

NONPOINT SOURCE POLLUTION WATERSHED SURVEY

OF

BASHAN LAKE, EAST HADDAM, CT.

CLEAN WATER ACT SECTION 319

CONNECTICUT WATERSHED PROJECT

Prepared for:

**The Connecticut Department of Environmental Protection
Bureau of Water Management
Lakes Management Section**

Prepared by:

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1993

INTRODUCTION

Benson Environmental Inc. was contracted by The Connecticut Department of Environmental Protection to conduct a Clean Water Act, Section 319 Nonpoint Source Pollution Watershed Survey of Bashan lake located in East Haddam, CT.

Nonpoint source pollution enters a lake from a variety of places, including but not limited to; storm water drainage, sheet runoff from lawns, seepage from on-site septic systems, forestry operations, construction activities and streambank erosion. The watershed or drainage basin is the area surrounding a lake in which all the land and water drains down into the lake which is at a lower elevation, see Map 1.

The water quality of the watershed's runoff greatly affects the ultimate water quality of the receiving pond or lake. Excess nutrients from nonpoint sources of pollution in the runoff increase algal and weed growth, while excess sediments can cause turbidity and can fill in areas of a pond or lake, increasing habitat for rooted aquatic weeds. Other pollutants such as pesticides and herbicides can disrupt the ecosystem of the waterbody.

The water quality data from Bashan Lake in the "Chemical and Physical Properties of Connecticut Lakes", indicates that the lake is not very productive with sparse areas of moderate weed beds and a water clarity depth of 18 feet. Recently there has been a infestation of watermilfoil by the boat launch that is being controlled by an initial limited chemical treatment, followed by small scale manual harvesting.

The implementation of Best Management Practices for the improvement of the lake's watershed included in this report are essential to the long term viability of the lake. Best

Management Practices (BMPs) are the most recent and proven methods for improving the quality of the water that runs off the watershed into the lake. BMPs range from the latest designs and maintenance of catch basins, septic systems and landscaping to proper zoning and land use planning.

This project consisted of three phases, the first included a review of Bashan Lake existing water quality data, a preliminary evaluation and a review of the lake's watershed and meetings with town officials and citizens. The second phase included additional field surveys and informing officials of any potential impacts to the water quality of Bashan Lake. The third phase, includes this final report which identifies nonpoint source pollution to Bashan Lake and makes recommendations for the implementation of Best Management Practices to reduce any negative impacts to the lake's water quality. Watershed maps are included that identify current land use and any potential problem areas in the watershed of Bashan Lake. Phase three, includes a meeting presenting the final report to the town and the lake association.

DESCRIPTION OF THE WATERSHED

The watershed of Bashan Lake comprises 1,275 acres and is located within the town of East Haddam, Connecticut. The watershed to lake surface area ratio is 4.6 to 1. This ratio indicates that the watershed is relatively small, with a limited area contributing nutrients to the lake. Larger watersheds can cause greater sediment and nutrient loads to a lake. Presently the small watershed of Bashan Lake appears to be providing a low concentration of nutrients to the lake, resulting in good water quality. However, with a small watershed, changes in land use can have negative impacts to the lake's water quality.

The outlet of Bashan Lake is located at the northern tip of the lake and flows a short distance to Moodus Reservoir. The reservoir then drains to the Moodus River and eventually enters the Connecticut River.

Soils

Map 1 depicts the suitability of soils for on-site septic disposal. The soils information was taken from the "Soil Survey of Middlesex County, Connecticut", prepared by the U.S.D.A. Soil Conservation Service and The Connecticut Agricultural Experiment Station. The soils were interpreted using aerial photographs and individual soil types less than 3 acres may not be delineated separately. These maps are meant to be a planning guide with actual field testing of the soil required for specific areas.

The areas of well drained, gently sloping soils not shaded on the map are well suited for individual on-site septic systems and belong to the Canton and Charlton fine sandy loam soil series. These soils comprise only a small section of the watershed.

The poorly drained, wetland soils, colored bright green on Map 1, are mainly Leicester, Ridgebury and Whitman which are extremely stony fine sandy soils. The soils are deep and formed in glacial till, with a water table located 0.0 to 1.5 feet below grade in Leicester and Ridgebury loams from November through May and 0.0 to 0.5 feet in Whitman loam from September through June. Activities within 75 feet of these soils are regulated by the East Haddam Inland Wetland and Watercourses Commission. Although these soils are delineated in the County Soil Surveys, individual soil delineation is necessary for permit review.

Most of the watershed contains soil with a perched water table at 1.5 to 3.0 feet below grade from November to March. The perched water table is due to the slow or very slow permeability of the substratum. These soils are not classified as wetland, but they still require engineered septic systems to prevent breakout of effluent to the surface. The soil series in most of the watershed are Woodbridge and Paxton, fine sandy loams, colored dark green on Map 1.

A small area of excessively drained glacial drift sandy soils are located in the northwest corner of the watershed. The sandy soils, colored yellow on Map 1, were formed in glacial outwash plains, stream terraces, kames and eskers. The soils contain sorted mixes of sand, gravel, cobbles and are Agawam and Hinckley fine sandy loams. The sandy texture and rapid permeability within the soils require careful on-site septic design to prevent groundwater and surface water pollution. Leachate from these systems can move through the soil before it is renovated, resulting in nutrient loading to the lake.

Areas of shallow depth to bedrock and slopes over 20%, colored pink on Map 1, occur in southwestern, southeastern and northwestern portions of the watershed. The soil units are

Charlton-Hollis loam and Hollis-Charlton extremely stony fine sandy loams. Bedrock is usually encountered between 15 and 20 inches in Hollis soils. Shallow to Bedrock soils are limited for development due to excavation problems, erodibility, rock outcroppings, slope and stoniness. Outcrops of bedrock can be observed throughout these areas. The bedrock underlying the watershed consists of Brimfield schist, a gray, rusty weathering medium to coarse grained interlayered schist and gneiss. Outcroppings of a gray, medium grained layered gneiss occur along the eastern portion of the watershed. Breakouts of septic leachate along the soil / bedrock interface can occur, requiring on-site septic systems to be carefully engineered to avoid groundwater and surface water pollution.

Land Use

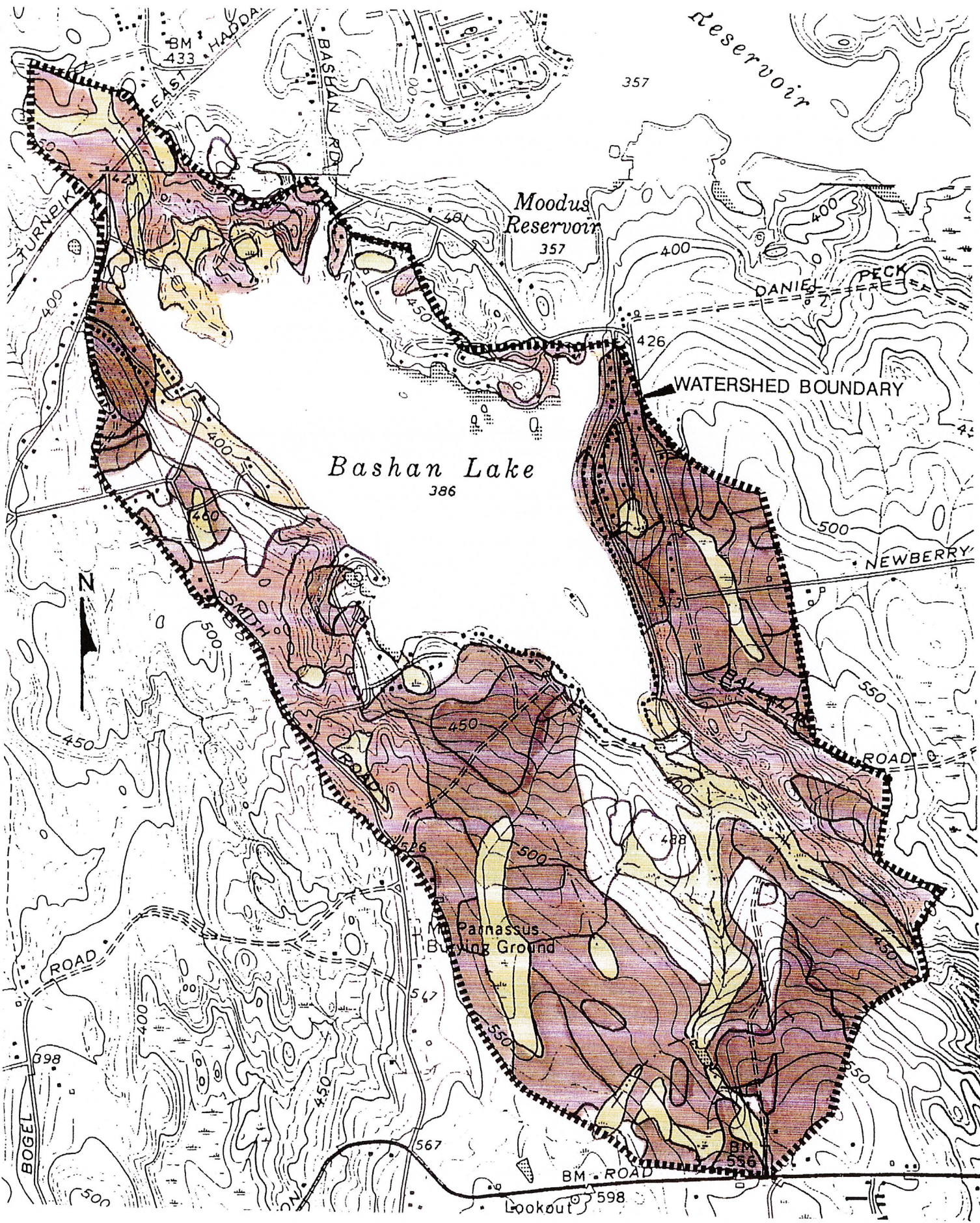
Map 2 depicts current land use. Home construction completed after any revisions to the U.S.G.S. topographical maps were added to the base map during field visits.

The watershed of Bashan Lake consists of single family residential development, woodland, wetlands and sparse agricultural use. The State owned boat launch is a small paved area at the southern end of the lake. Dense residential development is located along the southeastern, southwestern and northwestern lake shores. Moderately dense residential development is located in the northern portion of the watershed. A tree farm is located along Ballahack Road #2 as well as a small cornfield at the corner of Ballahack Road #2 and Newberry Road.

The perennial streams which help recharge the lake and their associated wetland corridors are mostly undisturbed and protected by closed canopy woodlands. The largest portion of the watershed which lies between the lake and Millington Road consists of undisturbed

woodlands and wetlands. The vegetated wetlands provide nutrient uptake and sediment removal along wetland corridors prior to the streams entering the lake.

A shoreline survey was conducted on 6/4/93. The shoreline was inspected visually from a boat for obvious nonpoint sources of pollution. The density of the homes along the shoreline and lack of suitable space for septic systems was noted. Many of the lawns extend down to the water with little or no vegetated buffer zones along the shoreline for nutrient uptake. On the eastern shore several of the lots appeared to be completely ledge with apparently very little available soil for adequate on-site septic systems. Several stormwater pipes were observed but there were no obvious signs of problems such as the formation of large sand deltas. A few renovations or new construction were observed with no site sedimentation and erosion controls. These sites were reported to the Town's Building Official, Wayne Green.



Bashan Lake
386

Moodus Reservoir
357

WATERSHED BOUNDARY

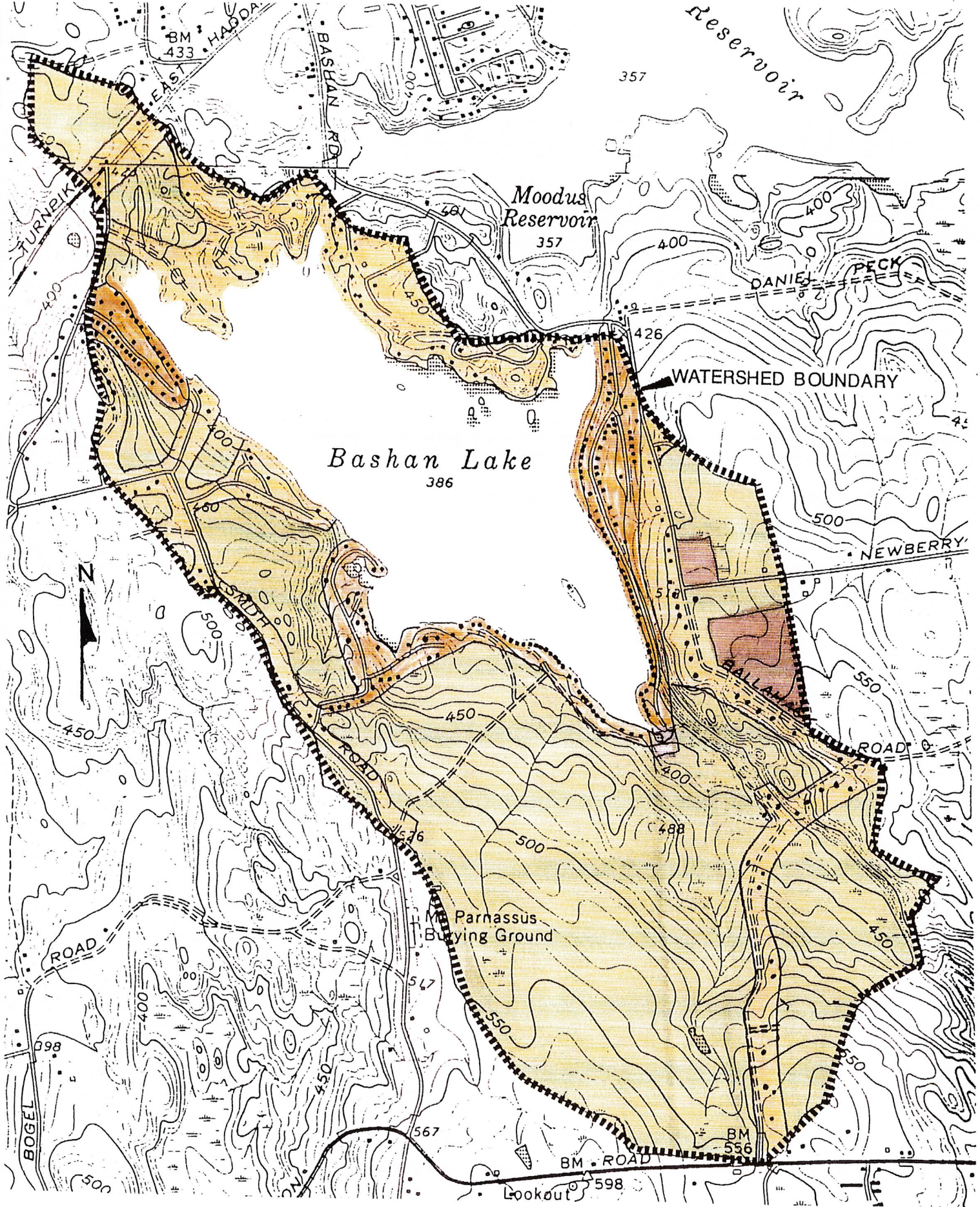
Parnassus
Burning Ground

BASHAN LAKE WATERSHED

Map 1 Septic Suitability

- | | |
|--|--|
|  Wetland soil, poorly drained |  Excessively drained soil |
|  Perched water table |  Shallow to bedrock, slopes |

Scale 1"=1000'



BASHAN LAKE WATERSHED

MAP 2 LAND-USE

- | | |
|--|--|
|  DENSE DEVELOPMENT |  WOODLAND |
|  MODERATELY DENSE DEVELOPMENT |  AGRICULTURAL |
|  STATE BOAT LAUNCH | |

Scale 1"=1000'

SPECIFIC TOPICS OF CONCERN

The Bashan Lake watershed survey has identified several topics of concern including; on-site septic systems, the use of privies, stormwater and road drainage and land use.

Waste Disposal Systems

The densely populated sections of the lake shore consist of many summer cottages which have been renovated for year round habitation, causing concern over the viability of the septic systems. These concerns were first addressed through a preliminary sanitary survey as described in a 1970 memo from George Calkins, Sanitarian Trainee, Southeastern Regional Office, to Mila Rindge, M.D., Medical Director, Southeastern Regional Office. Through a conversation with the previous Town Planner and Wayne Green, Building Official - Sanitarian it became evident that the condition, location and size of the septic systems has not been adequately documented.

Undersized and failing septic systems can introduce nutrients and household waste to the groundwater and surface water. Developed and undeveloped areas of the watershed contain soils that are not suitable for, or require engineered, on-site septic systems. The soils along the eastern shore have a perched water table which requires the use of fill and extensive leaching areas. The areas of the western shore that have perched water table and shallow depth to bedrock are susceptible to septic system breakouts. Excessively drained sandy soils may percolate too rapidly for septic system disposal areas.

New or repaired septic system disposal areas must be engineered to reduce the possibility of effluent reaching the surface water. A survey of the existing septic systems in the lakes watershed is recommended in order to evaluate the areas in need of remediation. This type of survey is called a sanitary survey and could include file searches of Building Department records, interviews with home owners, field inspection and testing. The intent of a sanitary survey is to locate the waste disposal systems, identify the type of system and determine break outs and undersized systems. Once this information is assembled an assessment of corrective measures can be determined.

The southwestern portion of the watershed contains an area called Wildwood, where approximately 38 summer cottages have privies (out-houses) as a means of waste disposal. This area should be prioritized for a sanitary survey to determine the location of the privies, their maintenance and the method for the disposal of the grey (bath and sink) water should be evaluated. It is recommended that this inventory go beyond the sanitary survey and include potential options to the use of privies and managing the grey water.

The Bashan Lake Association should contact Wayne Green, East Haddam's Building Official -Sanitarian for assistance. Potential funding for a sanitary survey is available from State of Connecticut through the Department of Environmental Protection. The work could be completed by the local Building Department or a private consulting engineering firm under contract with the town.

An immediate step the association can undertake to reduce the potential of septic system break outs is a septic system pump out program. A similar program has been conducted for several years at Lake Hayward and has been successful. A septic system pump out program consists of the association coordinating multiple tank cleanings with a single

septic company to provide a discount to individual homeowners. The discount is realized when several tanks are pumped during a given trip. Coordinating pumping can reduce the likelihood of break outs, provide a record for the association and protect property values.

Stormwater Management

Methods to manage stormwater quality include; catch basins with sumps, detention ponds, grass swales and vegetated buffer zones. These methods will substantially reduce pollutant loads to the lake if they are maintained regularly. Stormwater quality can be further improved by reducing or eliminating sources of pollution such as limiting road sanding, stabilizing erosive areas, sweeping roads and cleaning catch basins regularly. Among the many things homeowners can do to improve stormwater quality are, eliminating or reducing fertilizer use, washing cars away from the lake in grassed areas and proper disposal of lawn and yard waste.

The Town of East Haddam is actively improving many of the town roads in the lake's watershed. These improvements include installing catch basins with sumps. Roads that have been completed include Bashan, Alger and Ballahack # 2. Through a conversation with Andrew Tierney, Highway Foreman, it is evident that the town is aware of the need to maintain catch basins. Mr. Tierney has reported that catch basins are cleaned at least once a year and that any new road improvements will include stormwater BMPs. Concerns regarding roadway runoff for town roads should be addressed to the local highway department at 873-5023.

During the field inspection of the watershed road drainage problems were observed on Overlook and Sunset Roads, especially in the community beach area. Mr. Tierney has reported that these roads are scheduled for renovations of the stormwater system.

Privately owned roads within the watershed not maintained by the town include roads that do not have catch basins and are unpaved and have little protection against soil erosion into the lake. A survey of the private roads stormwater conveyance systems should be completed to assess the areas that need improvement of current systems and the possible establishment of new remediation techniques, (BMPs). A good source of information on engineering BMPs is "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMP's", Department of Educational Programs Metropolitan Washington Council of Governments, 1987. This manual can be purchased by phoning 202-962-3256.

Land Use

The entire shoreline and the majority of the watershed is zoned as LR, Residential (Lake and Riverfront), with a minimum lot size for conforming lots of 1 acre. A designation of LR means a seasonal dwelling is allowed provided waste disposal and water supply meet health code standards. Sections of the southern portion of the watershed are zoned R-1, with minimum lot size for conforming lots of 1 acre. Areas to the southeast of the lake are zoned R-2, with a minimum lot size of 2 acres. Any pre-existing nonconforming lots have to be developed according to the health codes which call for 75 feet between the septic system and the well. These zoning laws and the wetland and watercourse setback of 75 feet are adequate and should be maintained in the future.

The majority of the Bashan Lake Watershed is currently undeveloped, however the potential for development does exist. It is important for the lake association to become involved in local land use decisions. Lake association members should be aware of any possible development in the lake's watershed and should serve on the local planning,

zoning and wetland commissions. Participation in these commissions should insure that if the watershed is developed the affect on the lake's water quality is minimized.

Another way the lake association can become involved in land use planning is to develop a land use plan for the Bashan Lake watershed. A land use plan could identify tracts of undeveloped property and review methods for managing the lands future use. These methods could include conservation restrictions, buying development rights, or out right purchases of land by a land trust. The land use plan should also include a projection of the maximum potential development of the watershed under current zoning regulations. This information can be used to prioritize where land use planning methods could be applied. A land use plan should include an identification of undeveloped property on town maps to alert local commissions to the possible impacts to the lake if these areas are developed.

The lake association should consult with the Planning and Zoning Department on how to initiate a land use plan. Land use planning services are available from the Mid - State Regional Planning Agency, 347-7214, DEP Bureau of Water Management, Division of Planning and Standards, 566-7049, The Middlesex Extension Center, 345-4511 and private consulting firms. Possible funding may be available from the same program which funded this watershed management report, Section 319 of the Federal Clean Water Act.

CONCLUSIONS

This nonpoint source pollution watershed survey of Bashan Lake has identified existing and potential areas of concern. The purpose of this report was to collect and present this baseline information on the watershed of the lake and to recommend short and long term watershed management strategies. The identification of these nonpoint sources of pollution to the lake and preliminary recommendations is only the beginning. Bashan Lake currently has good water quality and the purpose of these recommendations is to maintain the lake's water quality for the future.

A lake watershed management program can only work with the help of the homeowners. Understanding that the individual homeowners actions can ultimately affect the lake's water quality is essential. The Bashan Lake Association has already begun the process of informing the residents with the publication of The Bashan Lake Reporter and the writing of the Watermilfoil Report for Bashan Lake. This type of educational material, including this report should continue and be expanded to inform all the homeowners in the watershed and all those that use the lake for swimming, boating or fishing.

Included at the end of this report is information that will be helpful in beginning a lake and watershed management program. The first section is the References that were used to complete this watershed report. The second is a list of Watershed Educational Material that includes Best Management Practices and general educational material on watershed protection and management. The final section is a Watershed Assistance Directory that includes the local, county, state and federal agencies that can offer assistance for specific problems concerning nonpoint source pollution in the lake's watershed.