

SECTION 7

MEASURABLE MILESTONES & EVALUATION OF PROGRESS

7.1 Management Strategies to Achieve Targeted Reductions

Eighteen broad objectives were identified based on the causes and sources of degradation for Lake Chatuge (discussed in Section 5). These objectives are presented in Table 7. The recommended actions listed in Section 6 are based on these objectives. Although all of the recommendations will help accomplish the goals of the Plan, for implementation purposes it is necessary to develop more specific, measurable management *strategies* for the watershed. If accomplished, the strategies discussed in this section should return Lake Chatuge to Good Ecological Health as assessed by TVA's Reservoir Vital Signs Monitoring Program. The strategies were chosen based on the following:

- identified objectives and suggested management measures;
- ability to help achieve needed nutrient load reductions to the lake;
- cost effectiveness and relative ease of implementation;
- ability to measure the results

Six measurable management strategies were selected:

1. Reduce the Total Phosphorus load from the Hiawassee WWTP by 50%
2. Restrict from streams and/or the lake, and provide appropriate alternative watering for, a minimum of 125 animals (25%) that currently have unrestricted access
3. Improve 40% of pastures considered to be in fair condition to good condition (about 2,500 acres)
4. Improve 50% of the most degraded pasture areas to a minimum of conditions considered fair (about 440 acres)
5. Reduce the Total Phosphorus load by 30% from existing commercial areas (about 1000 acres)
6. Reduce TP load by 5% from existing residential areas (nearly 7,000 acres)

There are other combinations of actions that will also accomplish the desired results. However, these are the strategies that were deemed by the planning team to produce the largest improvements for the resources invested, based on the above criteria. In addition to these strategies, efforts must also be undertaken to ensure that new development is better development in terms of watershed and water quality protection.

7.2 Implementation Schedule

A 15-year timeline spanning three phases of implementation is presented in Table 8. Year 1 will begin when funding first becomes available. Sub-watersheds identified as high and medium priority on Table 6 (pg. 42) will be prioritized for BMP implementation.

Table 7. Summary of Management Objectives Identified for the Lake Chatuge Watershed

Causes	Sources	Management Objectives
<ul style="list-style-type: none"> • Excess nutrients • Increased growth of algae • Low dissolved oxygen 	<ul style="list-style-type: none"> • Lack of nutrient limits for NPDES permitted discharges • Runoff from pasturelands • Unrestricted livestock access to streams • Leaky or failing septic systems • Untreated post-construction stormwater runoff from commercial and residential developed areas • Excess fertilizer runoff from lawns • Waste from pets and wildlife 	<ol style="list-style-type: none"> 1. Implement nutrient reduction strategies for permitted wastewater treatment plant discharges. 2. Reduce runoff from pasturelands. 3. Restrict livestock access to waters by installing fencing, stream crossings, and alternative watering sources. 4. Identify leaking and failing septic systems within the watershed and repair or replace them as needed. 5. Install retrofit stormwater BMPs when possible for existing commercially developed areas and residences to provide treatment of stormwater runoff. 6. Incorporate appropriate stormwater BMPs for new commercial and residential development within the watershed at the time of construction. 7. Reduce nutrient loads from excess lawn fertilizers and waste from pets and wildlife.
<ul style="list-style-type: none"> • Excess Sediment 	<ul style="list-style-type: none"> • Lack of adequate erosion control practices implemented and/or maintained during construction • Lack of enforcement of existing laws • Overgrazing and damage to stream banks by livestock • Erosion of stream banks associated with stormwater impacts and natural events (e.g. storms, floods) 	<ol style="list-style-type: none"> 8. Improve implementation of erosion/sediment control BMPs on construction sites within the watershed. 9. Employ and equip personnel for adequate enforcement of existing laws and rules pertaining to water quality protection. 10. Rotate livestock and implement BMPs for winter-feeding as needed to prevent loss of vegetation and overgrazing. 11. Reduce impervious surfaces to minimize impacts from storms.
<ul style="list-style-type: none"> • Increased Temperature 	<ul style="list-style-type: none"> • Lack of adequate riparian buffers • Removal of streamside and shoreline vegetation during development of property or associated with agricultural activities • Damage to vegetation by livestock • Large amounts of impervious surfaces 	<ol style="list-style-type: none"> 12. Restore and protect wooded shoreline and riparian buffers. 13. Limit removal of streamside and shoreline vegetation during development and associated with agricultural activities. 14. Prevent damage to riparian vegetation by livestock. 15. Limit imperviousness in the watershed.
<ul style="list-style-type: none"> • Increased runoff associated with rain/snow events 	<ul style="list-style-type: none"> • Proximity of roads to streams • Uncontrolled stormwater runoff from commercially developed areas and roads/highways 	<ol style="list-style-type: none"> 16. Avoid building roads right next to streams. 17. Control stormwater runoff from commercially developed areas and roads and highways and prevent concentrated flows directly into streams and the lake.
<ul style="list-style-type: none"> • Decreased aquatic and small game/bird habitat 	<ul style="list-style-type: none"> • Construction of homes or buildings within 50 feet of lake shoreline or stream banks • Lack of adequate riparian buffers 	<ol style="list-style-type: none"> 18. Limit construction of homes or buildings within 50 feet of the lake shoreline and stream banks.

Table 8. Implementation Schedule for the Lake Chatuge Watershed Action Plan

Action Plan Strategies*	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR 11	YR 12	YR 13	YR 14	YR 15
Implement aggressive nutrient reduction strategies at the Hiawassee WWTP		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Develop a proactive plan for handling sewage leaks and spills		X	X												
Identify sites for agricultural BMPs	X	X	X												
Eliminate unrestricted cattle access from streams/lake (50 animals)		X	X	X		X	X	X	X		X	X	X		
Improve "Fair" pastures to "Good" (250 ac)		X	X	X		X	X	X	X	X	X	X			
Improve "Poor" pastures to "Fair" (50 ac)		X	X	X		X	X	X	X	X	X	X			
Identify sites for commercial BMPs	X	X	X												
Install stormwater BMPs for TP reduction in existing commercial areas (80 ac)			X	X	X	X	X	X	X	X	X	X	X	X	X
Identify sites for residential BMPs	X	X	X	X											
Install stormwater BMPs for TP reduction in existing residential areas (585 ac)			X	X	X	X	X	X	X	X	X	X	X	X	
Identify demonstration sites for watershed-friendly new developments		X					X					X			
Revegetate bare, eroding cuts behind homes/buildings (1 ac/10 buildings)		X	X	X			X	X	X			X	X	X	
Plant 1000 linear ft of riparian buffer		X	X	X			X	X	X			X	X	X	
Bi-annual newsletter project updates	X	X	X												
Annual project status report				X		X	X	X	X		X	X	X	X	
Develop educational materials	X	X	X												
Monthly stream monitoring	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Assess the ecological health of the lake	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Re-evaluate and update the Action Plan					X					X					X

* Numerical values represent quantities restored per year

Strategies during the first five years (Phase I) generally involve implementation of nutrient reduction strategies at the Hiwassee wastewater treatment plant, development of a plan for handling sewage leaks and spills from the sanitary sewer system, locating and prioritizing sites for agricultural, residential, and commercial best management practices (BMPs), and beginning practice installation. During Phase I, approximately 900 acres of pasture, 240 acres of commercial development, and 1750 acres of residential development will be treated. In addition, 30 acres of critically eroding bare areas will be re-vegetated and 3,000 linear feet of riparian buffer re-planted. At the end of Phase I, funding, participation, and accomplishments will be reviewed, along with water quality data, and this plan will be re-evaluated before proceeding into Phases II and III.

7.3 Evaluation of Progress

HRWC will evaluate progress by tracking:

- (1) Sites reviewed for possible BMP installation
- (2) Practices planned
- (3) Practices installed
- (4) Reductions anticipated for targeted parameters associated with installed practices

In addition to sites selected for BMP installation through the formal process, HRWC plans to set up a system (hopefully online) whereby anyone can input actions taken (from the list of recommendations) watershed-wide. This way practices will be accounted for down to the smallest backyard buffer planting or rain garden installation; the system would also allow all stakeholders to fully participate in the restoration process! New local ordinances or changes to existing ordinances that positively impact water quality will also be tracked.

7.4 Measures of Success

Actual water quality data will be a key component of measuring success of the Action Plan. Major streams flowing into Lake Chatuge will continue to be monitored monthly for 14 parameters including turbidity, Total Suspended Solids, phosphorus, nitrogen, and nitrate/nitrite. Data throughout the life of the restoration effort will be compared periodically to more than four years of baseline data collected at the existing locations. The Tennessee Valley Authority will continue to assess the lake annually as part of its Reservoir Vital Signs Monitoring Program.

Overall project success will be determined by one or more of the following:

- (1) Implementation of BMPs such that the targeted reductions outlined in Section 5.5 are met.
- (2) Improvement in stream water quality is observed as measured by the HRWC volunteer monitoring program.
- (3) Chlorophyll-*a* concentrations do not exceed state water quality standards.
- (4) Improvement in TVA's Ecological Health Rating for Lake Chatuge is observed.