1 of 1

Master Plan

Executive Summary

Guntersville Reservoir Aquatic Plant Management

prepared by

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Chicago, Illinois

and

Lose & Associates, Inc.
Nashville, Tennessee

under contract to

US Army Engineer District, Nashville
Nashville, Tennessee

Sponsored by
**Tennessee Valley Authority and
US Army Corps of Engineers**

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MASTER

Preface

The Joint Agency Gunter'sville Project (JAGP) is sponsored by the Tennessee Valley Authority (TVA) and the Headquarters, US Army Corps of Engineers (HQUSACE). The work reported herein was conducted by the US Army Engineer District, Nashville (ORN), with input from TVA and the US Army Engineer Waterways Experiment Station (WES).

The TVA Vector and Aquatic Plant Management Program, under the direction of Dr. Joseph C. Cooney, is serving as lead program for managing the JAGP, with support from other organizations in River Basin Operations (RBO). Project funding is supported by Congressional appropriations to the TVA. The work is conducted under the management of Dr. Billy J. Bond, Vice President of RBO; Dr. Ralph H. Brooks, Manager of Water Resources; and Dr. Herbert C. Jones, Manager of the Aquatic Biology Department.

The WES work under the JAGP is conducted as part of the Corps of Engineers' Aquatic Plant Control Research Program (APCRP). The APCRP is sponsored by the HQUSACE and is assigned to the WES under the purview of the Environmental Laboratory (EL). Funding was provided under Department of the Army Appropriation 96X3122, Construction General. The APCRP is managed under the Environmental Resources Research and Assistance Programs (ERRAP), Mr. J. Lewis Decell, Manager. Mr. Robert C. Gunkel, Jr., is Assistant Manager, ERRAP, for the APCRP. Technical Monitor is Ms. Denise White, HQUSACE. At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander and Deputy Director was COL. Leonard G. Hassell, EN.

Nashville District's involvement in the JAGP includes participation in overall plan development and serving on the project management team. As part of the comprehensive project, TVA transferred funding to the Nashville District for preparation of this Master Plan and NEPA document for aquatic plant management on Gunter'sville Reservoir. This work was administered by the Environmental Resources Branch, Engineering Division, under the direction of Mr. H. Joe Cathey and Mr. C. Tom Swor. Commander of the Nashville District is LTC Stephen M. Sheppard.

Professional services for the actual preparation of this Master Plan were provided by HARZA Engineering Company, 233 South Wacker Drive, Chicago, Illinois 60606; under contract to the Nashville District. The project manager for HARZA was Mr. David B. Pott and Mr. Joe Morrison acted as project manager for the Nashville District. Assisting in preparing the report were Ms. S. E. Boltz, Mr. J. D. Siebert, Ms. D. H. Ansel, and Ms. J. R. Apolinario. Recreational and socioeconomic resources (Chapters 4 and 5) were subcontracted to Lose and Associates, Inc., 40 Rutledge Street, Nashville, Tennessee 37210, and led by Mr. T. Chandler.

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Glossary of Commonly Used Technical Terms

Aesthetics	The nature of beauty and visual appeal
Biocontrol, biological control	Control of aquatic plants using living organisms, such as grass carp, insects or pathogens
Chelates	Herbicide molecules that bind with a metal ion, typically copper, to form a chelate ring
Demographics	Statistics of human populations
Emergents	Rooted aquatic plants that emerge above the surface of the water
Eutrophic lake	A lake or reservoir typically having high sedimentation rates, high organic productivity, and high nutrient levels
Exotic species	Non-native or introduced species
Filamentous algae	Colonial algae whose growth form is that of a filament, sometimes forming hairlike mats on the surface of the reservoir
Geographic Information System (GIS)	An intelligent computerized map; an information management system involving the linkage of graphic or spatial data with tabular or attribute information

Hibernaculum	Any natural covering or structure for protecting an organism during winter
Hydrosoil	Reservoir bottom or shoreline sediment
Lacustrine	Of, relating to, or growing in lakes
Littoral zone	Shallow shoreline areas within the reservoir which support submersed plants
Macroinvertebrates	Animals without backbones large enough to be seen with the naked eye, such as worms, insects, and mollusks
Macrophyte	A vascular plant (non-algal) visible without magnification
Master Plan	A document guiding the comprehensive use and management of natural resources
Mainstem	A reservoir or other feature directly on the Tennessee River, not a tributary
Monospecific colonies	Pure stands of aquatic plants largely composed of a single species
Multipurpose	Having more than one use or function
Overbank	The mid-channel inundated islands and shallows in the reservoir representing preimpoundment floodway areas
Pelagic	Related to the open water portion of the reservoir
Photosynthesis	Process by which green plants convert light energy, water, and carbon dioxide into carbohydrates while releasing oxygen
Priority Treatment Area	A shoreline reach that TVA gives priority for controlling excessive aquatic plants which conflict with some reservoir use

Propagules	Plant fragments capable of regenerating a whole plant
Reservoir use suitability	An area on the reservoir having one or more traits making it amenable or suitable for certain activities or uses
Rhizomes	A buried plant stem having stored reserves of food and capable of producing roots below and shoots or leaves above
Riparian	Relating to the bank of the reservoir
Rookery	A colony of nesting birds
Submersed aquatic vegetation	Plants that grow in the water, and generally do not extend above the water surface and are rooted in the sediment
Thematic	A area of intensive study having similar characteristics, constituting a theme
Triploid	Having three pairs of chromosomes rather than two, making the organism genetically sterile and unable to reproduce
Turbidity	Murkiness or cloudiness of water
Vector	An organism that transmits a disease

List of Acronyms

ADEM	Alabama Department of Environmental Management
ALDCNR	Alabama Department of Conservation and Natural Resources
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
JAGP	Joint Agency Guntersville Project
NEPA	National Environmental Policy Act
SCORP	State Comprehensive Outdoor Recreation Plan
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USFWS	United States Fish and Wildlife Service
YMCA	Young Men's Christian Association

Executive Summary

1.0 Introduction

1.1 Project Authorization and Purpose

In 1989, Congress provided funding to start a five-year comprehensive project to manage aquatic plants in Guntersville Reservoir, to be jointly implemented by the U.S. Army Corps of Engineers (Corps) and Tennessee Valley Authority (TVA). TVA serves as the overall project coordinator and is the lead agency for this project. Known as the Joint Agency Guntersville Project (JAGP), the project will test and demonstrate innovative management technologies, and incorporate the most effective technologies into a comprehensive aquatic plant management plan for Guntersville Reservoir. The JAGP is intended to serve as a National Demonstration Project for aquatic plant management. As part of this JAGP, the Master Plan for Aquatic Plant Management for the Guntersville Reservoir Project, Alabama-Tennessee is authorized by Corps Contract Number DACW62-90-C-0067.

1.2 Scope of the Master Plan

A master plan, as defined by the Corps, is a document guiding the use and development of the natural and manmade resources of a given project or group of projects. The Master Plan is the basic document guiding the responsible agency in preserving, conserving, restoring, maintaining, managing, and developing the project lands, waters, and associated resources. As a continuing and dynamic document, the Master Plan anticipates what could and should happen and is flexible to changing conditions.

This Master Plan for Aquatic Plant Management for the Guntersville Reservoir Project, Alabama-Tennessee, describes the existing operation, management and public use of project facilities, lands, waters and biological resources. The effort to develop the Master Plan includes a database of the project resources. The database is spatially linked to allow graphic display of geographically-based data. The TVA will continue to maintain and update this geographic information system (GIS). It is anticipated that the GIS will provide not only the focus of

analysis for this Master Plan, but, as that database grows over time and with more distinct information, will be the source of updated Master Plans.

The 18 reservoir management units defined in the TVA's aquatic plant seasonal workplans have been the basis for a reservoir use suitability map. Aquatic macrophyte management recommendations have been prepared for each reservoir use on this map. These recommendations complement the reservoir use suitability map to become an integral part of the Master Plan.

1.3 Master Plan Objectives

The primary objective of the Master Plan for Aquatic Plant Management is to describe long range aquatic plant management strategies for the 18 management units within Guntersville Reservoir, thereby minimizing conflicts between the aquatic plants and reservoir users. The plan will attempt to balance the many competing demands placed on the reservoir. An additional objective is to have the plan reflect the needs and desires of the communities surrounding the reservoir.

1.4 Agency Coordination and Public Participation

The Master Plan for Aquatic Plant Management at Guntersville Reservoir is being developed by an independent consulting firm, Harza Engineering Company. The Nashville District Corps has been given responsibility for contracting and managing the consultant and for coordinating the development of the Master Plan with the TVA. The Corps is also responsible for coordinating the revision of the draft Master Plan and the implementation of the National Environmental Policy Act (NEPA) of 1969. The TVA is providing technical input and review at all stages of the master planning and NEPA processes. The TVA will also facilitate the exchange of information between the JAGP research projects and the consultant.

As part of the master planning process, coordination with local, state and federal natural resource agencies is important, so that current information is shared and the concerns of various organizations are recognized. In the initial stage of the Project, this coordination was accomplished through two meetings. As part of the JAGP, a Technical Advisory Panel was selected and convened for a meeting in Huntsville, AL, to discuss appropriate plant distributions for various thematic resource areas. ~~Experts in natural resource management were selected from academia, natural resource agencies, and the private sector and were asked to evaluate the effect of aquatic plants on their respective areas of expertise. After this initial step, all thematic area representatives were~~

asked to combine the five plant distribution maps into one map that adequately addressed all five areas. This activity required compromise among thematic areas, as priorities were re-evaluated and a consensus finally reached.

The second meeting held in association with two public workshops in January, 1991, was designed to familiarize interested federal, state, and local natural resource agencies with the master planning process and goals. This meeting was conducted by the consultant with the assistance of the Corps and the TVA.

Public input has been used in the preparation of this Master Plan. Appendix G to this Master Plan provides details on public involvement. Prior to the planning effort, two public workshops were held, one on January 14, 1991 at Guntersville High School and the second on January 15, 1991 at Scottsboro High School. The Guntersville workshop was attended by 103 people and the Scottsboro workshop by 56 people. The participants in these workshop were asked to register and were subsequently assigned to small groups. The attenders of the public workshops heard a short dissertation on the purpose of public participation in the master planning process for Guntersville Reservoir, whereupon the audience then broke into small groups for more detailed discussions. In addition to the oral comments received at the public workshops, written comments were solicited.

The draft Master Plan document was distributed to public libraries, elected officials and resource agencies in April, 1992. All individuals on the project's mailing list (developed through the above two workshops) were mailed either an Executive Summary of the project or a letter announcing the draft's availability, and, requested to comment upon it in written or oral form. Notices were also sent to media representatives announcing the availability of the draft Master Plan and inviting oral and written comments from the public. Two public meetings were held to receive oral comments on the draft Master Plan, in Guntersville and Scottsboro. The public comment period was originally set for April 30 to June 1, 1992 but was later extended to June 15 at the request of the general public.

2.0 Description of Guntersville Reservoir Study Area

2.1 General Features

The Tennessee River system provides a 650-mile-long navigation channel from Paducah, Kentucky to Knoxville, Tennessee. Guntersville Reservoir is the second largest of the mainstem Tennessee River reservoirs operated by the TVA. The multipurpose project was designed to provide navigation, flood control, power production, recreation, and other benefits to the region.

Guntersville Dam is located at Tennessee River mile (TRM) 349.0, about 8 miles northwest of Guntersville, Alabama. The dam impounds a 75.7-mile-long reservoir in Jackson and Marshall Counties, Alabama, and Marion County, Tennessee.

Guntersville Reservoir provides for flood control, navigation, and electric power generation. These three Congressionally authorized purposes provided the primary justification for construction of the reservoir and are the basis for routine operation. Secondary benefits of the Guntersville Project include public recreation, water supply, and fish and wildlife habitat.

2.2 Project Operation

The gates at Guntersville Dam allow raising of the pool to El. 595.4, giving 172,300 ac-ft of controlled storage for flood control and a total storage volume of 1,049,000 acre-feet. Normal reservoir operations keep the reservoir between El. 593 and El. 595 feet msl throughout the year. Drawdowns and water level fluctuations are used for flood control, aquatic plant management, and vector (mosquito) control.

A nine-foot navigation channel is maintained throughout the length of the reservoir as directed by Congress. Two navigation locks exist at the dam. The original lock on the right (north) end of spillway is 60 feet by 360 feet. A larger lock (110 ft by 600 ft) was added in 1965 on the right bank. About 5 million tons of commercial barge traffic uses this facility each year.

As mentioned, the reservoir is drawn down up to two feet each winter, primarily for flood control. Rather than spilling water during heavy rains, as much water as possible is released from the reservoir through the powerhouse to generate electricity and minimize power loss. Guntersville Reservoir may also be drawn down up to three feet in June or July for control of submersed aquatic vegetation when special

operations are coordinated at the upstream Nickajack Project. Drawdowns greater than three feet are not practical at Guntersville because of the shallow nature of portions of the upper impoundment and the need to maintain a minimum navigation pool. Drawdowns are also limited by potential impacts to municipal and industrial water supply intakes. This drawdown limitation historically has been a factor preventing achievement of the desired level of aquatic plant control; therefore, additional vegetation control measures have been used. Mosquito control is another benefit of drawdowns. Reservoir drawdowns and weekly water level fluctuations decrease mosquito larvae habitat and disrupt their life cycle.

2.3 Natural Resources

The varied topography of the area makes Guntersville a scenic attraction. Steep rocky cliffs, rolling pasture lands, and extensive forested tracts are the principal land cover types. The upper end of the reservoir has numerous large, shallow embayments and has extensive wetland areas. The lower end of the reservoir is more limnetic, with steep shorelines and large areas of open water. Historically, aquatic vegetation has been common throughout the reservoir, especially in shallows along shorelines, overbanks, and inundated islands, such as Pine Island.

The natural resources of Guntersville Reservoir make it one of the most popular areas in the region. Guntersville is well known for its fish and wildlife resources, especially the largemouth bass fishery, which bring it national recognition. Guntersville Reservoir supports the largest great blue heron colony in the Tennessee Valley. In addition, reservoir duck populations have been steadily increasing and the largest gadwall harvests for Alabama were recorded in Jackson County. Guntersville Reservoir supports several threatened or endangered species. Bald eagles are known to overwinter at the reservoir, and the Alabama Department of Conservation and Natural Resources and the TVA are attempting to establish a nesting population. At least three pairs of bald eagles attempted to nest in the Guntersville Reservoir area in 1991; at least one of these attempts was successful. The gray bat and the Indiana bat also occur at Guntersville Reservoir. Gray bats are resident year-round at the reservoir, migrating seasonally between brood caves, bachelor caves, and winter caves.

Prime largemouth bass fishing on Guntersville Reservoir typically occurs during early spring through midsummer, when submersed aquatic vegetation (primarily Eurasian watermilfoil) is subsurface, just prior to "top out." Late in the growing season when aquatic plants form dense surface mats, many shallow areas and embayments of the reservoir are covered and access for anglers, particularly bank fishermen, can be severely restricted.

Mussel populations in Guntersville Reservoir, although not studied intensively, appear to be less abundant than in most other Tennessee River reservoirs. Little or no survey work has been conducted in the downstream quarter of the reservoir or in embayments. Results from several surveys scattered over the remainder of the reservoir indicate that, of approximately 30 species occurring there, only seven species are found commonly. The two most abundant species, the heel-splitter and the washboard, account for between 40 and 80 percent of the live specimens examined. These species occur in both mid-channel and shallow water habitats.

Guntersville Reservoir supports a diverse wetland wildlife habitat with a corresponding diversity of waterfowl. The extensive beds of submersed aquatic plants adjacent to bottomland hardwoods, upland crop fields, and managed dewatering areas provide foraging and resting habitat for migratory, wintering, and resident-breeding waterfowl and wetlands wildlife. The TVA and the Alabama Department of Conservation and Natural Resources, Game and Fish Division, recognized the potential for developing habitat for migrating and wintering waterfowl on Guntersville Reservoir and from 1949 through 1959 developed more than 25,000 acres of land and water area for waterfowl management. Submersed aquatic plants (primarily Eurasian watermilfoil) began colonizing the reservoir in the early 1960s and expanded to a peak of about 19,300 surface acres in 1988. Waterfowl habitat management efforts and the colonization of Guntersville Reservoir with submersed aquatic plants have provided feeding and resting habitat for a substantial number of waterfowl and other wetland wildlife species. Although there is little doubt that a direct relationship exists between the amount of vegetated aquatic habitat and numbers of waterfowl that use these habitats, studies to estimate or quantify the role of aquatic vegetation in waterfowl habitat in the Southeast are limited.

Past inventories have identified more than 20 species of migratory waterfowl on Guntersville Reservoir during the fall and overwintering period. Common migratory waterfowl species using Guntersville Reservoir include gadwall, mallard, American wigeon, northern shoveler, American black duck, canvasback, wood duck, merganser, lesser scaup, and ring-necked duck. Less common species are northern pintail, blue-winged teal, green-winged teal, and bufflehead. The American coot and pied-billed grebe are two other frequently observed water birds. The American coot is the most numerous species during the migratory and overwintering period.

Gadwall, American wigeon, northern shoveler, American coot, and several other species use Eurasian watermilfoil and hydrilla beds, which generally colonize the deeper portions of the overbank areas, as feeding

and resting habitats. Such species as mallard, American black duck, teal, and northern pintail generally use the upstream portions of shallow embayments, where they feed on seeds and vegetative portions of aquatic plants such as pondweeds and naiads that colonize shallow areas. In addition, seeds of some shoreline emergent plants, such as sedges and smartweed, and the mast from riparian and bottomland hardwoods are also used as food by dabbling ducks, especially in the upper reaches of larger creek embayments.

Wood duck is the only waterfowl species that reproduces in substantial numbers on Guntersville Reservoir. Wood ducks nest in tree cavities and artificial nesting boxes, generally in riparian and bottomland forested wetlands. Important microhabitats used by juvenile wood ducks include wooded shoreline, fallen trees, and aquatic vegetation. Submersed aquatic vegetation is important to adult and juvenile wood ducks, both as a direct source of food and as a substrate for aquatic invertebrates, the latter being a critical dietary need for nesting hens and juveniles.

In association with its many aquatic and terrestrial habitats, Guntersville also supports substantial numbers and diversity of other wetlands wildlife. The most commonly observed wading birds are great blue and green-backed herons, both of which nest in areas of suitable habitat along the reservoir shoreline. In 1991, 1,455 great blue heron active nests were counted in nine nesting colonies located on or adjacent to Guntersville Reservoir. The Bellefonte colony, located adjacent to the mouth of Town Creek, is the largest known colony in the Tennessee Valley, with 1,018 active nests counted in 1991. In addition, there were 16 active great egret nests documented within this colony in 1991, marking the continued reestablishment of this species on Guntersville Reservoir.

Several semiaquatic mammals occur in Guntersville Reservoir shoreline wetlands, adjacent bottomland habitat, and submersed aquatic vegetation in shallow water. The species most commonly observed are muskrat, beaver, and raccoon. These species eat aquatic vegetation or forage in it and other wetland habitats for macroinvertebrates and fish.

The presence of aquatic plants generally has a positive effect on the waterfowl and wetlands wildlife utilization of Guntersville Reservoir and in turn the use of the reservoir by waterfowl hunters and other outdoor enthusiasts. However, many of the plants that are used as food and/or cover by waterfowl and wetlands wildlife can create problems for other recreational users such as boaters, swimmers, water skiers, and bank fisherman. In public workshops held in January, 1991 when local residents were asked to prioritize their perception of the benefits and/or problems created by the aquatic plants, they indicated fish and wildlife

habitat to be more important than any problem that the plants may cause recreationists (see Appendix G). Other user groups not in attendance at these workshops were not queried.

2.4 Aquatic Vegetation

Figure 1 Aquatic Plants in Guntersville Reservoir in Recent Years

Guntersville Reservoir has the greatest total coverage of aquatic plants (about 8,000 acres in 1990) of any reservoir in the TVA system. Nearly two-thirds of Guntersville Reservoir, or about 44,000 acres, is less than 18 feet deep and is potential habitat for aquatic plants. In addition to Eurasian watermilfoil, spinyleaf naiad, and hydrilla, common submersed species include southern naiad, narrow-leaved pondweed, American pondweed, coontail, and muskgrass (Figure 1). Less common submersed plants are horned pondweed, curlyleaf pondweed, Brazilian elodea, and Canadian elodea. Eurasian watermilfoil and hydrilla generally colonize the deeper portions of the overbank habitat, while the other species are primarily confined to the zone of water level fluctuation or to the upstream ends of shallow embayments. Common submersed species in the fluctuation zone include naiads, narrow-leaved pondweeds, muskgrass, and Eurasian watermilfoil.

Eurasian watermilfoil and hydrilla often occur in near monospecific or "pure" colonies because rapid growth and physiological adaptations

allow them to exclude or outcompete other species and thus colonize entire shallow embayments or submerged islands.

Hydrilla may grow at depths of up to about 18 feet, while Eurasian watermilfoil is primarily confined to depths of about 12 feet or less. By midsummer they form dense surface mats that provide substrate and support for various species of filamentous algae. In 1990 about 5,600 acres of Guntersville Reservoir was covered by pure or mixed colonies of Eurasian watermilfoil, and about 300 acres by colonies of hydrilla.

Algae are small, primitive plants not having true leaves or flowers. Aquatic algae are found on the bottom, floating or attached to underwater surfaces in Guntersville Reservoir. Algae can multiply rapidly, particularly during hot weather, and clog water intakes or cause taste or odor problems for potable water. Common algae in Guntersville Reservoir include *Chara* or muskgrass and the filamentous blue-green alga *Lyngbya* spp. In 1990, about 142 acres of mixed *Chara* and *Lyngbya* occurred on the reservoir.

Numerous emergent species occur along the shoreline of Guntersville Reservoir and grow to depths of 1 to 2 feet below summer pool levels. Common emergents include giant cutgrass, waterwillow weed, lizard's tail, Uruguayan waterprimrose, alligatorweed, and several species of grasses, rushes, and sedges. American lotus, a plant in the water lily family that has large round leaves and yellow flowers, covered about 160 acres of shallow water in several embayments on Guntersville Reservoir in 1990.

2.5 Socioeconomic Resources

Guntersville Reservoir visitors originate from a wide range of locations. For planning purposes, a nine-county area which approximates a fifty mile radius from the city of Guntersville will be considered as the primary area of influence. All locations in this area are within an hour's drive of the reservoir; thus the majority of day-use recreation probably originates within this nine-county area. The nine counties included are Marshall, Jackson, Madison, Morgan, Cullman, Blount, Etowah, and De Kalb in Alabama, and Marion County, Tennessee. Many visitors, particularly fishermen, travel much farther to use the reservoir. Based on interviews and observations, the Guntersville area of influence was found to include the metropolitan areas of Birmingham, Montgomery, Atlanta, Chattanooga, Nashville, and Memphis, as well as southern Indiana and Ohio.

The Guntersville Reservoir nine-county primary area of influence is for the most part rural in character. However, Madison County, which contains the city of Huntsville, is comparatively more urban. Slow to

moderate growth (3.1% through 2000) is projected for all counties except for Blount County, which should maintain its current population level. Madison is the most populous county and is projected to increase by the greatest percentage.

Employment in the nine-county area increased from 291,915 in 1978 to 327,222 in 1990, and is projected to increase to 359,109 by 2000. Agriculture and related industries have decreased with respect to the number of people employed, but farm income has increased. Manufacturing and service industries are making the greatest gains.

2.6 Recreation Resources

Guntersville Reservoir offers many opportunities for public recreation. One prime recreation interest is, and will continue to be, the exceptional quality of the reservoir's sport fishing; but besides boat and bank fishing, Guntersville Reservoir also offers a wide variety of other water-related activities, including pleasure boating, swimming, water skiing, sightseeing and sailing. Through its parks and public lands, the project offers a number of additional recreation opportunities such as hiking, picnicking, camping, nature study, photography, horseback riding, and small game hunting. Guntersville Reservoir continues to be one of the top waterfowl hunting areas in the Tennessee Valley.

The Alabama Mountain Lakes Tourist Association, in its annual economic report of tourist expenditures on north Alabama lakes, indicated that \$694.43 million was spent in 1990, a 1% increase over the 1989 figure. Of the total 1990 expenditures, \$115 million (17%) was spent on recreation-related activities. The recreation component was third behind food (30%) and shopping (27%). Expenditures for lodging and transportation followed at 15% and 11%, respectively. The report also stated that fewer Alabama residents and more out-of-state visitors camped in the area's campgrounds in 1990 than in previous years, which supports the general observation that public use originating beyond the Alabama border is increasing. The JAGP includes studies of recreational use and trends.

2.7 Surrounding Land Use

The three counties that adjoin the reservoir (Marshall and Jackson Counties in AL and Marion County in TN) have a rural character and are fairly typical of the region. The residential settlement patterns can be described as follows: The homes of the more affluent are located directly on the reservoir, new residential subdivisions are being built in the outlying areas, and older, rural farm houses remain dispersed across the landscape. Most commercial establishments are located in strip

developments along major thoroughfares, which are punctuated by gas stations and fast food restaurants. Waterfront industrial development is primarily located on the lower end of the reservoir, with a growing poultry industry employing more and more residents near lower Town Creek. Throughout the three counties, the reservoir is the dominating influence and provides the focus for life in the area.

The lower one-third of the reservoir is the most heavily urbanized shoreline, due to the presence of the town of Guntersville. Municipal parks, boathouses and marinas, potable water intakes, and industrial facilities are common in this area. These features are in contrast to the upper one-third of the reservoir, where relatively little development has occurred to date. The midreservoir is a transition between the contrasting upper and lower thirds, and has large shoreline areas devoted to public recreation or wildlife management.

3.0 Reservoir Use Suitability

3.1 Introduction

Reducing conflicts between aquatic plants and reservoir users is the goal of aquatic plant management. Therefore, determining where the reservoir's various use activities are likely to occur is prerequisite to identifying conflicts and developing plant management strategies. This section outlines the Master Plan's preparation of a reservoir use suitability map, which provides a conceptual guide for delineating areas to be considered for management of aquatic plants in Guntersville Reservoir.

3.2 Classified Water Uses

Alabama's Department of Environmental Management and Tennessee's Department of Health and Environment have identified certain appropriate uses for the waters of Guntersville Reservoir. These uses are the basis for water quality standards and include domestic and industrial water supply, contact recreation, support of fish and other aquatic life, navigation, irrigation, and livestock watering. Aside from the states' classified uses, the reservoir is also used to store flood waters, generate power, and assimilate treated municipal and industrial wastes.

3.3 Shoreline Management

The TVA manages its own shoreline property to promote recreational use, protect water quality, and meet other agency goals. Shoreline lands between the highest elevation inundated by reservoir

waters (elevation 600 ft) and reservoir waters is termed the marginal strip. The TVA's policy for managing the marginal strip permits a wide range of alterations by the adjacent land owners. Most of these landowners possess deeded or implied land rights to cross TVA land and build boat docks and other water use facilities upon written approval of the plans by the TVA.

Some shoreline development activities require approval under Section 26a of the TVA Act. The TVA has responsibility under Section 26a to review and approve construction of structures that could affect navigation flood control or public lands along Guntersville Reservoir. Requests for use and development of reservoir shoreline property are reviewed to determine feasibility of the proposed use with respect to the overall objectives for the reservoir.

3.4 Management Units

In 1982, the TVA established 18 management units as part of its annual aquatic plant control work program. For continuity, these units are recognized for the Master Plan process. Table 1 lists the names of the unit and their major features. The boundaries of the management units are based on operational, physical, and ecological characteristics and are shown on the plates at the end of this report.

The lower reservoir, (Units 1 through 7), is the most heavily used area of the reservoir for recreational power boating, water skiing, and sailing. Certain areas are heavily fished. Also, being more developed than upstream areas, the lower reservoir has the greatest concentration of recreational areas, residential areas, and recreational and industrial navigation facilities.

The midreservoir area, (Units 8 through 13), is a transition between the developed, heavily used lower reservoir and the upper, riverine area. The midreservoir area is heavily fished, by both boat and bank anglers. Large tracts of shoreline adjacent to both the middle and upper reservoirs are used for timber production and wildlife management.

The upper reservoir, (Units 14 through 18), is the least developed area, although two power plants are sited there. Waterfowl hunting occurs primarily in the upper reservoir.

Table 1

GUNTERSVILLE RESERVOIR MANAGEMENT UNITS

<u>Unit</u>	<u>Major Features</u>
<u>Lower Reservoir</u>	
1. Guntersville Dam	Dam, powerhouse, locks, summer camps
2. Honeycomb Creek	Public lands & access areas, subdivisions, water intakes
3. Conner Island	Islands, marinas
4. Browns Creek	Subdivisions, parks, access sites, water intake
5. Guntersville	Heavily developed shoreline, industrial, marinas & access sites, Big Spring Creek
6. Buck Island	Subdivisions, Siebold Creek, camps, marinas
7. Lake Guntersville State Park	State park, public access sites, Town Creek, Short Creek
<u>Midreservoir</u>	
8. Mill Creek-Boshart Creek	Mill and Boshart Creeks, shoreline residential development
9. Murphy Hill	Public lands, limited development
10. South Sauty Creek	Access sites & docks, public lands
11. Goose Pond	Mink Creek, Sauty Creek, Goose Pond Park, docks, North Sauty Waterfowl Refuge

12. Roseberry Creek-Section	Scottsboro, Roseberry & Dry Creeks, parks & access sites, shoreline residential development
13. Bellefonte	Jones Creek, scout camp, residential development, public lands
<u>Upper Reservoir</u>	
14. Mud Creek	Town & Mud Creeks, Bellefonte Nuclear Plant site, wildlife management areas
15. Coon Creek-Wannville	Public lands, wildlife management and habitat protection areas
16. Stevenson	Crow Creek, wildlife management areas and waterfowl refuge, municipal park
17. Widows Creek	Long Island Creek, Widow's Creek, public lands, wildlife management areas
18. South Pittsburgh	Nickajack Dam tailwater, public lands, municipal park

3.5 Existing Land Use

The character of lands adjacent to the reservoir is a dominant variable determining the suitability of the reservoir area for various uses. Land use, or more accurately, land cover, of lands within one-quarter mile of the reservoir shoreline was digitized from aerial photographs (Table 2). Commercial/industrial land cover includes commercial and service areas like shopping centers and office complexes, industrial sites, and transportation and utility facilities. Residential land includes single- and multi-family housing and mobile-home parks. Agricultural lands include row crops and pasture, orchards, and confined livestock operations. Shrub/scrub includes herbaceous, shrub, and brush lands such as old fields. Forested land includes evergreen, deciduous and mixed forests.

Table 2

LAND COVER ADJACENT TO EACH RESERVOIR MANAGEMENT UNIT

Unit	Total Shoreline (miles)	Residential		Commerce/Industrial		Agricultural		Forested		Total (miles)
		(miles)	(%)	(miles)	(%)	(miles)	(%)	(miles)	(%)	
1. Gunterville Dam	17.17	0.37	2	1.02	6	0.08	<1	15.25	89	0.455
2. Honeycomb Creek	22.06	3.47	16	2.00	9	0.83	4	14.26	65	1.50
3. Conner Island	21.82	0.37	2	2.08	10	2.72	12	16.37	75	0.27
4. Browns Creek	40.86	6.28	15	4.59	11	9.19	23	15.68	38	5.093
5. Gunterville	33.80	10.52	31	8.57	25	1.90	6	8.06	24	4.754
6. Buck Island	25.64	6.70	26	2.67	11	1.84	7	12.37	48	2.06
7. Lake Gunterville State Park	46.76	0.00	0	3.15	7	2.32	5	39.71	85	1.58
8. Mill Creek-Boshart Creek	31.59	10.56	33	0.88	3	1.84	6	13.98	44	4.334
9. Murphy Hill	20.99	4.19	20	1.21	6	3.09	15	10.29	49	2.220
10. South Sauty Creek	40.83	4.46	11	0.75	2	5.45	13	24.62	60	5.554
11. Goose Pond	74.90	3.31	4	7.10	10	14.47	19	29.91	40	20.117
12. Roseberry Creek-Section	56.03	11.02	20	4.67	8	3.07	5	30.17	54	7.093
13. Bellefonté	28.63	3.04	11	0.72	2	0.91	3	14.48	51	9.483
14. Mud Creek	103.60	2.16	2	1.79	2	21.82	21	38.42	37	39.418
15. Coon Creek-Wannville	54.34	0.00	0	0.99	2	22.56	41	20.96	39	9.838
16. Stevenson	82.20	0.00	0	3.26	4	41.18	50	15.52	19	22.247
17. Widows Creek	48.50	0.00	0	4.01	8	20.86	43	14.90	31	8.738
18. South Pittsburg	76.58	0.05	<1	3.29	4	44.62	58	19.15	25	9.472
Total	826.30	66.92	8	52.75	6	198.75	24	353.68	43	154.16

Wetlands are areas shown on the National Wetland Inventory maps of the study area, as updated by the interpretation of the aerial photographs. Barren lands are beaches and other sandy areas, quarries and borrow pits, and transition (construction) areas.

Recreation lands are used to accommodate and support the needs and desires of local residents and project visitors for intensive levels of recreational use at Guntersville Reservoir. Recreation lands consist of parks where the natural character of the environment has been substantially altered by development of landscaping, maintained grass turf, camping loops, picnic sites and shelters, play areas and structures, marinas and boat ramps, concession buildings, swim beaches, parking lots and roads. Recreation lands in the study area and the facilities they contain are generally administered by state or local government agencies. Not all public recreation lands are developed for intensive use; these lands are intended to promote enjoyment of natural resources through hiking, primitive camping, birdwatching and other low-density recreation activities.

Where recreation lands abut the reservoir, reservoir use may be significant and, depending upon the activity, may be compromised by aquatic vegetation.

Several wildlife management areas and waterfowl refuges are located on the reservoir. These lands contain valuable wildlife habitat components that will be managed to yield habitat suitable for a designated wildlife species or groups of species. Valuable public uses of these lands include sightseeing, wildlife viewing, nature study, hiking, hunting, fishing and trapping when compatible with the wildlife management objectives for a given unit and with state fish and wildlife regulations.

Significant property in the study area is designated for timber management, including forest management demonstrations, and multiple-use forest management. TVA manages these lands for production of forest products, within economic and environmental guidelines. Wildlife management is a compatible use.

Residential areas are used for human habitation, and commercial areas for services and economic support activities. Homes, schools, shopping and office centers, transportation and other facilities that are intensively used by man are compatible with these land use categories. The intensity of development on residential land, together with the recreation associated with family-living, ~~strongly-affects use of adjacent~~ water area. The occurrence of aquatic plants along a residential shoreline may compromise users' activities and enjoyment.

3.6 Reservoir Use Suitability

The study area database, a digital geographic information system (GIS), contains the information utilized to compute maps showing general areas of the reservoir that are suitable for various uses, and subsequently, for computing aquatic plant management maps. Although most areas of the reservoir are suitable for multiple use, the public indicated during scoping workshops that aquatic plants should only be managed to support the following uses: boat access, swimming, and water supply. Although these directions represent only those who attended the workshops and viewpoints of other groups were not obtained, the data are important and have been used in the GIS process. Also, specific aquatic plant management decisions must be made based upon those activities or resources most sensitive to aquatic plant biomass levels. As development on the reservoir continues, use suitability will evolve and TVA plans to update this Master Plan to accommodate such changes.

Table 3 lists the GIS's land and water features used to compute reservoir use suitability. The process for computing reservoir use suitability assumes that all water in the lower reservoir is used for boating or fishing (fishing within one-eighth mile (650 ft) of the shore, boating beyond that), midreservoir areas are all used for fishing, and the upper reservoir is used for wildlife management. This establishes a "background" use for the reservoir. The background use is then overridden by other use suitabilities for a given distance from a GIS feature based upon its rank. Ranking scales and zone sizes assigned to uses were based upon information received from the public workshops, TVA operational experience, preliminary results of the State of Alabama's Comprehensive Outdoor Recreation Plan, and technical judgement. Higher ranked features are shown in Table 3 as having low values. The computed reservoir use suitability areas are for the purpose of planning aquatic plant management, even though most of the reservoir is suitable for multipurpose use. Acreages for computed reservoir use suitability zones are summarized in Table 4.

This produces a map of zones or polygons representing suitable reservoir uses; water surface areas not within a computed polygon are considered to be the "background" use. The success of this process is dependent upon the zone size, ranking given to a particular use, and assumes that all features affecting reservoir use suitability are in the GIS database.

Boat launches are included in the GIS database. A zone of 150 feet is considered to be used for boating activities. Since boating is the primary activity that occurs at these sites, this zone was given a relatively high ranking so that it would override not only the designated background use, but other uses that may project into the boat launch zone.

Table 3
FEATURES USED TO COMPUTE RESERVOIR
USE SUITABILITY MAP

<u>Reservoir Management Units</u>	<u>Feature</u>	<u>Reservoir Use</u>	<u>Zone</u>	<u>Rank¹</u>
1 to 7	Background	Boating	> 650 ft from shore	12
1 to 7	Background	Fishing	> 650 ft from shore	12
8 to 13	Background	Fishing	All water	12
14 to 18	Background	Wildlife Management	All water	12
1 to 18	Boat launches	Boating	150 ft	4
1 to 18	Residential lands	Multiple Use	Within 150 ft of shore	5
1 to 18	Waterfowl Refuges	Wildlife Management	None	6
1 to 18	Bald eagle areas	Wildlife Management	Within 150 ft of shore	7
1 to 18	Wildlife Management Areas	Wildlife Management	150 ft	8
1 to 18	Public Participation (no control) Areas	Fishing	None	9
1 to 18	Recreation Areas	Multiple Use	Within 650 ft of shore	10
1 to 18	Public Swim Beaches	Swimming	150 ft	3
1 to 18	Industrial Water Intakes	Water Supply	300 ft of intake	2
1 to 18	Municipal Water Intakes	Water Supply	1/2 mi of intake	1
1 to 18	Sewage Outfall	Wastewater Disposal	0	11

1. Lower values indicate higher ranking, that is, number one, zones surrounding municipal water intakes will override all other uses. All background uses have the same ranking as there is no overlap of zones.

Table 4

RESERVOIR USE SUITABILITY

<u>Unit</u>	<u>Total Area (acres)</u>	<u>Water Supply</u> <u>(ac)</u> <u>(%)</u>	<u>Swimming</u> <u>(ac)</u> <u>(%)</u>	<u>Multiple Uses</u> <u>(ac)</u> <u>(%)</u>	<u>Boating</u> <u>(ac)</u> <u>(%)</u>	<u>Fishing</u> <u>(ac)</u> <u>(%)</u>	<u>Wildlife Management</u> <u>(ac)</u> <u>(%)</u>
1. Guntersville Dam	2,058	0 0	0 0	235 11	1,193 58	630 31	0 0
2. Honeycomb Creek	1,423.5	109 8	0.5 <1	363 26	417 29	534 37	0 0
3. Conner Island	2,353	0 0	0 0	109 4	699 30	1,545 66	0 0
4. Browns Creek	7,674	877 11	1.0 <1	606 8	4,603 60	1,589 21	0 0
5. Guntersville	3,137	289 9	0 0	457 15	1,459 46	932 30	0 0
6. Buck Island	3,211.5	0 0	0.5 <1	414 13	1,628 51	1,169 36	0 0
7. Lake Guntersville State Park	4,254.5	151 3	0.5 <1	833 20	1,940 45	923 22	407 10
8. Mill Creek-Boshart Creek	2,706	0 0	0 0	499 18	0 0	2,207 82	0 0
9. Murphy Hill	5,203	0 0	0 0	136 3	0 0	5,067 97	0 0
10. South Safty Creek	5,380	0 0	0 0	382 7	0 0	4,998 93	0 0
11. Goose Pond	6,268	355 6	0 0	500 8	0 0	3,694 59	1,719 27
12. Roseberry Creek-Section	5,950	416 7	0 0	465 8	0 0	5,069 85	0 0
13. Bellefonte	2,567	186 7	0 0	280 11	0 0	2,101 82	0 0
14. Mud Creek	4,208	0 0	0 0	59 1	0 0	0 0	4,149 99
15. Coon Creek-Wannville	2,326	0 0	0 0	35 2	0 0	0 0	2,291 98
16. Stevenson	2,545	0 0	0 0	15 <1	0 0	0 0	2,530 99
17. Widows Creek	1,589	0 0	0 0	18 1	0 0	0 0	1,571 99
18. South Pittsburg	2,313	244 11	0 0	100 4	0 0	0 0	1,969 85
Total	65,166	2,651 4	2.5 <1	5,320 8	11,939 18	30,590 47	14,666 23

Shoreline residential lands greatly influence the use of the reservoir. The GIS assumes this influence is primarily within 150 feet of the shoreline. These shoreline waters are subjected to multiple uses, especially swimming, angling, boating.

Waterfowl refuges are coded for wildlife management. Boundaries of the refuge are used to define the area for this code. Nearshore reservoir areas within 150 feet of a wildlife management area are also coded wildlife management. Likewise, bald eagles are considered in the computation of a use suitability map for the reservoir. The areas thus defined as suitable for wildlife management are given relatively high ranking so that this suitable use overrides many other suitable uses. The justification for this high ranking for wildlife management stems from information received from the general public during scoping workshops held in January, 1991. During these public workshops, the planning team was given a map with areas designated to be excluded from aquatic plant management efforts and requested to include these data in the analyses. This information was transferred into the GIS and the feature is entitled Public Participation and coded as suitable for fishing.

Reservoir areas off public recreation areas are considered suitable for multiple use for a distance of 650 feet. A moderate ranking has been assigned to zones around these features so that it may be overridden by public participation areas and wildlife management areas. Exceptions to this are boat launches (discussed above) and public swimming beaches. The GIS assumes that the reservoir is suitable for swimming for a distance of 150 feet from this feature.

Water intakes define areas of the reservoir for industrial and domestic water supply. A municipal intake is given one-half mile zones while industrial intakes are given 300 foot radii zones. Water supply is critical to public health, safety, and economic vitality, and as such has been given the highest two rankings in the GIS process.

4.0 Reservoir Use Objectives

4.1 Introduction

Reservoir use objectives reflect the limits of the resources associated with Guntersville Reservoir and specify how these resources should be managed for current and near-term public needs and desires.

4.2 Project Operations

Objective: To safely and efficiently operate and maintain Guntersville Reservoir for flood control, commercial navigation, and electric power generation.

Rationale: TVA is authorized by Congress to operate Guntersville Reservoir primarily for commercial navigation and flood control. When these uses are not affected, TVA may also operate the project for power generation. Beneficial secondary uses include fish and wildlife habitat, water supply, and public recreation. Under certain conditions, it is also possible to use reservoir operation to manage aquatic plants and to control disease vectors (mosquitoes). Water level fluctuations used for control action result in increased exposure of the plant to drying and/or freezing conditions, or to more effective herbicide applications during special summer drawdowns.

4.3 Boating

Objective: To maintain and enhance opportunities for a diversity of recreational boating, including power boating, waterskiing, sailing, sailboarding, and boat fishing, in designated areas of the reservoir.

Rationale: Boating at Guntersville Reservoir is a popular activity. The lower part of the reservoir, where the lake opens to its widest expanse, is used more for pleasure boating and water skiing, while the middle section of the lake is used more for fishing. This natural feature of reservoir morphology causes a separation which helps to avoid conflicts between activities.

Open water is essential to boating and water skiing, and is also needed to provide access to fishing areas. While aquatic plants may provide excellent habitat for some fish species, excessive growth can be dangerous for water skiers. In those areas where pleasure boating and water skiing are encouraged, aquatic plant management is generally not required. The depth of open water areas is greater than most species are able to colonize. In other areas, where fishing is the main activity, the edge effect provided by opening lanes for boats can improve the diversity of fish habitat and provide necessary access to prime fishing sites. During the public workshops, the participants' second most important concern regarding aquatic plant management was reservoir access and boating and maintaining boat ramp areas free of nuisance aquatic plants.

4.4 Day-use Recreation

Objective: To enhance day-use recreation opportunities on Guntersville Reservoir, while maintaining resource quality and diversity.

Rationale: There are a number of day-use recreation areas on Guntersville Reservoir used for several activities. Day-use normally originates within an hour's drive of the site, with 65% to 70% of public use occurring on weekends.

Although both state parks offer day-use areas, the counties and municipalities around the reservoir currently offer, and should continue to emphasize, day-use parks. Water oriented day-use parks that provide

picnic areas and access to swimming, hiking, boating, and fishing are ideal. The lake-oriented parks maintained by the towns of Guntersville and Scottsboro offer quality and convenient day-use facilities for public use.

Recreation areas on the reservoir can benefit from aquatic plant management by ensuring shoreline access and open water for multiple use. Swimming areas, in particular, need to be free of aquatic plants for public health and safety.

Since some species of mosquitos breed in plants near the shoreline, the mosquito populations can also be affected by aquatic plant management. Reducing numbers of mosquitos can improve the recreation experience for the public.

Many of the public's concerns about aquatic plant problems and/or benefits at Guntersville relate to day-use recreation opportunities. The public's third most important concern was related to the problems caused by aquatic plants for primary contact recreation, at swimming beaches and in skiing areas.

4.5 Visual Resource and Open Space Management

Objective: To enhance and maintain the natural beauty of the lake and shoreline.

Rationale: Guntersville Reservoir has a diverse shoreline which presents some problems in visual resource management. However, most of the lake has retained a natural scenic beauty. In areas where aesthetics is of major concern, especially in those areas where there is a large expanse of open water near residential or public recreation areas, it should be considered that controlling undesirable and unsightly aquatic plants can improve the beauty of the shoreline for some users. Aesthetics was commonly perceived as being adversely affected by aquatic plants at Guntersville during the public workshops. In undeveloped embayments, aquatic plants will generally benefit fish and wildlife resources, which can in themselves be a visual resource.

4.6 Water Quality

Objective: Maintain standards of water quality that protect suitable uses: potable and industrial water supply, water contact recreation, aquatic biota, treated wastewater disposal, and other uses.

Rationale: Guntersville Reservoir is a multi-use reservoir, with eight classified uses having been identified: domestic water supply, industrial water supply, recreation, fish and other aquatic life, navigation, irrigation, and livestock watering. The states of Tennessee and Alabama have identified these water uses for managing water quality. The objective of the Master Plan with respect to water quality is to manage aquatic plants at levels compatible with classified uses.

Aquatic plants may have beneficial effects on water quality by increasing sedimentation rates, and may be particularly valuable to water quality near treated wastewater outfall discharges in Guntersville. Aquatic plants near industrial or municipal water intakes may be likewise useful, assuming conflicts to other users, clogging, or taste or odor problems do not arise.

4.7 Threatened, Rare and Endangered Plants

Objective: Maintain and protect populations of threatened, rare, or endangered plant species.

Rationale: Protection of threatened, rare, or endangered vascular plants is part of the Endangered Species Act of 1973 for those species listed by the USFWS. No plants on the federal lists occur near the reservoir. The State of Alabama does not have its own listing for plants, but uses the USFWS list for official status for endangered, threatened, and special concern plants. Plants identified as rare or endangered and associated habitat will be identified and efforts will be made to protect these species from any impacts associated with aquatic plant management.

Three species of aquatic plants which occur in Guntersville Reservoir are of concern to the state: - Canadian elodea, *Elodea canadensis*, Engelmann's quillwort, *Isoetes engelmannii*, and sweet flag, *Acorus calamus*.

4.8 Threatened, Rare and Endangered Animals

Objective: Maintain and manage habitat to support populations of threatened, rare, or endangered fish and wildlife species.

Rationale: The TVA, ALDCNR, and TWRA have ongoing programs designed to protect species of concern and associated habitat in Guntersville Reservoir and the surrounding area in Tennessee and Alabama. Continued management for these species is part of the Endangered Species Act and state policies, and supports ongoing restoration efforts. Three species that are listed have the potential to be affected by aquatic plant management are bald eagle, gray bat, and Indiana bat. Two endangered species, the snail darter and the pink mucket mussel occur in the extreme upper end of the reservoir area.

The effect of aquatic plant management on one of these species, the gray bat, is currently being studied as part of the JAGP and results from this study will be considered in future management efforts.

4.9 Water Birds

Objective: Manage the reservoir to encourage the continued growth and diversification of resident and migratory water bird populations.

Rationale: The Migratory Bird Act protects all non-game migratory birds and encourages the proper management of critical habitat. Individual states regulate the harvest and oversee the management of game and non-game birds according to federal guidelines and recommendations. Both Alabama and Tennessee promote the management of habitat for water birds. Many water bird populations have declined significantly during the last century. Recently, a slight reversal of this trend has been noted for a few species, but many are still in decline. Proper habitat management, including aquatic plants, can encourage the slight increases already noted and promote future upward trends for water bird populations.

4.10 Wildlife Management

Objective: Manage the reservoir and adjacent land to support the diverse aquatic, wetland, and upland wildlife species.

Rationale: The available habitat in and around Guntersville Reservoir is unusually diverse and promotes diversity of wildlife species. The abundant wildlife in the area has recreational, economic, and ecological benefits to the reservoir and surrounding communities.

Aquatic vegetation provides food and cover for both upland and wetland wildlife. The public places a high value on wildlife production (see Public Participation Appendix) and desirable aquatic plants should not be controlled in wildlife management areas.

4.11 Fisheries

Objective: Manage the habitat to promote the various sport and commercial fisheries and protect habitat for both game and non-game species.

Rationale: The Guntersville Reservoir fish communities are important to the region for ecological, recreational, and economic reasons. All levels of the food chain are important for a productive, healthy ecosystem. The fish communities of the Tennessee Valley are among the most diverse in North America and care should be taken to protect important habitat for these fishes. Recreationers travel from all over the region to fish Guntersville Reservoir, indicating the recreational importance and economic opportunities associated with the reservoir's fish community. Populations of largemouth bass, the most socioeconomically-important species, appear to be enhanced by intermediate aquatic plant density.

5.0 Aquatic Plant Management

5.1 Introduction

The TVA's stewardship of its water resource system includes the management of aquatic plants within the reservoirs to ensure multiple uses of the water resource.

Aquatic plants perform many beneficial functions in the aquatic ecosystem. They provide substrate for a diverse assemblage of small organisms, cover and nursery areas for certain species of fish, and food and foraging habitat for waterfowl and water birds. They also produce oxygen by photosynthesis, reduce turbidity, and stabilize the shoreline. However, when present in excessive amounts, they may cause detriment to the aquatic ecosystem, as well as conflicts with various reservoir uses in certain areas. Aquatic plants restrict access to docks and launching areas, interfere with recreational swimming, fishing, and boating, foul shorelines with plant debris, increase mosquito populations, accelerate the aging of reservoirs that results in marsh formation and reduction in water storage capacity, degrade water quality by causing extreme fluctuations in dissolved oxygen and pH, and clog water intakes.

5.2 Aquatic Plants in Guntersville Reservoir

The morphometry of Guntersville Reservoir is well suited for colonization by submersed aquatic plants because of a shallow littoral zone created by the flooding of extensive alluvial flood-plains. The submersed macrophytic habitat is subjected to minimal surface fluctuation (about 2 ft) as determined by the original design of the impoundment. Consequentially, the most severe aquatic plant problems in the TVA system have occurred in Guntersville Reservoir.

The perennial macrophyte Eurasian watermilfoil has been the most pervasive exotic species throughout TVA mainstream reservoirs during the last 25 years. Cloning from an intentional planting by a marina operator in Watts Bar Reservoir about 35 years ago, watermilfoil's downstream and even upstream dispersion has been rapid and widespread. More than 19,000 acres of Guntersville Reservoir were colonized with aquatic plants, predominantly watermilfoil by 1969; however, climatic and other natural conditions, and to a lesser extent recent biocontrol demonstration measures, have reduced the current infestation to about 5,200 acres in 1991.

Hydrilla was discovered in Guntersville Reservoir in 1982 and expanded to almost 3,000 acres within six years. From this original distribution, hydrilla has now expanded and is known to occur in four mainstream reservoirs. Within Guntersville Reservoir, hydrilla competitively excluded other submersed aquatic plants, even watermilfoil,

through the drought years of the mid-1980s and because of its lower light requirement, hydrilla was able to expand to 2,900 acres, or about four percent of the total surface area.

The increase in plant coverage at Guntersville Reservoir peaked in 1988, the last year of a four-year drought. The low flows and clear water were ideal for aquatic plant growth. Watermilfoil and hydrilla continued to increase in abundance, and, native pondweeds declined slightly between 1984 and 1988. Heavy rains in 1989, 1990 and 1991 caused high flows and turbidity which resulted in decreased levels of aquatic plants. In spite of this observed decrease, Guntersville Reservoir continues to be the most severely impacted reservoir of the 12 TVA reservoirs with aquatic plant communities.

Other species, such as spinyleaf naiad, southern naiad, small pondweed, American pondweed, muskgrass, and coontail, constitute most of the remainder of the submersed macrophyte community. Several emergent species, such as alligatorweed, Uruguayan primrose, and giant cutgrass, cause localized water utilization problems but are minor compared to conflicts caused by submersed species.

Guntersville Reservoir is a multipurpose reservoir. Major industrial water users, such as Widows Creek Steam Plant, withdraw large quantities of water and periodically experience clogging problems related to aquatic plants.

Most recreational uses, especially contact recreation, are severely hampered by dense aquatic vegetation. One component of water-based recreation, bass fishing, has experienced a boom due in part to publicity arising from several major fishing tournaments. Some aquatic plant management conflicts have emerged with regard to the popularity of this type of sport fishing and the general resistance of participants to aquatic plant reduction efforts. On the other hand, bank and pier fisherman have experienced fishing access problems and desire more plant control. The major fishing tournaments have historically been held in the spring with aquatic plants do not cover large areas of the reservoir. Thus the tournament angler does not experience the high levels as the permanent residents do.

Guntersville Reservoir, by virtue of its water-level operation scheme, variation in utilization, presence of a diverse native and exotic flora, and demographics, will continue to present a challenge for optimum and acceptable deployment of aquatic plant management technologies.

5.3 Discussion of Management Alternatives

Aquatic plants can be managed using chemical, biological, mechanical, and operational techniques. A variety of herbicides have been developed to manage aquatic plants. The major public perception with the use of herbicides is that they have a negative impact on the environment. Biological methods have been effective for some species in

certain situations. Unlike the site-specific control possible with herbicides, biocontrols can affect the entire reservoir. Most organisms that are effective as control agents are also exotic species, such as the grass carp. Before an exotic species is released, extensive research is conducted to determine any impact it might have on non-target species. Triploid grass carp are considered an acceptable control agent because they are sterile, and therefore likely to cause only short term effects.

Mechanical control is achieved by harvesting the plants. An added benefit for small eutrophic lakes is that nutrients tied up in the plants are removed from the lake; at Guntersville, removal of nutrients through harvesting would only be a small proportion of the annual nutrient load. However, when the plants are cut, small fragments break off and can later root to form new stands of aquatic plants. In addition, mechanical harvesting is labor intensive and expensive, making it impractical for large areas. Water level fluctuation, a type of operational or environmental control, is most effective if the water level is altered at least 10 feet. This magnitude is necessary to expose roots and propagules (reproductive structures) of most of the population to freezing and drying conditions.

Under the current TVA Aquatic Plant Management Program, EPA-registered herbicides are used to supplement water level fluctuations to control excessive vegetation in designated high use areas or "Priority Treatment Areas". Priority Treatment Areas are littoral areas around lakeside homes, campgrounds, boat ramps, swimming beaches, public use areas, and marinas.

An area 150 feet wide along the shoreline in these areas is normally treated to suppress excessive vegetation. Mid-reservoir aquatic plant colonies and aquatic plants along undeveloped shorelines and isolated coves provide habitat for fish and waterfowl and are not treated except in special situations. Examples of special situations include (1) boat lanes to provide access to open water or improve angler access and increase "edge effect" for fisherman, (2) small coves to be treated when rotenoned for fisheries studies, (3) small test plots, usually less than ten acres, and (4) treatment of isolated colonies of especially noxious plants such as hydrilla. In addition, areas around water municipal water intakes are excluded from routine herbicide treatment to protect water supplies from herbicide residues. If treatment in the vicinity of intakes is required, special procedures are implemented and coordination with water plant managers and regulatory agencies is made to ensure approved residue tolerances are not exceeded. Individual homeowners, recreation facilities, marinas, and other locations may be excluded from the herbicide application program upon agreement between TVA and the individual.

Typically, TVA treats Eurasian watermilfoil with 2,4-D, and hydrilla with endothall or diquat with organically-complexed copper (copper chelates). In 1989, these three (or combinations) were the most commonly used herbicides on Guntersville Reservoir. Other herbicides and combinations that were evaluated for effectiveness on Guntersville in 1989 were copper chelates alone and in combination with fluridone, and

endothall. Application rates are based on US Environmental Protection Agency guidelines and on application rate studies conducted by the TVA on mainstem Tennessee River reservoirs. Airboats equipped with spray booms, trailing hoses, and nozzles to inject herbicides under the water surface are used for submersed vegetation control. These boats have an effective swath width of about eight feet, but outrigger booms on each side extend the effective swath to approximately 18 feet. A flashing red light is activated when treatment is in progress. For emergent vegetation control, a handgun is used to apply herbicides. Helicopters are occasionally used, often in coordination with reservoir drawdowns, however, the primary use of helicopters is for application of mosquito larvicides.

Generally, water level fluctuations for flood control on TVA mainstem reservoirs begin in late summer or early fall. A minimum pool level is attained by early January and maintained until late March when reservoirs are refilled by spring flooding. This operation has implications for aquatic plants. The fall and winter drawdown exposes plants and propagules of perennial aquatic plants to drying and freezing. 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 Guntersville, control from winter drawdowns is primarily limited to perennial species that reproduce vegetatively and have underground root crowns and rhizomes in the drawdown zone. Only minimal control is obtained for the naiads and other aquatic plants that produce seed prior to the drawdown. The seed remains dormant through the winter, allowing these species to survive the drying and freezing conditions. One drawback to this technique is the lack of control of effects on non-target areas of the reservoir such as large embayments, waterfowl management areas and refuges. These areas, typically dominated by shallow water habitat, tend to be the most impacted by the summer drawdowns.

At Guntersville, special short-duration summer drawdowns were used in 1983, 1987, and 1989 primarily for control of annual plant species. The reservoir was drawn down in June or July for one to two weeks. Helicopter and airboat herbicide application was intensified in priority treatment areas during the drawdown to maximize plant management benefits.

5.4 A Summary of the Joint Agency Guntersville Project

Congressman Tom Bevill and former Congressman Ronnie Flippo, responding to concerns of the local constituency regarding aquatic plant management at Guntersville Reservoir, were instrumental in obtaining congressional authorization and funding for the Joint Agency Guntersville Project (JAGP). The JAGP was developed and is being undertaken jointly by the TVA and the Corps, with TVA as the lead federal agency. The primary directive to these two agencies was to develop a five-year comprehensive plan for reducing excessive plant populations to manageable nonproblem levels in Guntersville Reservoir. This Master Plan is a part of the JAGP.

The aquatic plant management project consists of three major components: (1) operational enhancement, which includes refinements of routine operational control measures as part of TVA's stewardship responsibilities; (2) demonstrations of current proven technologies that must be tailored to local conditions on a large scale and evaluated for effectiveness, economy, and environmental impact before becoming operational; and, (3) applied research, which requires additional data in the local region before being integrated with the large-scale test demonstrations or into the operational programs. A substantial part of the JAGP includes provisions for identifying and quantifying the effects of aquatic vegetation on other water resource uses, such as recreation, economic development, and water supply (for both industrial and public uses). The JAGP is separated into seven sections: 1) Planning and Review Process, 2) Information and Education, 3) Economic/Recreation Evaluations, 4) Database Development and Environmental Evaluations, 5) Operational Enhancements, 6) Demonstrations, and 7) Applied Research. One or more projects, termed work units, have been assigned to each section.

5.5 Management Objectives

Aquatic plants affect many uses of Guntersville Reservoir and compromise TVA's ability to meet the resource objectives discussed in the previous chapter. TVA's aquatic plant management program is intended to support multipurpose use of the reservoir. Its goal is to reduce densities of aquatic plants to acceptable levels in areas of use conflict (i.e. boat launches, docks, swimming beaches, and water intakes), without eliminating aquatic plants in areas where they are environmentally beneficial or pose no conflicts with use.

The principal objectives are management of aquatic plants along developed sections of shoreline, suppression of the growth and spread of hydrilla, and maintenance of access to portions of the reservoir where aquatic plants may restrict boat traffic and other forms of water contact recreation. Note that two of these three objectives involve the distribution of the plants in the reservoir. Eradication of all aquatic vegetation is neither feasible nor desirable. Plant management technology or methods are not addressed in this Master Plan. However, a Supplemental Environmental Impact Statement is being prepared for public review that discusses management methods.

As water quality is managed to support specific uses of the water resource, so may aquatic plants be managed. For example, waterfowl habitat is a common use of Guntersville Reservoir. To support the use of Guntersville Reservoir as waterfowl habitat, the manager should encourage production of species of aquatic plants preferred by target waterfowl species for nesting and feeding in those locations of the reservoir appropriate for waterfowl management.

Table 5 lists eight uses of Guntersville Reservoir. This list was compiled from information obtained during the public workshops held in January, 1991, as well as from general knowledge of reservoir operation, ecology and existing reservoir uses.

For many activities on Guntersville Reservoir, it is the amount and location of vegetation, not the species, that affect a given use. In these cases management simply involves maintaining levels of aquatic plants compatible with designated or desired uses. This is true for many public recreational uses: power boating and water skiing, nonpower boating, swimming, and, to some extent, angling, since it is the physical structure of the vegetation that provides benefits to many fish populations. Conversely, waterfowl strongly prefer certain species of aquatic plants over others and species composition is more important than the amount of coverage.

Some reservoir uses require little or no management of aquatic plants. While commercial navigation is not yet affected by aquatic vegetation, information received from the public indicates that boaters use surface aquatic plants as indicators of shallow water areas. Aquatic plant management programs should continue to avail boaters of this use.

5.6 Aquatic Plant Management Plan

This section presents the aquatic plant management plan, together with the existing Priority Treatment Areas, as Plate 1, Sheets 1 through 4. Summarized below are the resource objectives for each of the reservoir's 18 management units. These management units are indicated on Sheets 1 through 4 by broken lines and designated by management unit number. Resource objectives are presented below for each reservoir management unit, and address the following topics.

- (1) Unit Description is a brief presentation of natural and cultural features that affect resource use.
- (2) Reservoir Use Suitability presents the reservoir uses that are suitable for each unit.
- (3) Resource Objectives briefly states the objective(s) for each management unit.
- (4) Aquatic Plant Management Concepts are descriptions of the areas and degree of aquatic plant management that can or should be undertaken to implement the resource objectives in that unit. These concepts will be refined and detailed in subsequent reports, including the TVA's future Annual Work Plans.
- (5) Constraints present a summary of administrative and/or site-specific factors that may influence or constrain implementation of the unit resource objectives.

Table 5

AQUATIC PLANT MANAGEMENT OBJECTIVES

<u>Reservoir Use</u>	<u>Objectives</u>	<u>Desirable Species</u>
Swimming	Free use of nearshore waters for body contact recreation	None
Boating	Large surface areas that neither foul propellers or create safety problems for skiers	Low growing plants that do not reach water surface
Wildlife Management	Provide feeding and nesting habitat for waterfowl	Watermilfoil and native submersed and emergent species
Navigation	Commercial vessels are not affected by vegetation; vegetation marks channel	Floating species could affect navigation in unusual situations
Fisheries Management	Nursery habitat and cover for fish, provide access to fishing areas	Submersed vegetation
Multiple Uses	Support all desired public uses	Depends upon use; ten percent or less surface cover
Water Supply ^a	Prevent intake from becoming clogged with plant material	Naturally occurring species; less than 25 percent coverage
Wastewater Disposal	Maximize the natural filtration benefits of aquatic macrophytes	Submersed species

a.Areas within 0.5 mile radius excluded from herbicide treatment. If aquatic plant management is required, options should be coordinated with water plant managers and ADEM.

5.6.1 Management Unit 1: Guntersville Dam

This 2,058-acre reservoir unit, being the closest unit to the dam and not having large tributary embayments, has the deepest average depth of any unit. Corresponding to this, aquatic macrophytes are found primarily around the shoreline, largely watermilfoil lining the left (south) bank. Some of this shoreline on the south has been a Priority Treatment Area in the past because of a YMCA camp and residential areas located there.

There is no boat access to the unit other than from the upstream reservoir units or through the project locks. Land cover along the shoreline is primarily mixed deciduous and evergreen forest. TVA manages its land on the south shore primarily for timber production and wildlife habitat, its north shore lands for timber and public recreation (undeveloped). About 19%, or 3.3 miles, of the shoreline is designated public recreation areas. Special and/unique wildlife areas in the unit include the Hambrick Cave used by gray bats, a federally listed endangered species. Bald eagles, also endangered, forage near the dam and a nesting pair have been observed in the unit for the last two years.

This unit is suitable for boating (1,193 acres), fishing (630 acres), and multiple use (235 acres). Commercial navigation and hydropower production are priority uses at the dam. Resource objectives include providing for safe power boating and water skiing, allowing for multiple use of littoral areas in vicinities of the YMCA camp and residences and the public recreation areas at the dam and along the north shore, maintaining unique and sensitive wildlife populations, and providing for quality fish habitat.

Sheet 1 of 4, Plate 1 is a management plan for the lower reservoir showing about 4.8 miles of shoreline that should be considered as potential macrophyte management areas. Red shorelines shown on Plate 1 are TVA's existing Priority Treatment Areas that have been treated with herbicides in the past when use conflicts with aquatic vegetation have occurred. Unit 1 has large contiguous areas not colonized by aquatic macrophytes and as such is a choice unit for power boating and water skiing. Operationally, no management is required to support this reservoir use as the water depth is greater than can be colonized by aquatic plants.

An area across from the mouth of Honeycomb Creek was requested during the public workshops to be exempted from macrophyte control activities because it was a popular fishing site. An exception to this was a request that boat channels through this area be created. The design of boat channels should be in accordance with the final recommendations from the Joint Agency Guntersville Project's research findings.

The littoral area off the YMCA camp and residential areas should be managed for multiple use. The desired level of aquatic plants is ten percent or less.

Natural levels of aquatic macrophytes along the dam and the north shore will support the use of the adjacent land for general public recreation, as well as providing continued wildlife habitat benefits. The north shore recreation areas are undeveloped, and the dam reservation has no water-contact recreation facilities. Hence, these areas do not warrant intensive control efforts in the immediate term, but should be considered potential treatment sites if the recreation facilities are further developed.

No constraints to managing aquatic plants have been identified in Unit 1. Operationally, coordination with the YMCA camp and their intended seasonal uses of the reservoir is warranted. Should the gray bat studies of the JAGP indicate that the Hambrick Cave population is affected by plant management activities there, the plan should be revised to protect this endangered species.

5.6.2 Management Unit 2: Honeycomb Creek

This 1,424-acre reservoir unit is composed of the Honeycomb Creek embayment. Public access to Unit 2 is provided at several boat launching areas, including two commercial marinas. The 22-mile shoreline in Unit 2 is substantially more developed than Unit 1, with significant areas of surrounding land devoted to residential and commercial uses. Also, about 21% (4.7 miles) of this unit's shoreline is designated as public recreation areas. The John Thompson Reservation tract, located at the mouth of the unit on the north shore, is managed for low-density public recreation, timber production, and wildlife habitat.

Honeycomb Creek is fairly steep sided so littoral areas deepen quickly. Because of this, aquatic macrophyte beds are present primarily along shorelines and in the upper ends of the embayment. Watermilfoil is the primary aquatic macrophyte. Hydrilla has not yet been found in monospecific colonies in this unit. Major portions of the Honeycomb Creek shoreline has been a Priority Treatment Area for TVA's Aquatic Plant Management Program. The four Priority Treatment Areas are on the residential and recreation areas on the south shore along County Road 480, including Snug Harbor Marina; residential areas on both shores of Jagger Branch; and, the commercial developments on the north shore of Honeycomb Creek from Sunrise Marina to the Thompson Reservation. Special and/unique wildlife in the unit include the use of local foraging areas by two federally listed endangered species: gray bat and bald eagle.

This unit is suitable for fishing (534 acres), boating (417 acres), multiple use (363 acres), swimming (about 0.5 acre at one site) and water supply (109 acres).

Resource objectives for Unit 2 include providing for quality fish habitat, allowing for multiple use of littoral areas in vicinities of residential and public recreation areas, providing for safe power boating and access to marinas and boathouses, and prevent the municipal water intake from becoming clogged with aquatic plant material.

Sheet 1 shows 12.8 miles of shoreline that should be considered potential plant management areas. Aquatic plant coverage along residential shorelines should be less than ten percent for a distance of 150 feet. Individual homeowners may request exclusion from TVA's plant management program. Littoral or shallow reservoir areas abutting lands used for public recreation (excluding marinas) are also classified for multiple use, and should have ten percent or less coverage for a distance of 650 feet. Access to and areas within marinas should have no more than five percent coverage by aquatic macrophytes; similarly, boat launch areas should have a maximum of about five percent coverage. These facilities should also be posted cautioning boat owners about transporting exotic aquatic macrophytes into or out of Guntersville Reservoir on their boats or trailers.

The extreme upper end of Jagger Branch should be managed for fishing, with some consideration for wetland wildlife. Aquatic plant control practices permissible there are the creation of boat lanes or those that selectively control exotic species while encouraging native vegetation. Operationally, no management is required to support use by boats in areas deeper than about 18 feet.

An area with a radius of one-quarter mile around the North Marshall Water System intake (County Road 5 bridge) should be monitored, and if aquatic plant levels exceed 25% coverage or cause clogging problems, then control options should be coordinated with the water plant manager and the ADEM. The water intake is located in an area that has historically been heavily colonized by aquatic plants, so control in that area may be required.

The John Thompson Reservation is indicated as a potential macrophyte management area, although no waterfront recreation facilities are present there. Unless such facilities are developed, plant management of littoral areas around this site is not necessary.

Should the gray bat studies of the JAGP indicate that the Hambrick and/or Blowing Wind Cave populations are affected by plant management activities, the plan should be revised to protect this endangered species.

5.6.3 Unit 3: Conner Island

This 2,353-acre reservoir unit has about 22 miles of shoreline, about 16% of it designated as public recreation areas. Shoreline land cover is dominated by mixed forest. Much of the shoreline lands are TVA-owned

forest allocated for timber production, wildlife management, and low-density public recreation. Fishing and boating are two of the most common uses of this unit.

Several small islands are located on the north side of the reservoir management unit. The shallows around these islands support extensive areas of aquatic macrophytes, primarily pure watermilfoil beds. During the January 1991 public workshops, the planning team received a request to not treat these beds of watermilfoil during the annual aquatic plant program as they are popular fishing areas. Hydrilla has not yet been found in pure stands in Unit 3. Priority Treatment Areas exist near residential areas and marina sites near Claysville.

Unit 3 is largely suitable for boating (699 acres) and fishing (1,545 acres) and multiple use (109 acres). Multiple use areas border public recreation areas and residential lands.

Resource objectives for Unit 3 include providing for safe boat access, maintaining quality fish habitat while providing for boat angling access, and allowing for multiple use of littoral areas in vicinities of public recreation areas and residential properties.

Plate 1 shows about 3.7 miles of shoreline in Unit 3 that the TVA should potentially consider for aquatic plant management. Bold red shorelines on the plate are Priority Treatment Areas under the TVA's ongoing aquatic plant control program. Residential shorelines should be managed to support multiple for a distance of 150 feet. Littoral reservoir areas abutting lands used for public recreation (excluding marinas) are also classified for multiple use, but should be managed for a greater distance into the reservoir, about 650 feet. Desirable aquatic macrophyte coverage for multiple use areas is ten percent or less.

An area, as previously described, was identified during public workshops to be managed for fish habitat and should be largely exempt from macrophyte control activities, with the exception that boat channels through this area could be created. It is also recognized that grass carp feeding could occur in this area especially impacting preferred aquatic plant species. The design of boat channels should be in accordance with the final recommendations from the Joint Agency Guntersville Project's research findings.

5.6.4 Management Unit 4: Browns Creek

This unit is 7,674 acres in surface area and has 41 miles of shoreline. It is accessed from any one of several boat launches or docks on the west shore of Browns Creek embayment. Shoreline lands are primarily mixed forest. TVA-owned lands in this unit are managed for low-density public recreation, timber production, and wildlife habitat.

About 25% (10.4 miles) of shoreline lands are designated as public recreation areas. Several day-use parks are located on this unit. Among them are Guntersville Municipal Park and Marshall County Park No. 2. Two potable water intakes are located in the unit, off the AL 69 causeway and on the eastern shore of the Browns Creek embayment.

Pure stands of watermilfoil are the primary aquatic plants colonizing Unit 4. In recent years hydrilla has been colonizing the unit, and, in 1988, became the second-most common aquatic plant there. The residential and recreational shoreline areas have been a Priority Treatment Area for TVA's aquatic plant control program for several years. During the January 1991 public workshops, the planning team received a request to not treat beds of aquatic plants along AL 69 bridge during the annual control program as they are popular fishing areas. This area is not designated as a Priority Treatment Area and is not treated under the current herbicide program.

Unit 4 is most suitable for water supply (877 acres), swimming (2 public beaches), multiple use (606 acres), boating (4,603 acres), and fishing (1,589 acres).

Resource objectives for Unit 4 include providing for quality fish habitat while also maintaining channels for boat angler access when needed, allowing for multiple use of littoral areas in vicinities of residential and recreation areas, providing for safe boating and access to marinas and boathouses, providing feeding and resting habitat for waterfowl and aquatic mammals, and preventing municipal water intakes from becoming fouled with aquatic plant material.

Plate 1 shows 20.3 miles of shoreline that should be considered potential aquatic plant management areas for multiple use with a desirable plant coverage of ten percent or less. Residential shorelines suitable for multiple use should be designated for intensive control efforts for a distance of about 150 feet from the shoreline. Littoral reservoir areas abutting lands used for public recreation (excluding marinas) are likewise most suitable for multiple use, and should receive a similar control effort. An intensive control mechanism that reduces aquatic plant coverage to near zero may be warranted at the two public swimming beaches. The upper end of the bay should be managed for fisheries and wildlife management with limited treatment, utilizing practices that selectively control exotic species while encouraging native vegetation.

Suitable areas for boating include the open-water areas of the bay and upstream of the AL 69 causeway. Operationally, no management is required to support this use in areas deeper than about 18 feet. Access to and areas within marinas should be maintained to have minimal coverage by aquatic macrophytes; similarly, boat launch areas should be kept as low as practical. These facilities should also be posted cautioning boat owners about transporting exotic aquatic macrophytes into or out of Guntersville Reservoir on their boats or trailers.

Water supply intakes are generally located in water sufficiently deep that aquatic plants do not cause problems.

5.6.5 Management Unit 5: Guntersville

This 3,137 acre-reservoir management unit is accessed from several commercial marinas or public boat launches on the Big Spring Creek embayment. There are thirteen barge freight terminals in this unit; one industrial water intake, two industrial wastewater discharges, and one municipal wastewater discharge are located in it as well. This is the most heavily developed unit on the reservoir, with nearly one-third of shoreline lands being residential. Another 25% is commercial or industrial. Nearly five miles of shoreline (14%) is designated as public recreation areas, including several day-use parks.

Aquatic vegetation in the unit is largely watermilfoil. Much of Unit 5's shoreline has been a Priority Treatment Area for TVA due to its extensive development for residential and recreational purposes. A large wetland complex exists at the head of Big Spring Creek embayment, and is designated by TVA as a Small Wild Area.

The GIS hierarchy classified this management unit as being suitable for boating (1,459 acres), water supply (289 acres), fishing (932 acres), and multiple use (457 acres). Resource objectives include providing quality water for drinking and industrial uses, providing for quality fish habitat, allowing for multiple use of littoral areas in vicinities of residential and recreation areas, and providing for safe boating and access to marinas, ramps, and boathouses.

Sheet 1 shows 18.2 miles of shoreline that should be considered as potential macrophyte management areas. Residential shorelines should be classified for multiple use with desirable aquatic plant coverage less than ten percent of the surface area for a distance of about 150 feet from the shoreline. Littoral reservoir areas abutting lands used for public recreation are likewise most suitable for multiple use, and a similar level of aquatic macrophyte coverage is desirable. No more than five percent aquatic plant coverage is desirable around boat ramps. Boat ramps should be posted cautioning boat owners about transporting exotic aquatic plants into or out of Guntersville Reservoir on their boats or trailers. No management is required to support the use of deeper reservoir areas for boating.

No more than 25% coverage of aquatic plants is desired in an area with a radius of one-quarter mile around the Houston Bridge water intake. The reservoir in this vicinity is not suited for submersed plant growth and little control is actually anticipated. If aquatic plants do exceed tolerable levels, control options should be coordinated with the water plant manager and ADEM.

The wetland complex at the head of the embayment, Big Spring Creek Small Wild Area, is also a public recreation area, although undeveloped. Plate 1 indicates the nearshore area is a potential aquatic plant management area, which would conflict with TVA's fish and wildlife management objectives in designating it a wild area. Since the recreation area is undeveloped, and reservoir use does not currently include water-contact recreation, there is currently little reason for controlling aquatic plants there. TVA will not treat aquatic plants near the Big Spring Creek Small Wild Area unless recreational use of the shoreline is encouraged by developing such facilities or colonies of hydrilla develop there. Also, the infrequent use of summer drawdowns could influence the area's aquatic plant community as could grass carp feeding.

5.6.6 Management Unit 6: Buck Island

Unit 6, the 3,211-acre Buck Island unit, includes 25.6 miles of shoreline, much of which is residential. There are three commercial recreation marinas in the unit and one or more boat launches. Large forested areas of Buck Island are owned by TVA and managed for multiple use, timber production, wildlife, and public recreation. The State's classified uses for this portion of the reservoir are public water supply, fish and wildlife, and swimming. There is one domestic wastewater discharge located in the unit and one TVA water quality monitoring station. There are numerous summer camps, marinas, and recreation areas (including Siebold Creek Public Recreation Area) in this unit. In fact, about 25% of this unit's shoreline is designated as public recreation areas. TVA has designated residential portions of the shoreline and marina areas as Priority Treatment Areas. Hydrilla was present in large colonies in 1987 and 1988, but has since diminished in coverage.

Unit 6 is most suitable for the following uses: swimming (one public swim beach), boating (1,628 acres), fishing (1,169 acres), and multiple use (414 acres). As such, resource objectives include providing for quality fish habitat, allowing for multiple use of littoral areas in vicinities of residential and recreation areas, including swimming beaches, and providing for safe boating and access to marinas, boat ramps, and boathouses.

Plate 1 shows 13.9 miles of shoreline that should be considered as potential plant management areas. Although the Siebold Creek area is annually colonized by watermilfoil and other aquatic plants, much of the shoreline of the Buck Island subdivision is not, as the substrate, bank steepness, and other factors are not suitable habitat for the plants. Hence, Buck Island residents may perceive the few aquatic plants as beneficial, while Siebold Creek residents perceive use conflicts with the plants. Residential shorelines are suitable for multiple use with aquatic plant coverage less than ten percent of the surface area for a distance of about 150 feet from the shoreline. Littoral reservoir areas abutting lands used for public recreation are likewise most suitable for multiple use, and

a similar level of aquatic macrophyte coverage is desired for a distance of 650 feet from the shoreline. Boat ramps and marinas should have five percent or less coverage.

Marinas and boat ramps should be posted cautioning boat owners about transporting exotic aquatic plants into or out of Guntersville Reservoir on their boats or trailers. No management is required to support the use of deeper reservoir areas for boating.

An intensive control mechanism that reduces aquatic plant coverage to zero percent may be warranted at the Marshall County Park No. 1 public swimming area.

5.6.7 Management Unit 7: Lake Guntersville State Park

About two-thirds of the shoreline in this 4,254-acre reservoir unit is designated as a public recreation area. It contains the Lake Guntersville State Park. No residential shoreline is contained within this unit. Public access to Unit 7 is provided at several launches. The State's classified uses for this reservoir management unit are for swimming and the support of fish and wildlife. However, there are three domestic wastewater discharges, one domestic water supply intake (Short Creek), one industrial water supply intake, and one industrial wastewater discharge (plus a TVA water quality monitoring station) located in Unit 7.

Aquatic macrophyte beds were limited to two acres in 1990, although coverage has been as high as 395 acres in the past. Colonies have primarily been watermilfoil, various naiads, and hydrilla. Portions of the state park's shoreline have been a Priority Treatment Area for TVA's Aquatic Plant Management Program, along with camp grounds, picnic areas, and swim beaches.

The project database contains several records of bald eagle sightings near the Lake Guntersville State Park and along Town Creek.

Multiple recreation use is associated with the campgrounds and public recreation areas (833 acres). This unit is also suitable for wildlife management (407 acres), water supply (151 acres), boating (1,940 acres), swimming (one public swim beach), and fishing (923 acres).

Resource objectives for the unit include providing quality water for drinking and industrial uses, providing protection for bald eagle foraging habitat, allowing for multiple use of littoral areas in vicinities of recreation areas, protecting quality fish habitat, and providing for safe boating and access to boat ramps.

Plate 1 shows 18.3 miles of shoreline in Unit 7 as potential aquatic plant management areas. Scoping activities of the master planning process determined that the general public as well as the state park had specific interests for managing aquatic plants in Unit 7. A request was made by the public to not control aquatic plants in certain midreservoir

and lower Town Creek embayment areas of Unit 7, in order to preserve fish habitat. These areas are not designated Priority Treatment Areas and are not treated under the current TVA program. These areas are classified most suitable for fishing.

Reservoir shorelines abutting public recreation areas are utilized for multiple use and aquatic plant coverage should be less than ten percent of the surface area for a distance of about 650 feet from the shoreline. Developed shoreline recreation areas only need be managed at this time. An intensive control mechanism that reduces aquatic plant coverage to near zero may be warranted at the Lake Guntersville State Park public swim beach.

Access to boat ramps in the unit should have no more than five percent coverage by aquatic macrophytes. These facilities should also be posted cautioning boat owners about transporting exotic aquatic macrophytes into or out of Guntersville Reservoir on their boats or trailers. No management is required to support the use of deeper reservoir areas for boating.

5.6.8 Management Unit 8: Mill Creek: Boshart Creek

Reservoir Management Unit 8 is 2,706 acres in area. It includes a number of public and private boat launches which are accessible from Highway 79. There are resorts and camps, including Camp Trico (Girl Scouts), and public recreation areas in this unit. In fact, about 22% of the shoreline is designated as public recreation areas. Land cover of the adjacent shoreline is primarily forested, although there are significant residential areas along the shoreline. The State's classified uses for this reservoir management unit are for swimming and the support of fish and wildlife. There are no known water intakes or treated wastewater discharges in Unit 8.

Aquatic macrophytes are present along the shoreline as well on the overbank areas in mid-channel. Watermilfoil tends to dominate near the shore whereas hydrilla occurs in pure stands in the channel. Pine Island, a midreservoir submerged island, has been one of the largest hydrilla colonies in the reservoir; in 1990, however, no hydrilla was reported in Unit 8 by the TVA aquatic plant program. Hydrilla, once the most abundant aquatic macrophyte in this unit, has disappeared and watermilfoil is the dominant species in plant colonies here. Long reaches of residential and recreational shoreline in this unit have regularly been a Priority Treatment Area of TVA's Aquatic Plant Management Program. Mid-reservoir colonies and littoral areas along undeveloped shorelines provide fish and waterfowl habitat and are not designated as Priority Treatment Areas.

This unit is suitable for fishing (2,207 acres) and multiple use (499 acres). Resource objectives include protecting quality fish habitat and allowing for multiple use of littoral areas in vicinities of recreation areas and residential properties.

Plate 1 shows 16.7 miles of shoreline in Unit 8 as potential aquatic plant management areas. All of this area is associated with multiple use suitability of public recreation areas and residential properties. Access to public boat ramps should be maintained at minimal coverage by aquatic macrophytes. These facilities should also be posted cautioning boat owners about transporting exotic aquatic macrophytes into or out of Guntersville Reservoir on their boats or trailers.

5.6.9 Management Unit 9: Murphy Hill

Unit 9 is 5,203 acres in area. Although there are several private marinas or boat launches, no public launches are in this unit. Less than one percent of the shoreline is designated as public recreation areas. The State's stream classifications for this unit are swimming and fish and wildlife. No water intakes or treated wastewater outfall discharges exist in the unit. Land cover in the unit is primarily forest. The unit was the site of a proposed coal gasification facility, but this project has been indefinitely delayed. The land was cleared for the facility but is now revegetating. Intervening land between the Murphy Hill coal gasification site and residential areas at distal ends of the reservoir management unit are TVA-owned areas variously allocated for public and commercial recreation, multiple-use forest management, commercial navigation, and agriculture.

Aquatic vegetation colonization patterns are similar to those in Unit 8. In the five years preceding 1990, watermilfoil dominated littoral vegetation colonies while hydrilla was most common in midchannel overbank areas. In 1990, only 11 acres of aquatic macrophytes were found in Unit 9. TVA's Aquatic Plant Management Program has considered the shorelines of the Little Mountain and Mountain Lakes resorts and part of South Sauty Points Subdivision as Priority Treatment Areas in the past.

This unit is suitable for fishing (5,067 acres) and multiple use (136 acres). Resource objectives are to protect quality fish habitat and to allow for multiple use of littoral areas in vicinities of recreation areas and residential properties. During the public workshops, the most important concern expressed was the value of aquatic plants to fish and wildlife habitat. The public also expressed a desire for plants to be managed so that boat docks, piers and public access sites remain open for use.

Plate 1 shows 4.7 miles of shoreline in Unit 9 as potential aquatic plant management areas. All of this area is associated with the multiple use suitability of public recreation areas and residential properties. There are no public access sites in this unit to maintain. Littoral waters in public recreation areas should have less than ten percent of the surface area covered by aquatic plants, for a distance of about 650 feet from the shoreline. Similar coverage is the goal for waters adjacent to residential properties, but the zone of management may be reduced to about 150 feet from the shore. These areas have routinely been Priority Treatment Areas for TVA's Aquatic Plant Management Program and should

continue to be designated for intensive control. Midreservoir colonies and littoral areas along undeveloped shorelines provide fish and waterfowl habitat and should not be subject to intensive control efforts.

5.6.10 Management Unit 10: South Sauty

Unit 10 is a 5,380-acre area accessible from public and private launches on South Sauty. Land cover of the adjacent shoreline is primarily forest. About 12% of the shoreline is designated as public recreation areas, including Bucks Pocket State Park at the upstream end of South Sauty Creek. TVA has allocated shoreline land it owns along this unit for a variety of uses, from natural areas to wildlife management and multiple use forest management. The State of Alabama has classified this portion of the reservoir for swimming and support of fish and wildlife. There are no permitted water supply intakes or wastewater outfalls located within Unit 10.

Watermilfoil has historically been the dominate aquatic plant in this unit, with hydrilla composing a significant percentage of macrophyte colonies between 1986 and 1989. While watermilfoil has colonized primarily littoral waters, hydrilla has established midreservoir colonies. Recreation and residential areas in the unit have regularly been Priority Treatment Areas under TVA's Aquatic Plant Management Program: South Sauty Point Subdivision, along the South Sauty bridge and causeway, Morgan's Cove, and Lakeshore Drive in Langston.

The project GIS indicates that this unit is suitable for fishing (4,998 acres) and multiple use recreation (382 acres). Other uses, such as boating, are however not inappropriate. Resource objectives include protecting quality fish habitat and allowing for multiple use of littoral areas in vicinities of recreation areas and residential properties.

Plate 1 shows 11.7 miles of shoreline in Unit 10 as potential aquatic plant management areas. All of this area is associated with the multiple use suitability of public recreation areas and residential properties. There are no public access sites to maintain in this unit. Littoral waters in public recreation areas should have less than ten percent of the surface area covered by aquatic plants for a distance of about 650 feet from the shoreline. Similar coverage is the goal for waters adjacent to residential properties, but the zone of management may be reduced to about 150 feet from the shore. Midreservoir colonies and littoral areas along undeveloped shorelines are classified for fishing use suitability, provide fish and wildlife habitat, and are not potential aquatic plant management areas.

5.6.11 Management Unit 11: Goose Pond

Unit 11 is a 6,269-acre area accessed from one of the public or private boat launches on Mink Creek or North Sauty Creek. Shoreline land cover is primarily forest, reflecting the presence of two natural areas and the North Sauty Waterfowl Refuge in the unit. The natural areas

contain caves harboring the federally endangered gray bat. About 14% of the unit's shoreline is designated as public recreation areas. An area of 1,494 acres is designated as a waterfowl management area. The State of Alabama has classified this portion of the reservoir for swimming and support of fish and wildlife, although, there is a municipal water supply intake located in North Sauty Creek embayment.

Large areas of watermilfoil regularly colonize the North Sauty Creek embayment. In the upper reaches of the bay, aquatic macrophyte diversity increases, with lotus, naiads, and mixed colonies present. Recreation and residential areas in the unit have regularly been Priority Treatment Areas under TVA's Aquatic Plant Management Program.

This unit is suitable for water supply (355 acres), fishing (3,694 acres), multiple recreation use (500 acres), and wildlife management (1,719 acres). Resource objectives include protecting quality fish habitat, allowing for multiple use of littoral areas in vicinities of recreation areas and residential properties, providing for quality waterfowl and aquatic mammal habitat, and providing quality water for municipal use.

North Sauty Creek's designation as a waterfowl refuge is of overriding importance in managing aquatic plants there. Waterfowl, in general, benefit from the habitat values provided by the plants. Commercial, residential and recreation areas intensify human interaction with the reservoir and multiple recreation use should be supported around these lands. Access to boat ramps and residential boathouses will need to be provided.

Plate 1 shows 15.7 miles of shoreline in Unit 11 as potential aquatic plant management areas. Public recreation areas' littoral waters should have less than ten percent of the surface area covered by aquatic plants, for a distance of about 650 feet from the shoreline. Similar coverage is the goal for waters adjacent to residential properties, but the zone of management may be reduced to about 150 feet from the shore. Public boat ramps should have no more than five percent coverage by aquatic macrophytes. These facilities should also be posted cautioning boat owners about transporting exotic aquatic macrophytes into or out of Guntersville Reservoir on their boats or trailers.

An area with a radius of one-quarter mile around the Scottsboro Water Works intake should be maintained and if aquatic plant levels exceed 25% coverage or cause clogging problems, control options should be coordinated with water-plant managers and the ADEM.

Other than the creation of boat channels, macrophyte monitoring, and reservoir-wide management efforts (like drawdown), no management efforts are warranted for the waterfowl management area.

5.6.12 Management Unit 12: Roseberry Creek: Section

This 5,950-acre unit contains the Roseberry Creek-Dry Creek embayment and the City of Scottsboro. Access is available from public boat launches or marinas on either side of the reservoir. The State classifies this reservoir management unit for public water supply, swimming, and the support of fish and wildlife. The Scottsboro Water Works intake at Comer Bridge, together with the City's North Sauty intake, has a design capacity of five mgd. One municipal wastewater discharge is located in the unit. Land cover of the shoreline is primarily forest. Several small recreation areas exist along Roseberry Creek. About 4.5 miles (8%) of Unit 12's shoreline is designated as public recreation areas.

Unit 12 has exhibited diverse aquatic macrophyte seasonal colonizations in recent years. Large mid-reservoir colonies of watermilfoil and hydrilla develop in overbank areas each summer. In the Roseberry Creek area, watermilfoil and mixed colonies predominate. TVA's Aquatic Plant Management Program has considered residential shorelines within the Roseberry Creek embayment as Priority Treatment Areas.

Unit 12 is suitable for water supply (416 acres), multiple use (465 acres) and fishing (5,069 acres). Resource objectives for the unit include providing for quality fish habitat, allowing for multiple use of littoral areas in vicinities of recreation areas and residential properties, and providing quality water for municipal use.

High quality, reliable water supply for Scottsboro is economically important. Residential shoreline properties at Lakeview Shores Subdivision on River Ridge as well as the recreation areas on Roseberry Creek, intensify littoral reservoir use and these areas are classified for multiple use. Shoreline recreation and residential areas require unhindered access to the reservoir for multiple recreational use. Boat docks, piers and public access sites in the unit should remain open to boaters for use. Aquatic plants provide cover and feeding opportunities for fish, values that fishermen expressed as a major consideration in managing Guntersville Reservoir.

Plate 1 shows 18.6 miles of shoreline in Unit 12 as potential plant management areas. Public recreation areas' littoral waters, suitable for multiple use, should be maintained to have less than ten percent of the surface area covered by aquatic plants, for a distance of about 650 feet from the shoreline. Similar coverage is the goal for waters adjacent to residential properties, but the zone of management may be reduced to about 150 feet from the shore.

Access to public boat ramps on Roseberry Creek and at Comer Bridge should have a minimal coverage by aquatic plants. Also, these facilities should also be posted cautioning boat owners about transporting exotic aquatic macrophytes into or out of Guntersville Reservoir on their boats or trailers.

An area with a radius of one-quarter mile around the Scottsboro Water Works intake at Comer Bridge should be monitored and if aquatic plants exceed 25% coverage or cause clogging problems, control options should be coordinated with the water plant manager and the ADEM.

5.6.13 Management Unit 13: Bellefonte

Reservoir Management Unit 13 is 2,567 acres at normal pool. Access is from Comer Bridge or upstream sites, as there are no boat launches in this unit. Alabama classifies this unit for public water supply, swimming, and the support of fish and wildlife. There are no intakes or wastewater outfalls in the unit. There is a TVA water quality monitoring station in Jones Creek. Land cover around the unit is primarily forest and wetland; the islands in the unit are covered with palustrine wetland forest. TVA owned lands on the northwest shore are allocated for multiple use, including navigation and industrial use, public recreation, and wildlife management. On the southeast shore, TVA lands are allocated for forest management demonstrations, timber management, wildlife management and public recreation. About 15% of the shoreline in this unit is designated as public recreation areas. On Jones Creek, there is a Boy Scout Camp.

Watermilfoil dominates the aquatic plant community in this unit. Until 1989, American lotus was present in large beds, but has declined recently. Hydrilla has been found in Unit 13, but reached a maximum of 11 acres in 1988. Residential shoreline areas upstream of Comer Bridge, on both sides of the reservoir, and a Boy Scout Camp on Jones Creek are designated Priority Treatment Areas under TVA's Aquatic Plant Control Program.

This unit is suitable for fishing (2,101 acres) and multiple use (280 acres). A portion of the water supply use zone from Unit 12 extends into Unit 13 (186 acres). Resource objectives include providing for quality fish habitat and allowing for multiple use of littoral areas in vicinities of recreation areas and residential properties. Public recreation areas on Jones Creek receive multiple recreational use, ranging from primary contact recreation to nonpower boating.

Plate 1 shows 10.2 miles of shoreline in Unit 13 as potential plant management areas. With the exception of the overlap from the Comer Bridge water intake, all of these waters are off public recreation areas on Jones Creek. We recommend that this areas be maintained to have less than ten percent of the surface area covered by aquatic plants, for a distance of about 650 feet from the shoreline.

5.6.14 Management Unit 14: Mud Creek

This 4,208-acre unit contains the Bellefonte Nuclear Generating Station, completion of which has been delayed but is presently scheduled to go on-line in the late 1990's. Public access to Unit 14 is from ramps maintained on both Town Creek and Mud Creek embayments. Public

recreation areas are limited to boat access sites in this unit, with less than one percent of shoreline designated as such. The primary land cover types for shoreline land in this unit are forest and wetland. Associated with these land covers are 56 miles (54%) of shoreline designated as wildlife management area.

TVA's granting of a fifteen-year easement to the ALDCNR for management of Mud Creek Wildlife Management Area has preserved much of the unit for wildlife. TVA has allocated land in this unit outside of the Wildlife Management Area for public recreation, timber management, and multiple use forest management. The State of Alabama has classified this portion of the reservoir for public water supply, swimming, and support of fish and wildlife.

Aquatic macrophyte colonies in Unit 14 have historically been dominated by watermilfoil. Hydrilla has not been found yet in monospecific beds greater than three acres in area. TVA's Aquatic Plant Management Program Annual Reports have indicated that aquatic plants covered between 1,900 and 2,700 acres of this unit between 1983 and 1990. The current Priority Treatment Areas in this unit are residential and recreation area shorelines and a marina. Boat channels are also regularly created to improve access to Town and Mud Creeks.

Reservoir Management Unit 14 is suitable for wildlife management (4,149 acres) and multiple use (59 acres). Resource objectives include supporting wildlife management area objectives, as well as supporting boat access at Mud and Town Creeks boat launches and multiple use along residential shorelines.

The Mud Creek Wildlife Management Area is the overriding feature in managing this unit for wildlife habitat. There are small residential areas and three public access sites in the unit that should be considered in managing aquatic plants and should not compromise the primary wildlife management objective.

Accordingly, Sheet 3 shows about 2.5 miles of shoreline that should be considered for potential aquatic plant management. This 2.5 miles represents multiple use areas and should have less than ten percent of the surface area covered by aquatic plants. The wildlife management use areas will be monitored, with particular attention paid to exotic species such as hydrilla. Aquatic plant management efforts will include those technologies that selectively control exotics such as site-specific herbicide treatment, and technologies that affect aquatic plants reservoir-wide, like water-level fluctuation will receive less emphasis for site specific problems. All management efforts will be coordinated with the ALDCNR.

5.6.15 Management Unit 15: Coon Creek-Wannville

Unit 15 is a 2,326-acre area, primarily riverine in character, with many sloughs or backwaters. The east shoreline is designated as part of the Raccoon Creek Wildlife Management Area; most of the west

shoreline is designated part of the Mud Creek Wildlife Management Area. Access to the unit is available from a single public recreation area on Raccoon Creek. Land cover of the adjacent shoreline is dominated by agriculture and forest. TVA has allocated shoreline land it owns along this unit for a variety of uses, from wildlife management to multiple use forest management to industry (Coffey Ferry). The State of Alabama has classified this portion of the reservoir for public water supply, swimming, and support of fish and wildlife. There are no permitted water supply intakes or wastewater outfalls located within Unit 15.

Unit 15 contains one of two TVA natural areas located in the area around Guntersville Reservoir, Raccoon Gulf Natural Area, as well as parts of the Mud Creek Management Area, the Raccoon Creek Wildlife Management Area, and the Crow Creek Waterfowl Refuge. The Raccoon Gulf Natural Area is one of the few true wilderness areas in the TVA system and provides excellent habitat for several endangered or species of concern including the gray bat, Indiana bat, bald eagle, and osprey. The Raccoon Gulf has shallow embayments littered with stumps and other natural debris, creating excellent fish and waterfowl habitat. The abundance of fish and waterfowl attracts bald eagles and osprey into the area for foraging. A bald eagle and an osprey nest were located in this unit in 1991. Because of the remoteness of the area and the underwater hazards to boaters, Raccoon Gulf is not used extensively for boating. It is popular for waterfowl hunting.

Watermilfoil has historically been the dominate aquatic plant in this unit. Its distribution within the unit is largely restricted to backwaters and embayments. To date, hydrilla has not established itself in Unit 15. There are no Priority Treatment Areas in this unit.

Unit 15 is suitable for wildlife management (2,291 acres) and multiple use (35 acres). Resource objectives include supporting wildlife management objectives and boat access from Raccoon Creek access point and multiple use at the recreation area.

Aquatic vegetation colonization of Unit 15 has been limited to embayments and backwaters. Management of aquatic plants in this unit should include monitoring of species coverage and maintenance of multiple use (including boat access) along the shoreline at the public recreation area. Should the Coffey Ferry industrial site be developed, environmental resources should be protected by preserving buffer zones and other mitigation measures.

5.6.16 Management Unit 16: Stevenson

Reservoir Management Unit 16 is 2,545 acres in area. The only direct access to the unit is from Stevenson Municipal Park on Crow Creek. This unit includes most of the Crow Creek Waterfowl Refuge, Crow Creek Wildlife Management Area, much of the Raccoon Creek Wildlife Management Area. Two bald eagles nesting attempts have been reported in the Crow Creek Waterfowl Refuge area. The TVA owns

nearly all of the land bordering this unit and has allocated it for wildlife management, timber management, forest management demonstrations, and multiple use forest management. Common shoreline land covers are rowcrop land, pasture, or wetland.

The State of Alabama has classified this portion of the reservoir for public water supply, swimming, and support of fish and wildlife. Crow Creek is classified for support of fish and wildlife. There are two treated industrial wastewater outfalls and one treated municipal wastewater outfall in the unit.

Aquatic plant coverage in Unit 16 has not shown the post-1988 decline as dramatically as downstream management units. In 1983, 599 of the total 849 acres were watermilfoil, the remainder being largely lotus and other native plants. Watermilfoil was 496 of the 1,226 acres vegetated in 1988, while lotus was 386 acres and pure or mixed beds of naiads were 224 acres. In 1990, the 953 acres of vegetation included 359 acres of watermilfoil, 319 acres of naiads, and 176 acres of mixed naiads-watermilfoil. No lotus was found in 1989 and 1990. Stevenson Municipal Park, in the Crow Creek embayment, is a Priority Treatment Area under TVA's Aquatic Plant Control Program.

Unit 16 is suitable for wildlife management (2,530 acres) and multiple use (15 acres). Resource objectives include providing feeding and resting habitat for waterfowl and aquatic mammals, supporting boat access from Stevenson Municipal Park, and allowing for possible water quality benefits effects of aquatic plants around treated wastewater outfalls.

Plate 1 shows about 2.2 miles of shoreline that should be considered potential aquatic plant management areas. These 2.2 miles represent multiple use areas (Stevenson Municipal Park) and should be maintained to have less than ten percent of surface area covered by aquatic plants. Although no control activities are currently needed at this park, if monitoring indicates that aquatic plants are adversely affecting the use of the Stevenson Municipal Park boat launch, localized control measures may be needed. The wildlife management use areas will be monitored, with particular attention paid to hydrilla distribution. Aquatic plant management efforts will include those technologies that selectively control exotic species in site specific areas, such as hydrilla, and technologies such as drawdown that have reservoir-wide effects will have less emphasis for site specific problems.

5.6.17 Management Unit 17: Widows Creek

This 1,589-acre unit, again, riverine in character, includes the TVA's Widow Creek Steam Plant and the upstream end of the Raccoon Creek Wildlife Management Area on Long Island Creek. Public access is from either of two boat launches, on opposite sides of the reservoir. The primary land cover types for shoreline land in this unit are agriculture and deciduous forest. Most of the shoreline is owned by the TVA and,

according to its land management plan, is allocated primarily for wildlife management. About 48% of the shoreline is designated as wildlife management areas.

The State of Alabama has classified this portion of the reservoir for public water supply, swimming, and support of fish and wildlife. Widow Creek is classified for swimming and fish and wildlife. The only water supply intakes located within the unit are the two supplying cooling water to the Widow Creek Plant (TRM 407.7). Treated wastewater discharges to the unit include two to Widow Creek and one to the Tennessee River.

Units 16, 17 and 18 have shown similar patterns of aquatic vegetation colonization. Like Unit 16, vegetation colonies in Units 17 and 18 did not exhibit the post-1988 decline in acreage to the extent that downstream units did. Unit 17 is dominated by watermilfoil and watermilfoil mixed with naiads. This unit has no Priority Treatment Areas under TVA's Aquatic Plant Control Program.

Unit 17 is suitable for wildlife management (1,571 acres) and multiple use (18 acres). Resource objectives are to provide feeding and resting habitat for waterfowl and aquatic mammals and to support boat access from two public boat launches.

Plate 1 shows about 0.4 mile of shoreline that might be considered a potential aquatic plant management area. This area is offshore of a public recreation area on the mainstream of the reservoir. Few aquatic plants colonize this area. And, given the lack of waterfront recreation at this recreation area, little management is generally required there.

Monitoring of aquatic plants should continue in this and all reservoir management units. Although no control activities are currently needed in Unit 17, if monitoring indicates that aquatic plants are adversely affecting the use of access points or water intakes, localized control measures may be needed. The occurrence of hydrilla in the wildlife management area should particularly be monitored, and, if found, measures taken to control it.

5.6.18 Management Unit 18: South Pittsburgh

This 2,313-acre unit is the most upstream unit in Guntersville Reservoir. Access to the unit is from Nickajack Dam, South Pittsburgh Municipal Park, Bridgeport, or Reese Ferry. There are barge terminals, mooring sites, and safe harbor areas along the shoreline. The primary land cover types for shoreline land in this unit are agriculture and deciduous forest. Most of the shoreline is owned by the TVA and, according to its land management plan, is designated for low density public recreation and wildlife habitat. Long and Burns Islands, managed for wildlife habitat, are located within this unit. This far upstream, the reservoir itself is more riverine in character than lacustrine.

The States of Alabama and Tennessee have classified this portion of the reservoir, including the lower end of Sequatchie River, to be suitable for domestic, agricultural and industrial water supply, support of fish and wildlife, recreation, and, navigation. Hunting and fishing are two of the more popular activities occurring in this part of the reservoir. Water supply intakes are operated by the municipalities of South Pittsburgh, Bridgeport and Jasper, and one industrial concern. Treated wastewater is discharged to the unit by the same three municipalities.

Aquatic vegetation in Unit 18 is dominated by watermilfoil and watermilfoil mixed with naiads. The unit has no Priority Treatment Areas under TVA's Aquatic Plant Control Program. Vegetation in the unit has not declined in the two years monitored after the 1988 reservoir-wide maximum as have midreservoir units.

Unit 18 is suitable for wildlife management (1,969 acres), water supply (244 acres) and multiple use (100 acres). Commercial navigation facilities will retain their use, continuing TVA's role in supporting interstate commerce.

Resource objectives include providing feeding and resting habitat for waterfowl and aquatic mammals, preventing municipal water intakes from becoming fouled with aquatic plant material, and allowing for multiple use of littoral areas in vicinities of public recreation areas and for safe access to boat ramps.

Plate 1 shows 6.9 miles of shoreline that should be considered as potential aquatic plant management areas. Aquatic vegetation colonization of Unit 18 has historically been limited to tributary embayments, particularly Battle Creek. The 1989 colonization database shows no colonization of the mainstem. Little management should therefore be required in most years. Monitoring of plant colonization should be continued. If the use of access ramps becomes hindered because of aquatic vegetation, then localized control procedures should be implemented.

A reservoir radius of one-quarter mile around the four water supply intakes should also be monitored, and if aquatic plant coverage exceeds 25% or causes clogging problems, control options will be coordinated with the water plant manager and the appropriate state agencies.

6.0 Conclusion

6.1 Aquatic Plant Management

The objective of this Master Plan were to describe management strategies for a five-year period for the reservoir's 18 management units to minimize conflicts between the aquatic plants and reservoir users. It must be realized however, that the dynamic changes in aquatic plant

communities require that flexibility be retained to respond to changing conditions. The Master Plan thus serves as a guide for managing aquatic vegetation. The management plan so formulated was intended to balance competing demands and community interests with the environmental effects of plant management. The Master Plan's strategies addressed the geographic distribution of aquatic plants on the reservoir rather than the techniques of plant management.

The TVA's current aquatic plant management program using Priority Treatment Areas is based upon reservoir shoreline uses. The Master Plan is based upon reservoir use suitability. Because shoreline features strongly influence reservoir use suitability, the Master Plan is not significantly different from the current TVA program. Essentially, the Master Plan includes reservoir areas beyond the current plant management program by including potential plant management areas around water intakes and undeveloped recreation lands. These areas are not currently included as Priority Treatment Areas nor are they planned for inclusion in the near term because use conflicts rarely exist there. This is further elaborated upon in the Environmental Assessment (Appendix A of the Main Report).

This Master Plan is scheduled for updating in 1994 (and subsequently thereafter, depending upon changes in public perceptions, plant management technologies, and other factors) to incorporate additional resource data currently being generated. Public participation will again be included in this update.

6.2 TVA Contacts

The public is encouraged to contact the TVA aquatic plant management staff with questions or aquatic plant management requests. Please contact one of the following individuals using TVA's public hotline (1-800-288-2483) or in writing:

A. Leon Bates, Earl. R. Burns, or David H. Webb
Vector and Plant Management
Tennessee Valley Authority
Office Service Annex 1B
Muscle Shoals, Alabama 35660

If you have questions about this Master Plan you may contact one of the above individuals or the authors of the Master Plan:

David B. Pott
Harza Engineering Company
Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606
1-312-831-3000

Mr. Joe Morrison, Jr.
Environmental Resources Branch
U.S. Army Corps of Engineers
P.O. Box 1070
Nashville, Tennessee 37202
1-615-736-5026

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HARZA

KEY MAP

TENNESSEE

ALABAMA

LEGEND

EXISTING PRIORITY TREATMENT AREAS

POTENTIAL AQUATIC PLANT MANAGEMENT

BOAT LAUNCH

PUBLIC SWIMMING AREA

WASTEWATER OUTFALL

WATER INTAKE

RESERVOIR MANAGEMENT UNIT BOUNDARY

RESERVOIR MANAGEMENT UNIT NUMBER

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TENNESSEE VALLEY AUTHORITY
WATERWAYS EXPERIMENT STATION, US ARMY CORPS OF ENGINEERS

GUNTERSVILLE RESERVOIR
AQUATIC PLANT MANAGEMENT
MASTER PLAN

AQUATIC PLANT
MANAGEMENT PLAN

SHEET 2 OF 4

PLATE 1

North

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HARZA

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north

KEY MAP

TENNESSEE

ALABAMA

LEGEND

- EXISTING PRIORITY TREATMENT AREAS
- POTENTIAL AQUATIC PLANT MANAGEMENT
- BOAT LAUNCH
- PUBLIC SWIMMING AREA
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 AQUATIC PLANT MANAGEMENT
 MASTER PLAN

AQUATIC PLANT MANAGEMENT MAP

KEY MAP

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ALABAMA

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EXISTING PRIORITY
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GUNTERSVILLE RESERVOIR
AQUATIC PLANT MANAGEMENT
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AQUATIC PLANT
MANAGEMENT MAP

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