached to each print. Matchpoints are determined on sequential photos to avoid overlap on the acreage determinations. The aquatic plant colonies are then delineated on the mylar overlay and species determinations are then checked for consistency and accuracy by other members of the Aquatic Plant Management staff. The outlined colonies are then planimetered and the data reported in acres. A scale for the photographs is calculated using structures of known size compared to measured sized on the photographs.

APPENDIX B

Aquatic Macrophytes (in acres), Kentucky Reservoir, September 1992

Management Units	Milfoil 1	Naiads 2	Mixed 3	Lotus 4	Algae 5	TOTAL
1. Kentucky Dam: Birmingham Ferry	78	0	0	0	0	78
2. Kentucky Dam: Bear Creek	6	0	0	0	0	6
3. Birmingham Ferry: Eggner Ferry Bridge	313	0	0	0	0	313
4. Bear Creek: Eggner Ferry Bridge	112	0	0	0	0	112
5. Jonathan Creek	25	12	0	0	0	37
6. Eggner Ferry Bridge: Rushing Creek	124	0	0	0	0	124
7. Eggner Ferry Bridge: Blood River	88	0	0	0	0	88
8. Blood River	6	0	0	0	0	6
9. Rushing Creek: Scotts Fitzhugh Bridge	381	0	0	0	0	381
10. Blood River: Scotts Fitzhugh Bridge	492	1	0	0	0	493
11. Scotts Fitzhugh Bridge: Big Sandy River	0	35	0	0	0	35
12. Big Sandy River	0	0	0	4	55	59
13. West Sandy Dewatering Project	0	0	0	0	0	0
14. Scotts Fitzhugh Bridge: Danville (East)	112	0	0	0	0	112
15. Scotts Fitzhugh Bridge: Danville (West)	29	2	0	0	0	31
16. Danville: Sulfur Creek	59	0	474	0	0	533
17. Johnsville Steam Plant: Sulfur Creek	6	21	0	0	0	27
18. Birdsong	0	5	0	0	0	5
19. Duck River: Cold Branch Bridge	0	176	0	0	0	176
20. Eagle Creek: I - 40 Bridge	0	0	0	0	0	0
21. I-40 Bridge: Deer Creek	0	0	0	0	0	0
22. Dry Creek: Perryville Bridge	0	0	0	0	0	0
23. Perryville Bridge: Whites Creek	0	0	0	0	0	0
24. Beech River	0	0	0	0	0	0
25. Whites Creek: Clifton Ferry	0	0	0	0	0	0
TOTAL	1831	252	474	4	55	2616

1. Milfoil = Eurasian watermilfoil
2. Naiads = spinyleaf and Southern
3. Mixed = milfoil, naiad, coontail, egeria, etc. - less than 75% of each species
4. Lotus = American lotus
5. Algae = filamentous or chara

Aquatic macrophytes (in acres), Pickwick Reservoir, 1992

<u>Management Units</u>	<u>Naiads</u>	<u>Chara</u>	<u>TOTAL</u>
1. Pickwick	0	2	2
2. Yellow Creek	100	0	100
3. Waterloo	0	0	0
4. Bear Creek	0	0	0
5. Natchez Trace	3	0	3
TOTAL	103	2	105

*Estimated from boat surveys in 1992.

Acreage of Aquatic Plants (in acres), Wilson Reservoir, 1992

<u>Management Unit</u>	<u>Nm</u>	<u>TOTAL</u>
1. Bluewater Creek	3	3
2. Other Areas	2	2
TOTAL	5	5

*Estimated from boat surveys in 1992.

Aquatic macrophytes (in acres), Wheeler Reservoir, September 1992

Management Unit	Milfoil 1	Naiads 2	Mixed 3	Lotus 4	Pondweed	Coontail	Hydrilla	Algae 5	Mixed 6	Other 7	TOTAL
1. Wheeler Dam	0	0	0	0	0	0	0	0	0	0	0
2. Elk River	0	0	0	0	0	0	0	0	0	0	0
3. Spring Creek	0	0	0	0	0	0	0	0	0	0	0
4. Browns Ferry	108	0	0	5	0	0	0	0	0	0	113
5. Decatur	1868	3	1154	219	0	0	0	0	0	0	3244
6. Flint Creek	0	0	103	403	0	0	0	1	23	12	542
7. Rockhouse	0	22	0	382	0	0	0	2	107	0	513
8. Triana	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1976	25	1257	1009	0	0	0	3	130	12	4412

1. Milfoil = Eurasian watermilfoil
2. Naiads = spinyleaf and Southern
3. Mixed = milfoil and naiads
4. Lotus = American lotus
5. Algae = filamentous and chara
6. Mixed = milfoil, naiads, coontail, egeria, pondweed, filamentous algae, etc.
7. Other = primrose, spatterdock

Aquatic macrophytes (in acres), Gunterville Reservoir, September 1992

Management Unit	Milfoil 1	Naiads 2	Pondweeds	Mixed 4	Mixed 5	Mixed 6	Lotus 7	Hydrilla	Algae 8	Algae 9	Other 10	TOTAL
1. Gunterville Dam	T	0	0	0	0	0	0	0	1	0	0	1
2. Honeycomb	0	0	0	0	0	2	0	0	2	0	0	4
3. Conner Island	0	T	0	T	0	0	0	0	8	4	0	12
4. Browns Creek	1	0	0	0	0	0	0	0	1	0	T	2
5. Gunterville	T	0	0	0	0	1	0	0	2	0	T	3
6. Buck Island	43	0	T	0	0	0	0	0	15	1	0	59
7. Gunterville State Park	1	0	0	0	0	0	0	0	3	2	0	6
8. Mill Creek: Boshart Creek	13	0	0	1	0	1	T	0	8	1	0	24
9. Murphy Hill	47	1	0	0	0	0	0	0	11	3	0	62
10. South Sauty	211	0	0	0	0	0	0	0	9	1	0	221
11. Goose Pond	1152	0	0	5	0	7	131	T	16	3	0	1314
12. Roseberry Creek: Section	806	2	0	1	1	4	47	0	14	0	2	877
13. Bellefonte	690	T	0	4	7	11	18	0	7	T	T	737
14. Mud Creek	1418	1	0	3	2	4	42	1	76	3	0	1550
15. Coon Creek: Wannville	388	1	0	3	0	14	0	0	0	1	0	407
16. Stevenson	405	29	2	20	0	16	0	0	46	0	0	518
17. Widows Creek	154	0	0	1	3	18	0	0	T	T	0	176
18. South Pittsburg	T	0	0	20	0	0	0	0	0	0	0	20
TOTAL	5329	34	2	58	13	78	238	1	219	19	2	5993

1. Milfoil = Eurasian watermilfoil
 2. Naiads = spinyleaf and southern
 3. Pondweeds = American, small, curlyleaf
 4. Mixed = milfoil and naiad - no more than 75% of either species
 5. Mixed = milfoil and pondweed
 6. Mixed = milfoil, naiad, coontail, egeria, etc. - less than 75% of each species
 7. Lotus = American lotus
 8. Algae = filamentous or chara
 9. Algae mixed = algae and other vascular plants
 10. Other = Brazilian elodea, Canadian elodea, water stargrass, coontail
- T = Trace amounts

Aquatic macrophytes (in acres), Nickajack Reservoir, September 1992

Management Units	Milfoil 1	Naiads 2	Mixed 3	Pondweed 4	Mixed 5	Hydrilla	TOTAL
1. Nickajack Dam	39	0	8	8	T	T	55
2. Mullins Cove	146	0	18	0	302	0	466
3. Suck Creek	18	2	4	1	18	0	43
4. Chattanooga	1	3	15	0	0	0	19
TOTAL	204	5	45	9	320	T	583

-
1. Milfoil = Eurasian watermilfoil
 2. Naiads = spinyleaf and southern
 3. Mixed = milfoil and naiads
 4. Pondweed = American pondweed
 5. Mixed = naiads, coontail, pondweed, milfoil

Aquatic macrophytes (in acres), Chickamauga Reservoir, September 1992

Management Units	Milfoil 1	Naiads 2	Pondweeds 3	Naiads	Mixed 4	Lotus 5	Algae 6	TOTAL
1. Chickamauga Dam	0	0	0	0	0	0	0	0
2. Dallas Bay	0	0	0	0	0	0	0	0
3. Patton Island:								
Sequoyah Nuclear Plant	0	0	0	0	0	0	0	0
4. Wolftever Creek:								
Savannah Bay	0	0	0	0	0	0	0	0
5. Sequoyah Nuclear Plant:								
Soddy Creek	0	0	0	0	0	0	0	0
6. Soddy Creek	67	1	0	0	8	0	0	76
7. Opossum Creek	0	0	0	0	17	0	0	17
8. Soddy Creek:								
Blythe Ferry	0	0	0	0	0	0	0	0
9. Sale Creek	0	54	0	0	0	0	2	56
10. Hiwassee River	4	0	2	0	1	1	5	13
11. Armstrong Bend	28	6	0	T	0	5	10	49
12. Gillespie Bend	57	2	20	0	20	34	0	133
13. Washington Ferry	21	4	0	0	14	4	0	43
TOTAL	177	67	22	T	60	44	17	387

1. Milfoil = Eurasian watermilfoil
2. Naiads = spinyleaf and Southern
3. Pondweeds = American, small, and curlyleaf
4. Mixed = milfoil, naiads, coontail, pondweeds - no more than 75% of any species
5. Lotus = American lotus
6. Algae = filamentous and chara

Aquatic macrophytes (in acres), Watts Bar Reservoir, September 1990*

Management Unit	Eurasian Watermilfoi	Naiads Spinyleaf, Southern	Mixed Milfoil & Naiad	Coontail	TOTAL
1. Watts Bar Dam to Gillespie Ben	3	0	0	0	3
2. Piney River	3	0	0	0	3
3. Thief Neck Island	68	0	0	0	68
4. Caney Creek	0	0	0	0	0
5. Kingston	0	0	0	0	0
6. Long Island	6	0	0	0	6
7. Loudoun	0	0	0	0	0
TOTALS	80	0	0	0	80

*Aquatic macrophytes are estimated to have declined to approximately 10 acres in 1992 without any known large colonies based on boat surveys.

Aquatic macrophytes (in acres), Melton Hill Reservoir, September 1991 •

Management Unit	Eurasian		TOTAL
	Watermilfoil	Other	
1. Melton Hill Dam: Gallaher Bend	32	0	32
2. Williams Bend: Solway Bridg	53	0	53
3. Bull Run Steam Plant	155	0	155
4. Clinton	0	0	0
TOTALS	240	0	240

*Aquatic plant acreage in 1992 estimated to be the same as 1991 based on boat surveys and 1991 aerial photography.

Aquatic macrophytes (in acres), Fort Loudoun, September, 1985*

Management Unit	Eurasian		TOTAL
	Watermilfoi	Other 1	
1. Knoxville	27	0	27
2. Jones Bend: Looney Island	21	0	21
3. Little River	1	0	1
4. Louisville	1	0	1
TOTALS	50	0	50

* Aquatic macrophytes are estimated to have declined to about 25 acres in 1992 and confined primarily to management units 1 and 2 based on boat surveys.

Aquatic macrophytes (in acres), Tellico Reservoir, September 1992

Management Unit	Eurasian Watermilfoil	Parrots Feather	Mixed 1	TOTAL
1. Lotterdale	26	0	2	28
2. Vonore	22	0	1	23
3. Tellico River	136	0	3	139
4. Toqua	7	5	26	38
TOTAL	191	5	32	228

1. Mixed = spinyleaf naiad, muskgrass, spikerush, pondweeds

Aquatic macrophytes (in acres), Tributary Reservoirs, 1992

Management Unit	Chara	Naiads	Mixed 1	TOTAL
1. Blue Ridge: Charlie Cree	1	0	0	1
2. Norris: Sequoyah	0	1	0	1
3. Norris: Leadmine area	1	0	0	1
4. Boone: Candy Creek	0	2	0	2
5. Boone: Hodge Island	0	0	8	8
TOTAL	2	3	8	13

1. Mixed = curlyleaf pondweed, egeria mix

APPENDIX C

Using Pesticides Safely

Reprinted from Apply Pesticides Correctly
A Guide for Commercial Applicators - USDA -
 USEPA

There are two good reasons for using pesticides safely:

- to keep yourself and other people from being poisoned, and
- to avoid harming the environment.

Protecting Man

How Pesticides Harm Man

Pesticides can cause injury. They are *toxic*. Manufacturers find out how toxic a pesticide is by testing it on animals. The product's *hazard*—the danger that injury will occur to man—depends on the toxicity of the active ingredient plus the exposure to the product during use.

Most pesticides can cause severe illness, or even death, if misused. But every registered pesticide can be used safely if you use proper care.

Children under 10 are the victims of at least half of the accidental pesticide deaths in this country. If pesticides were always cared for correctly, children would never touch them.

Many accidental pesticide deaths are caused by eating or drinking the product. But some mixers, loaders, and applicators die or are injured when they breathe a pesticide vapor or get a pesticide on their skin. Repeated exposure to small amounts of some pesticides can cause sudden severe illness.

Most pesticides can enter the body through the skin. You may get more into your body this way than you would accidentally swallow or inhale while working. With some pesticides, skin contact alone can cause death.

You should help prevent *all* accidents with pesticides:

- by using and storing pesticides away from children and other untrained persons, and
- by taking care to follow directions when using them

Products for restricted use need special care. The label is your guide

Symptoms of Pesticide Poisoning

You should know what kinds of sickness are caused by the pesticides you use. You also should know the conditions under which each one may make you sick.

There are two kinds of clues to pesticide poisoning. Some are feelings that only the person who has been poisoned can notice—such as nausea or headache. These are *symptoms*. Others, like vomiting, also can be noticed by someone else. These are *signs*. So you should know:

- what your own feelings might mean, and
- what signs of poisoning to look for in your co-workers and others who may have been exposed.

All pesticides in the same chemical group cause the same kind of sickness. This sickness may be mild or severe, depending on the pesticide and the amount absorbed. But the *pattern* of illness caused by one type of pesticide is always the same. Having some of the signs and symptoms does not always mean you have been poisoned. Other kinds of sickness may cause similar signs and symptoms. Headache and a feeling of being unwell, for example, may signal the start of many kinds of illness. It is the *pattern of symptoms* that makes it possible to tell one kind of sickness from another.

Get medical advice quickly if you or any of your fellow workers have unusual or unexplained symptoms starting at work or later the same day. If you suspect a person has been poisoned, do not leave him alone. Do not let yourself or anyone else get dangerously sick before calling your physician or going to a hospital. It is better to be too cautious than too late. Take the container (or the label) of the pesticide to the physician. Do not carry the pesticide container in the passenger space of a car or truck.

Synthetic Organic Pesticides

Organophosphates—These pesticides injure the nervous system. The signs and symptoms go through stages. They normally occur in this order:

Mild Poisoning

- fatigue
- headache
- dizziness
- blurred vision
- too much sweating and salivation
- nausea and vomiting
- stomach cramps or diarrhea

Moderate Poisoning

- unable to walk
- weakness
- chest discomfort
- muscle twitches
- constriction of pupil of the eye
- earlier symptoms become more severe.

Severe Poisoning

- unconsciousness
- severe constriction of pupil of eye
- muscle twitches
- secretions from mouth and nose
- breathing difficulty
- death if not treated.

Illness may be delayed a few hours. But if signs or symptoms start more than 12 hours after you were exposed to the pesticide, you probably have some other illness. Check with your physician to be sure.

Carbamates—The only carbamates likely to make you ill on the job act almost like organophosphates. They produce the same signs and symptoms if you are poisoned by them. But the injury they cause can be corrected more easily by a physician. For this reason, most carbamates are safer than organophosphates. The label will warn you of the danger.

Organochlorines—Not many organochlorines (chlorinated hydrocarbons) have poisoned applicators.

Early signs and symptoms of poisoning include:

- headache,
- nausea,
- vomiting,
- general discomfort, and
- dizziness.

With more severe poisoning, convulsions follow. They may even appear without the warning symptoms. Coma may follow the convulsions. The person also may be unusually excited or irritable.

Nitrophenols and Pentachlorophenol—The signs and symptoms of skin exposure include:

- redness,
- burning, and
- blisters.

The signs and symptoms of poisoning include:

- headache,
- nausea,
- gastric distress,
- restlessness,
- hot feeling,
- flushed skin,
- sweating,
- deep and fast breathing,
- fast beating of the heart,
- fever,
- ashen color,
- collapse, and
- coma.

Severe poisoning usually runs a rapid course. One usually dies or is almost well within 24 to 48 hours.

Fumigants and Solvents—Too much exposure to these compounds may make a person seem drunk. The signs and symptoms are:

- poor coordination,
- slurring words,
- confusion, and
- sleepiness.

Repeated exposure to the fumigant methyl bromide has caused permanent internal injury without early signs or symptoms of poisoning. You can absorb a fatal dose of it before symptoms appear.

Inorganic Pesticides

Large single doses of most inorganic pesticides cause vomiting and stomach pain. The signs and symptoms depend on the mineral from which the pesticide is made.

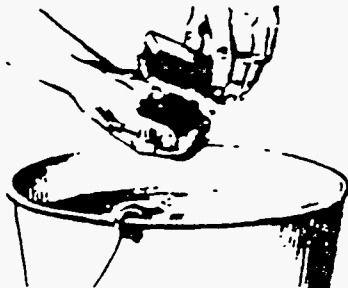
Plant-derived Pesticides

Some plant-derived pesticides are very toxic. Technical pyrethrum

may cause allergic reactions. Some rotenone dusts irritate the respiratory tract. Nicotine is a fast-acting nerve poison about as dangerous as parathion. Some other plant-derived pesticides are strychnine, rotenone, and red squill.

First Aid Procedures

Read the directions in the "Statement of Practical Treatment" on each label. These instructions can save your life and the lives of your employees.



If you get a pesticide on your skin:

- Remove the pesticide as quickly as possible. Remove all contaminated clothing. Prompt washing may prevent sickness even when the spill is very large. Don't forget your hair and fingernails. Water-wettable powders or suspensions are easy to remove with plain water. So are most emulsifiable concentrates and emulsions. Solutions of pesticides in petroleum oil or other solvents are harder to remove without soap or a detergent. Detergents work better. Washrooms and emergency field washing facilities should have detergents rather than plain soap.

If you inhale a pesticide:

- Get to fresh air right away.

If you splash a pesticide into your mouth or swallow it:

- Rinse your mouth with plenty of water.
- Go or be taken to a physician immediately.
- It is sometimes dangerous to cause vomiting; follow label directions.

Protecting Your Body

Pesticides can enter the body in many ways. The main ones are:

- getting the pesticide on your skin,
- inhaling it, and
- swallowing it.

To prevent this, you must wear protective clothing and equipment. No safety recommendations can cover all situations. Your common sense should tell you to use more protection as the hazard increases. The pesticide label will tell you the kind of protection you need.

Remember to bathe, using a detergent, when you finish working with pesticides or pesticide-contaminated equipment. Any time you spill a pesticide on yourself, wash immediately.

Protective Clothing

Body Covering—Any time you handle pesticides, you should wear at least:

- a long-sleeved shirt and long-legged trousers, or
- a coverall type garment.

They should be made of closely woven fabric. When handling pesticide concentrates or very toxic materials, you also should wear a liquid-proof raincoat or apron. Wear trousers *outside* of the boots to keep pesticides from getting inside.



Gloves—When you handle concentrated or highly toxic pesticides, wear liquid-proof neoprene gloves. However, some fumigants are readily absorbed by neoprene. The label will tell you what kind of gloves to use. They should be long enough to protect the wrist. Gloves should not be lined with a fabric. The lining is hard to clean if a chemical gets on it. Sleeves should be *outside* of the gloves to keep pesticides from running down the sleeves and into the gloves.

Hat—Wear something to protect your head. A wide-brimmed, waterproof hat will protect your neck, eyes, mouth, and face. It should not have a cloth or leather sweatband. These sweatbands are hard to clean if chemicals get on them. Plastic "hard hats" with

plastic sweatbands are good. They are waterproof and are cool in hot weather.

Boots—Wear unlined neoprene boots. However, some fumigants are readily absorbed by neoprene boots. Follow label instructions.

Goggles or Face Shield—Wear goggles or a face shield when there is any chance of getting pesticides in your eyes. Your eyes will absorb many pesticides. You can wear goggles alone or with a respirator.

Care of Clothing—Wear clean clothing daily. If clothes get wet with spray, change them right away. If they get wet with pesticide concentrates or highly toxic pesticides, destroy them. They are hard to get clean by normal methods. Do not store or wash contaminated clothing with the family laundry. Wash hats, gloves, and boots daily, inside and out. Hang them to dry. Test gloves for leaks by filling them with water and gently squeezing.

Wash goggles or face shields at least once a day. Elastic fabric headbands often absorb pesticides and are difficult to clean. Have some spares so you can replace them often, or use neoprene headbands.

Respiratory Protective Devices

The respiratory tract—the lungs and other parts of the breathing system—is much more absorbent than the skin. You *must* wear an approved respiratory device when the label directs you to do so. Follow the label instructions on respiratory protection.

You probably will need a respirator:

- if you will be exposed to a pesticide for a long time.
- if the pesticide you are using is highly toxic, or
- if you are working in an enclosed area.



Cartridge Respirator

Chemical Cartridge Respirator—You should wear this kind of respirator:

- when you are exposed to intermittent concentrations of a toxic pesticide.

The inhaled air comes through both a filter pad and a cartridge made to absorb pesticide vapors. Most harmful vapors, gases, and particles are removed. These half-face masks cover the mouth and nose. To cover the eyes also, use one that is combined with goggles or wear separate goggles.



Canister Respirator

Chemical Canister Respirator (Gas Mask)—You should wear this kind of respirator:

- when you are exposed to a continuous concentration of a toxic pesticide.

The canister has longer-lasting absorbing material and filters than a cartridge respirator. Gas masks usually protect the face better than cartridge types. Neither kind will protect you during fumigation or when the oxygen supply is low, as in a silo.



Supplied Air Respirator

Supplied Air Respirator—You may use this kind of respirator when mixing or applying pesticides:

- when the oxygen supply is low,
- when you are exposed to high concentrations of highly toxic pesticides in enclosed areas, as in fumigation, or
- when your work can be done close to a supply of clean air.

Clean air is pumped through a hose to the face mask.



Self-contained Breathing Apparatus

Self-Contained Breathing Apparatus—You should wear this kind of respirator under the same conditions as the supplied air respirator. It does about the same thing. The difference is that you carry cylinders of air or oxygen with you, usually on your back. This lets you move more freely and over a wider area than you can with a supplied air respirator.

Selection and Maintenance—Specific types of cartridges and canisters protect against specific chemical gases and vapors. Be sure you choose one made for the pesticides you are using. Use only those approved by the National Institute for Occupational Safety and Health (NIOSH), or the Mining Enforcement and Safety Administration (MESA).

The respirator must fit the face well. Long sideburns, a beard, or glasses may prevent a good seal. Read the manufacturer's instructions on the use and care of any respirator and its parts before you use it.

When applying pesticides, change filters, cartridges, and canisters if you have trouble breathing, or if you smell pesticides. Remove and discard filters, cartridges, and canisters after use. Then wash the face piece with detergent and water, rinse it, and dry it with a clean cloth. Store it in a clean, dry place away from pesticides.

The useful life of a cartridge or canister depends on:

- the amount of absorbent material,
- the concentration of contaminants in the air,
- the breathing rate of the wearer, and
- the temperature and humidity.

If you have trouble breathing while wearing a respiratory device, see your physician to find out whether you have a respiratory problem.

Protecting the Environment

The "environment" is our surroundings and its many forms of life. Every plant or animal is affected by other plants or animals in the environment. Factors like rain, temperature, and wind are part of the environment. We cannot do much about them. But we can control some other things, including the use of pesticides.

Many people consider pesticides a tool for preserving or improving the environment. Others feel that they cause pollution. As a weed is a "plant out of place," a pesticide

sometimes can be a "tool out of place". Correct use prevents pollution by pesticides.

How Pesticides Harm the Environment

Using pesticides in a way other than as directed on the label can:

- injure plants and animals,
- leave illegal residues, and
- damage the environment in many other ways.

Any pesticide can cause harm if not chosen and used with care. Here are some ways damage can occur.

Direct Kill of Non-Target Organisms

Do not let a pesticide contact anything except the target area. Drift from herbicides can kill nearby crops and landscape plants. You may kill bees and other pollinators if you treat a crop while they are working in a field. Or you could kill parasites and predators that help control harmful insects.

Pesticides are sometimes applied over a large area. Targets are such things as mosquitoes, forest insects, and weeds. Many non-target plants and animals within the treated area may be harmed. Plan area projects with great care so you will not do irreparable damage to the environment.



Runoff from a sprayed field can kill fish in a nearby stream or pond. Life in streams can be wiped out by careless tank filling or draining and improper container disposal.

All of these kills can result in lawsuits, fines, and loss of certification.

If more than one pesticide will control your target pest, choose the one that is the least hazardous to the environment and most useful for your situation. Ask your Cooperative Extension agent to help you make this choice

Persistence and Accumulation

Not all pesticides act the same after you apply them. Most are in one of these two groups:

Pesticides that break down quickly remain on the target or in the environment only a short time before being changed into harmless products. Some are highly toxic. Others are fairly harmless.

Pesticides that break down slowly may stay in the environment without change for a long time. Often this is good, because you get long term control. These are called *persistent pesticides*. Most of them:

- are not broken down easily by microorganisms, and
- are only slightly soluble in water.

Some persistent pesticides can injure sensitive crops planted on the same soil the next year. But they seem to be of little hazard to the environment beyond the treated soil. Other persistent pesticides can build up in the bodies of animals, including man. They may build up until they are harmful to the animal itself or to the meat eater that feeds on it. These are called *accumulative pesticides*.

Pesticide Movement in the Environment

Pesticides become problems when they move off target. This may mean:

- drifting out of the target area as mist or dust,
- moving on soil through runoff or erosion,
- leaching through the soil,
- being carried out as residues in crops and livestock, or
- evaporating and moving with air currents.

Soil and Pesticides

Persistent pesticides may limit future planting. You can plant only crops which the pesticide will not kill or contaminate.

Even pesticides directed at plants or animals can move to the soil. They may be washed or brushed off. They may be worked into the soil with dead plant parts.

Air and Pesticides

Pesticides in the air cannot be controlled. The pesticides can settle into water, crops, trees, houses, or barnyards. The wind can carry them hundreds of miles. Even gentle breezes can carry them away from the target.

Water and Pesticides

Water is necessary for all life. But it is not safe to drink or bathe in polluted water.

Most fish and other aquatic life can survive only slight changes in their environment. Even tiny amounts of many pesticides can harm them or destroy the food they live on. They may die at once, or there may be chronic effects. The behavior of an animal can be changed so that predators can more easily catch and kill it. Pesticide-contaminated eggs may not hatch.

Pesticides in water also may harm other wildlife. Polluted irrigation water can harm crops, soil, and livestock. It can cause illegal residues in crops, milk, and meat.

Pesticides contaminate water in many ways. They are applied directly to water when controlling some pests. Your State may require a permit for this. It can be done safely if you:

- choose the pesticides carefully,
- make sure they are registered for the use intended, and
- apply them when and as directed.

But water can be polluted if you use the wrong pesticide or apply it carelessly.

Pesticides also can reach water directly as a result of:

- drift,
- spills,
- application to waterways (ditches and streams), and
- incorrect disposal methods.

Pesticides also may reach water indirectly. This happens because of erosion, runoff, and leaching. In fact, most pesticide movement through air or soil ends up in water.

Benefits of Careful Use

Pesticides help the environment when they are used correctly. Most importantly, they can help produce better quality and higher yields of food, fiber, and timber by reducing damage from pests.

Weigh carefully the advantages and disadvantages of each pesticide use. Choose the pesticide that will do the least damage while giving good control. Finally, plan each part of the job carefully from beginning to end.

Be a responsible pesticide applicator.

Safe Use Precautions

Most parts of your job may involve some risk of pesticide injury:

- hauling pesticides,
- storage,
- mixing,
- calibrating equipment before use,
- loading,
- applying,
- repairing equipment,
- working in pesticide-treated crops and buildings,
- cleaning application equipment after use,
- disposing of surplus pesticides and empty containers,
- cleaning up spills, and
- cleaning protective clothing and equipment.

Some of these things are done indoors. Many are done outdoors. Each one requires some safety measures to prevent harm to people, animals, and plants as well as to soil and water outside the target area.

You can prevent harm from pesticides if you follow safety precautions and use common sense. Here are the *minimum* safety steps you should take.

Before You Buy a Pesticide

The first and most important step in choosing a pesticide is to know what pest you need to control. Then find out which pesticides will control it. You may have a choice of several. You may need help to guide you. Common sources of information are your Cooperative Extension Service, most agricultural schools, the U.S. Department of Agriculture, and pesticide manufacturers and dealers.

At the Time of Purchase

Read the label of the pesticide you intend to buy to find out:

- restrictions on use,

- if this is the correct chemical for your problem,
- if the product can be used safely under your conditions,
- environmental precautions needed,
- if the formulation and amount of active ingredient are right for your job,
- if you have the right equipment to apply the pesticide,
- if you have the right protective clothing and equipment, and
- how much pesticide you need.

Before You Apply the Pesticide

Read the label again to find out:



- the protective equipment needed to handle the pesticide,
- the specific warnings and first aid measures,
- what it can be mixed with,
- how to mix it,
- how much to use,
- safety measures,
- when to apply to control the pest and to meet residue tolerances,
- how to apply,
- the rate of application, and
- special instructions.

Transportation of Pesticides

You are responsible for the safe transport of your pesticide.

- The safest way to carry pesticides is in the back of a truck. Fasten down all containers to prevent breakage and spillage.
- Keep pesticides away from food, feed, and passengers.
- Pesticides should be in a correctly labeled package.
- Keep paper and cardboard packages dry.

- If any pesticide is spilled in or from the vehicle, clean it up right away. Use correct cleanup procedures.
- Do not leave unlocked pesticides unattended. You are responsible if accidents occur.

Pesticide Storage

The label will tell you how to store the product.

As soon as pesticides arrive, correctly store them in a locked and posted place. Children and other untrained persons should not be able to get to them.

The storage place should keep the pesticides dry, cool, and out of direct sunlight. It should have enough insulation to keep the chemicals from freezing or overheating.

The storage place should have:

- fire-resistant construction, including a cement floor,
- an exhaust fan for ventilation,
- good lighting, and
- a lock on the door.

Keep the door locked when the building is not in use.

The storage building should be away from where people and animals live. This will avoid or minimize harm to them in case of fire.

Store all pesticides in the original containers

Do not store them near food, feed, seed, or animals

Check every container often for leaks or breaks. If one is damaged, transfer the contents to a container that has held *exactly* the same pesticide. Clean up any spills correctly

Keep an up-to-date inventory of the pesticides you have



Mixing and Loading Pesticides

Keep livestock, pets, and people out of the mixing and loading area

Do not work alone, especially at night

Work outdoors. Choose a place with good light and ventilation. Do not mix or load pesticides indoors or at night unless there is good lighting and ventilation.

Before handling a pesticide container, put on the correct protective clothing and equipment.

Each time you use a pesticide, read the directions for mixing. Do this before you open the container.

This is essential. Directions, including amounts and methods, are often changed.

Do not tear paper containers to open them. Use a sharp knife. Clean the knife afterwards, and do not use it for other purposes.

When taking a pesticide out of the container, keep the container and pesticide below eye level. This will avoid a splash or spill on your goggles or protective clothing. Do the same thing when pouring or dumping any pesticide.

If you splash or spill a pesticide while mixing or loading

- Stop right away.
- Remove contaminated clothing.
- Wash thoroughly with detergent and water. *Speed is essential.*
- Clean up the spill.

When mixing pesticides, measure carefully. Use only the amount called for on the label. Mix only the amount you plan to use.

When loading pesticides, stand so the wind blows across your body from the right or left to avoid contaminating yourself

To prevent spills, replace all pour caps and close containers after use

Pesticide Application

Wear the correct protective clothing and equipment

To prevent spillage of chemicals, check all application equipment for:

- leaking hoses, pumps, or connections, and
- plugged, worn, or dripping nozzles.

Use water to correctly calibrate spray equipment before use. Before starting a field application, clear all livestock and people from the area to be treated

Drift is the movement of spray droplets or dust particles away from the target area. Drift increases

- as droplet or particle size decreases, and
- as wind speed increases. It can be minimized if you
- spray at low pressure
- use the largest practical nozzle openings, and

- spray during the calmer parts of the day.

Vaporization is the evaporation of an active ingredient during or after application. Pesticide vapors can cause injury far from the site of application. High temperatures increase vaporization. You can reduce vaporization by:

- choosing nonvolatile chemical formulations, and
- spraying in the cooler parts of the day.

Cleaning Equipment

Mixing, loading, and application equipment must be cleaned as soon as you finish using it. Clean both the inside and outside, including nozzles. Only trained persons should do this job. They should wear correct protective clothing.

Sometimes you may need to steam clean equipment or use special cleaning agents. In other cases, hot water and detergent may be enough.

Have a special area for cleaning. It is best for the area to have a wash rack or concrete apron with a good sump. This will catch all contaminated wash water and pesticides. Dispose of sump wastes by burning or burial as you would excess pesticides. Keep drainage out of water supplies and streams.

Equipment sometimes must be repaired before it is completely cleaned. Warn the person doing the repairs of the possible hazards.

Disposal

Excess Pesticides

EPA recommends ways to dispose of excess pesticides. Consult local authorities for procedures in your area. If you have excess organic pesticides:

- Use them up as directed on the label.
- Burn them in a specially designed pesticide incinerator.
- If you do not have access to proper facilities for burning, bury the pesticides in a specially designated landfill.
- If you cannot either burn or bury them right away, store the pesticides until you can.

These recommendations also tell you how to dispose of excess diluted liquid pesticides. Add these and rinse liquids to spray mixtures in the field when you can. If you cannot use excess diluted pesticides, follow the disposal instructions for excess pesticides

Containers

To prepare containers for disposal:

1. Empty the container into the tank. Let it drain an extra 30 seconds.
2. Fill it one-fifth to one-fourth full of water.
3. Replace the closure and rotate the container. Upend the container so the rinse reaches all the side surfaces.
4. Drain the rinse water from the container into the tank. Let the container drain for 30 seconds after emptying.
5. Repeat steps 2 through 4 at least two more times for a total of three rinses.

Remember to empty each rinse solution into the tank.

The EPA recommendations divide containers into three groups. They tell you how to dispose of each kind.

Group I Containers—These are containers which will burn, and:

- held organic or metallo-organic pesticides, but not organic mercury, lead, cadmium, or arsenic compounds.

Here are ways to dispose of them:

- You may burn them in a special pesticide incinerator.
- You may bury them in a specially designated landfill.
- You may burn small numbers of them as directed by State and local regulations.
- You may bury them singly in open fields. Bury them at least 18 inches below the surface. Be careful not to pollute surface or subsurface water.

Group II Containers—These are containers which will *not* burn, and:

- held organic or metallo-organic pesticides, but not organic mercury, lead, cadmium, or arsenic compounds.

Here are ways to dispose of them:

- Rinse the containers three times.
- Many large containers in good shape can be reused by your supplier. Return them to the pesticide manufacturer or formulator, or drum reconditioner.
- You can send or take them to a place that will recycle them as scrap metal or dispose of them for you.
- All rinsed containers may be crushed and buried in a sanitary landfill. Follow State and local standards.

- You may bury them in the field.

If the containers have not been rinsed:

- Bury them in a specially designated landfill.

Group III Containers—These include any containers which held organic mercury, lead, cadmium, or arsenic, or inorganic pesticides. Here are ways to dispose of them:

- Rinse them three times and bury them in a sanitary landfill.
- If they are not rinsed, bury them in a specially designated landfill.

Cleanup of Pesticide Spills

Minor Spills

Keep people away from spilled chemicals. Rope off the area and flag it to warn people. Do not leave unless someone is there to warn of the danger.



If the pesticide was spilled on anyone, give the correct first aid. Confine the spill. If it starts to spread, dike it up with sand or soil.

Use an absorbent material to soak up the spill. You can use soil, sawdust, or a special product made to do this. Shovel all contaminated material into a leakproof container for disposal. Dispose of it as you would excess pesticides. Do not hose down the area. This spreads the chemical.

Put something on the spill to stop the chemical action. You may be able to use common household bleach or a solution of lye or ammonia. If you are not sure what to use, call the chemical manufacturer. Always work carefully. Do not hurry.

Do not let anyone enter the area until the spill is all cleaned up.

Major Spills

The cleanup job may be too big for you to handle. You may not be sure of what to do. In either case, keep people away, give first aid, and confine the spill. Then call the manufacturer for help.

The National Agricultural Chemicals Association has a Pesticide Safety Team Network. They can tell you what to do. Or they can send a safety team to clean up the spill. You can call them toll-free any time at (800) 424-9300.

If a major pesticide spill occurs on a highway, have someone call the highway patrol or the sheriff for help. (Carry these phone numbers with you.) Do not leave until responsible help arrives.

Report all major spills by phone to your State pesticide regulatory agency. You also may need to notify other authorities:

If the spill is on a State highway, call:

- the highway patrol, or
- the State highway department.

If the spill is on a county road or a city street, call:

- the county sheriff, or
- city police.

If food is contaminated, notify:

- State or Federal food and drug authorities, or
- city, county, or State health officials.

If water is contaminated, notify:

- State health officials,
- regional, State, or Federal water quality or water pollution authorities, and
- the State fish and game agency.

Safe-Entry Times

It may be dangerous for an unprotected person to enter an area immediately after some pesticides have been used. The time that must pass before the area is safe for a person without protective clothing is called a safe-entry time, or reentry period. This time is given on the label of each pesticide that may cause a reentry problem. It varies according to the pesticide applied and the crop or area treated. These times have been set to allow harmful pesticide residues to break down or disappear. Reentry may pose special problems in some areas. Check with local authorities for any special rules that may apply.