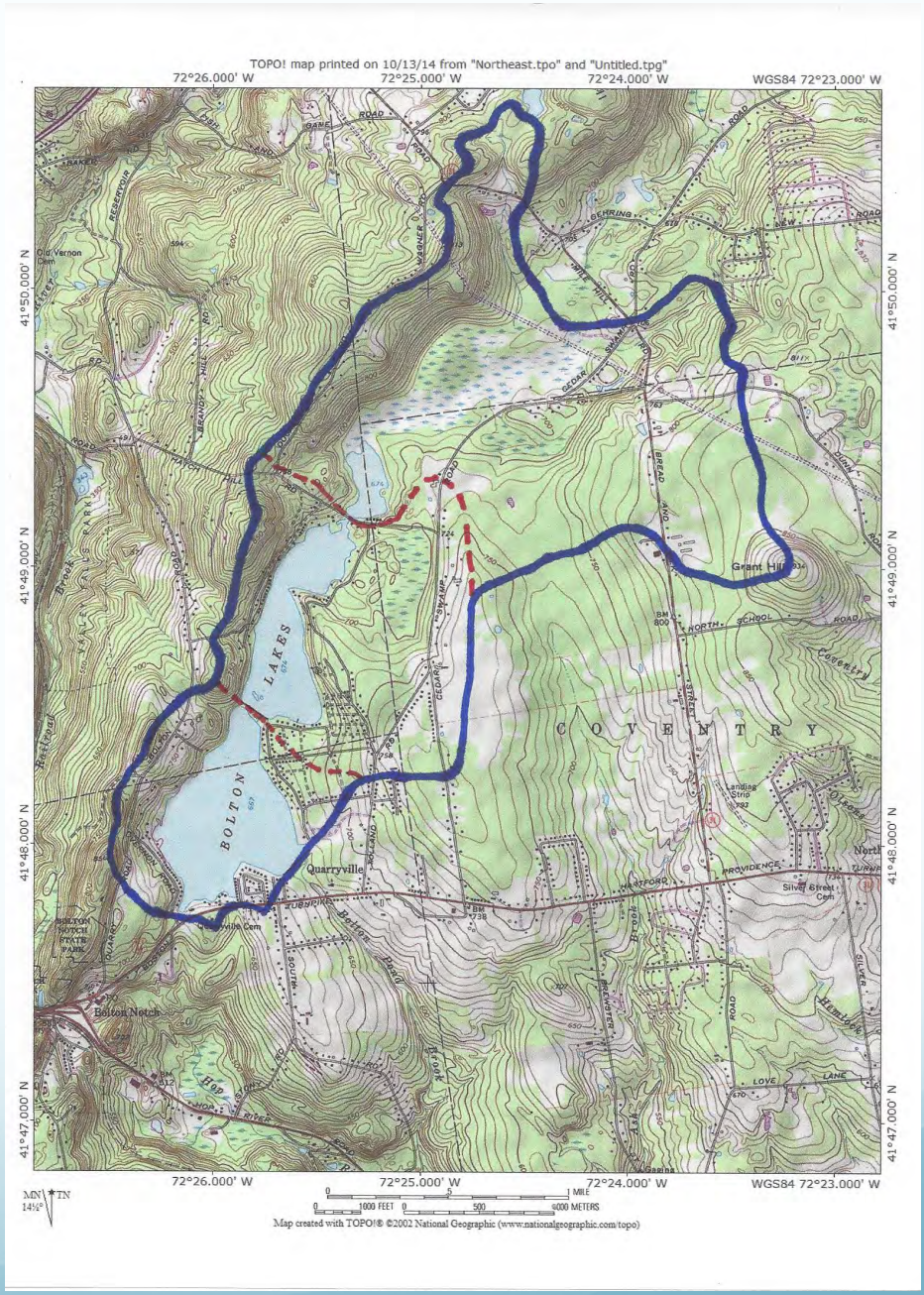
A Historical Perspective of the Bolton Lakes Watershed

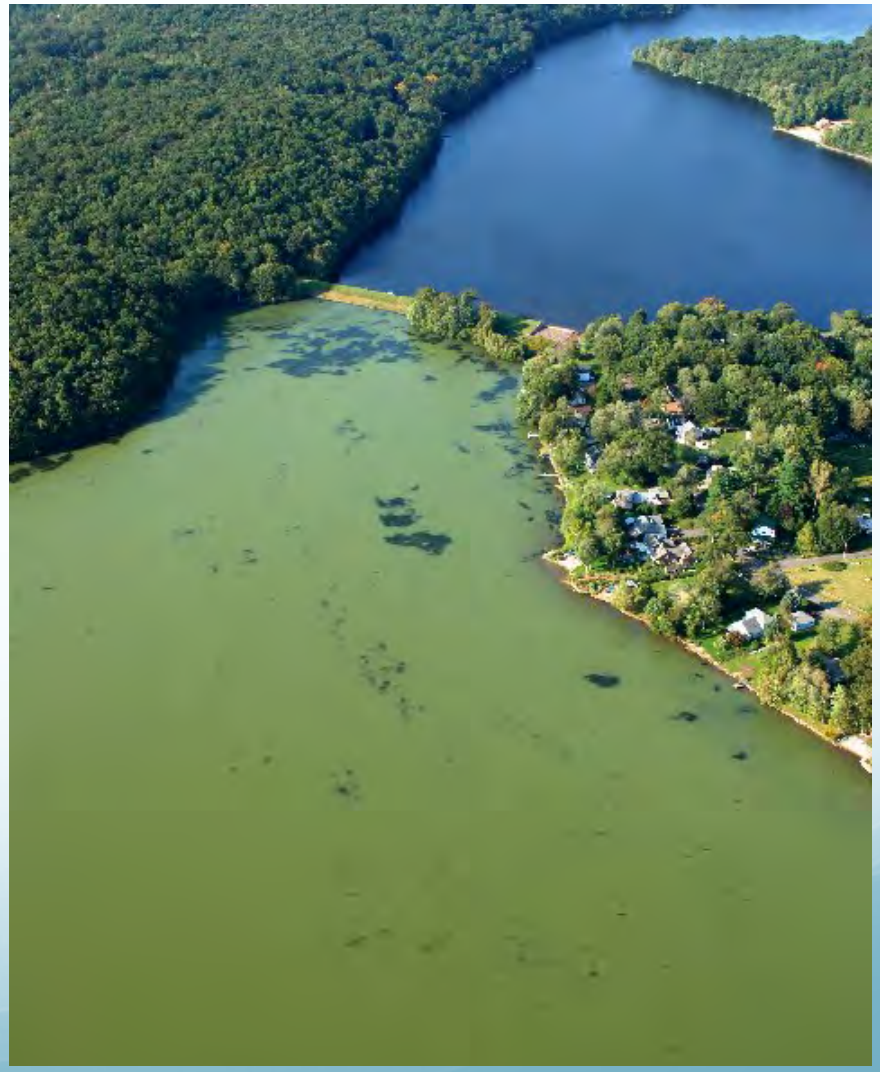
"Water is the Great Integrator"



We are here because of this-August 2012

A review of our history and what we "know" may help us understand:

- How did we get to "this"
- And how can we get beyond "this"
- Our historical summary is incomplete—we will continue to improve it—if you see errors or have information to add—please send it to Karl Prewo prewokm@aol.com)

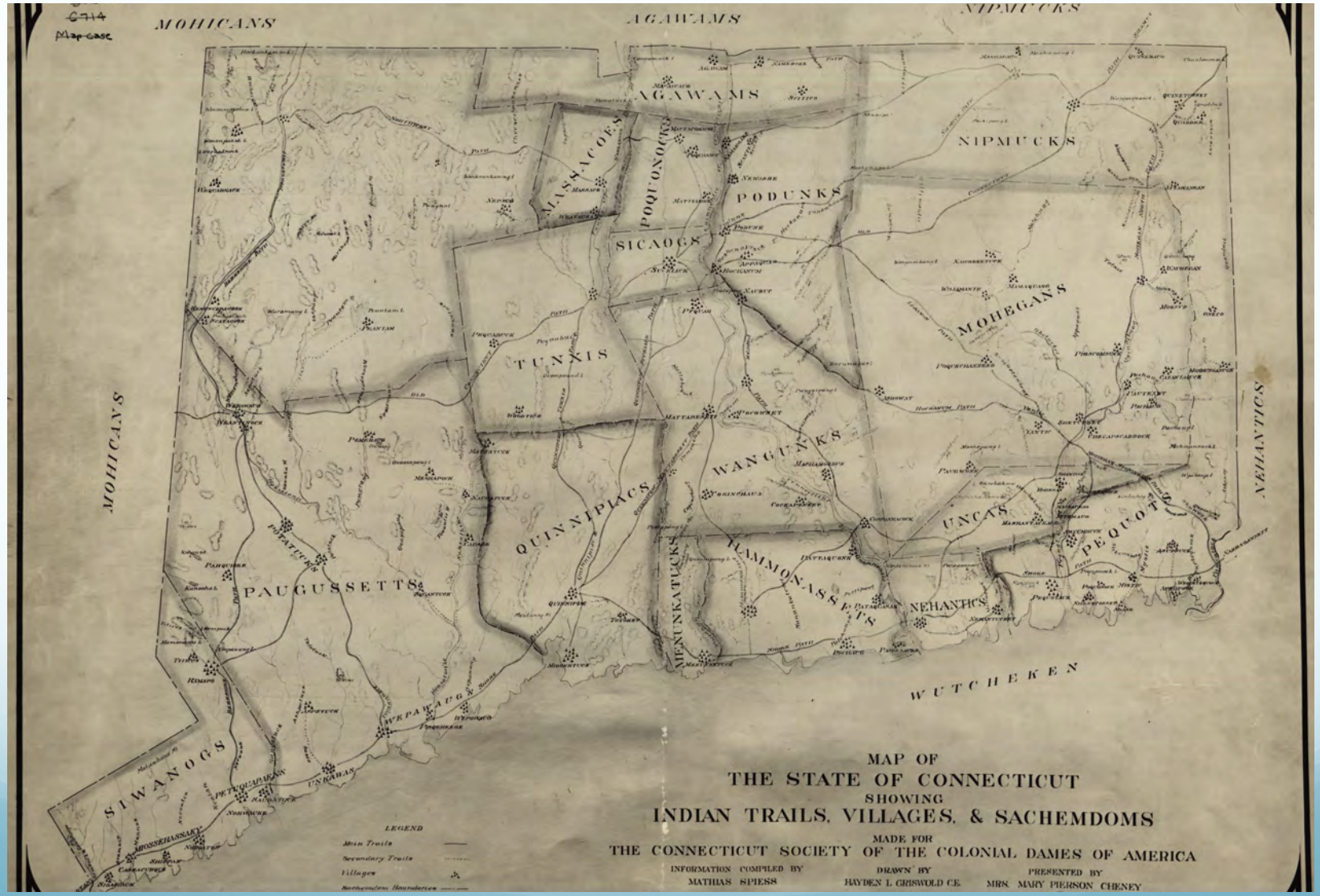


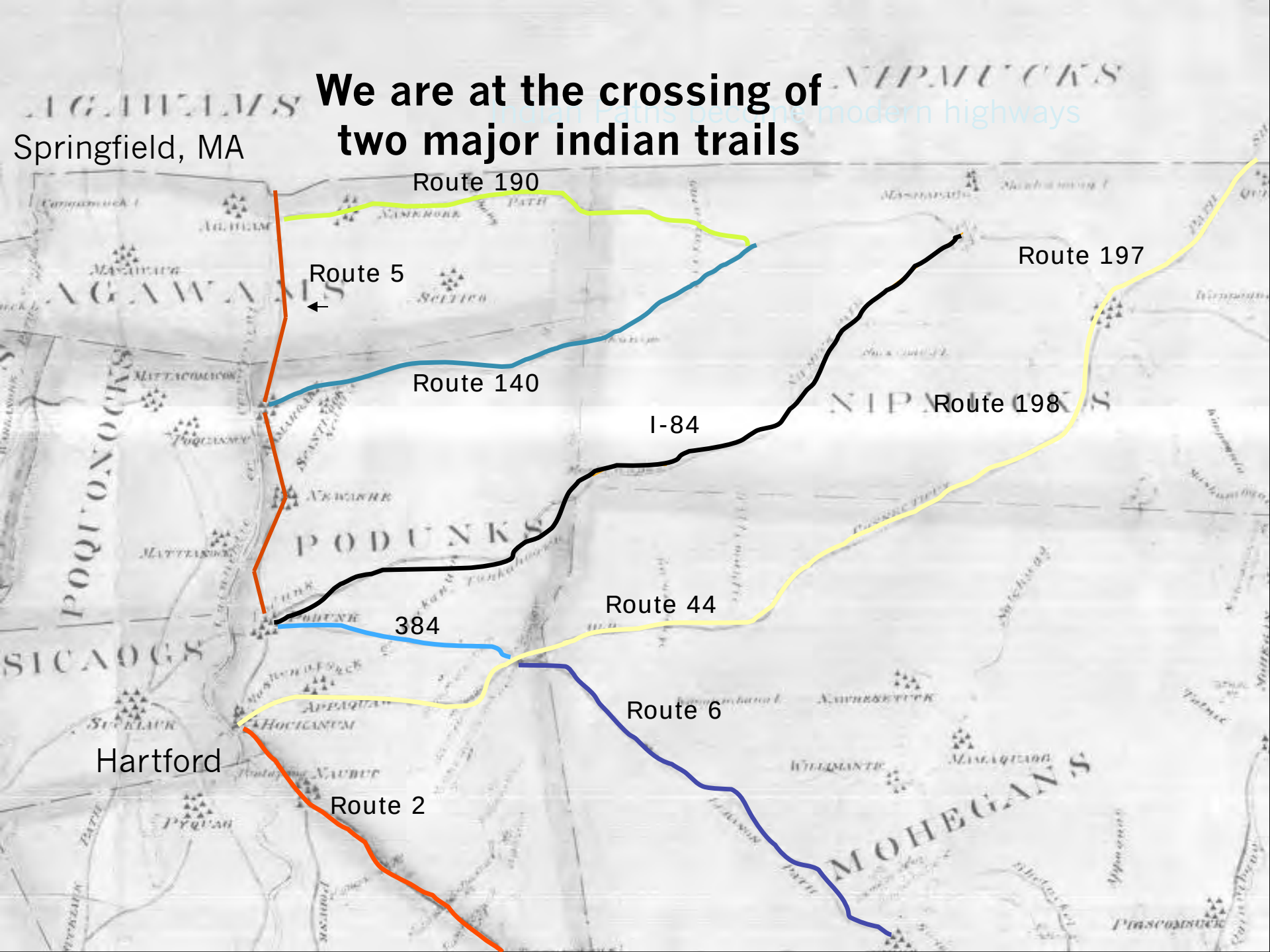
4 Perspectives

- A history of development
- A history of studies and reports
- A history of actions and reactions
- Future

The Wattershed Native American Hunting Grounds

The Podunk Indians (from E Hartford) then the Pequots and finally the Mohegans controlled the watershed reion




We are at the crossing of two major indian trails
Springfield, MA
Route 190
Route 5
Route 140
Route 197
Route 198
I-84
Route 44
384
Route 6
Hartford
Route 2

1811 Map Indicates two bodies of water straddling the boundary between Vernon and Bolton with Mills Operating in the area

The stream bed for the Mill that operated on water exiting upper Cedar Swamp above Hatch Hill Road

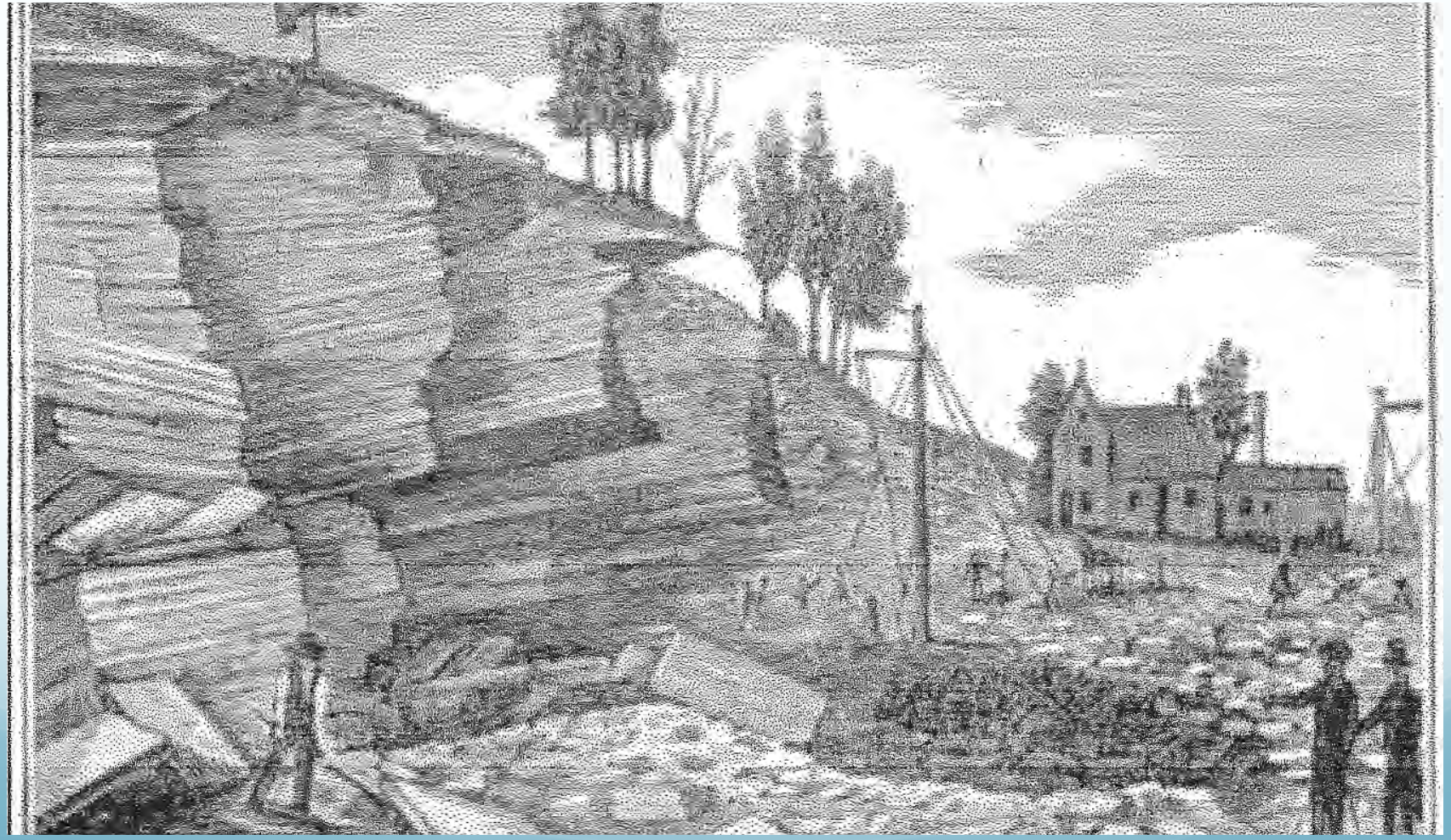
-Note tree stumps next to the stream and in Middle Lake

(Photos of 198X Deep Drawdown of Middle Lake)

Quarryville

A bustling boomtown was created at Bolton Notch in the early 1800's to provide granite and flagstone for Hartford, Springfield Armory, New York, Albany, Philadelphia, Baltimore and Washington

(ref Bolton Historical Society)



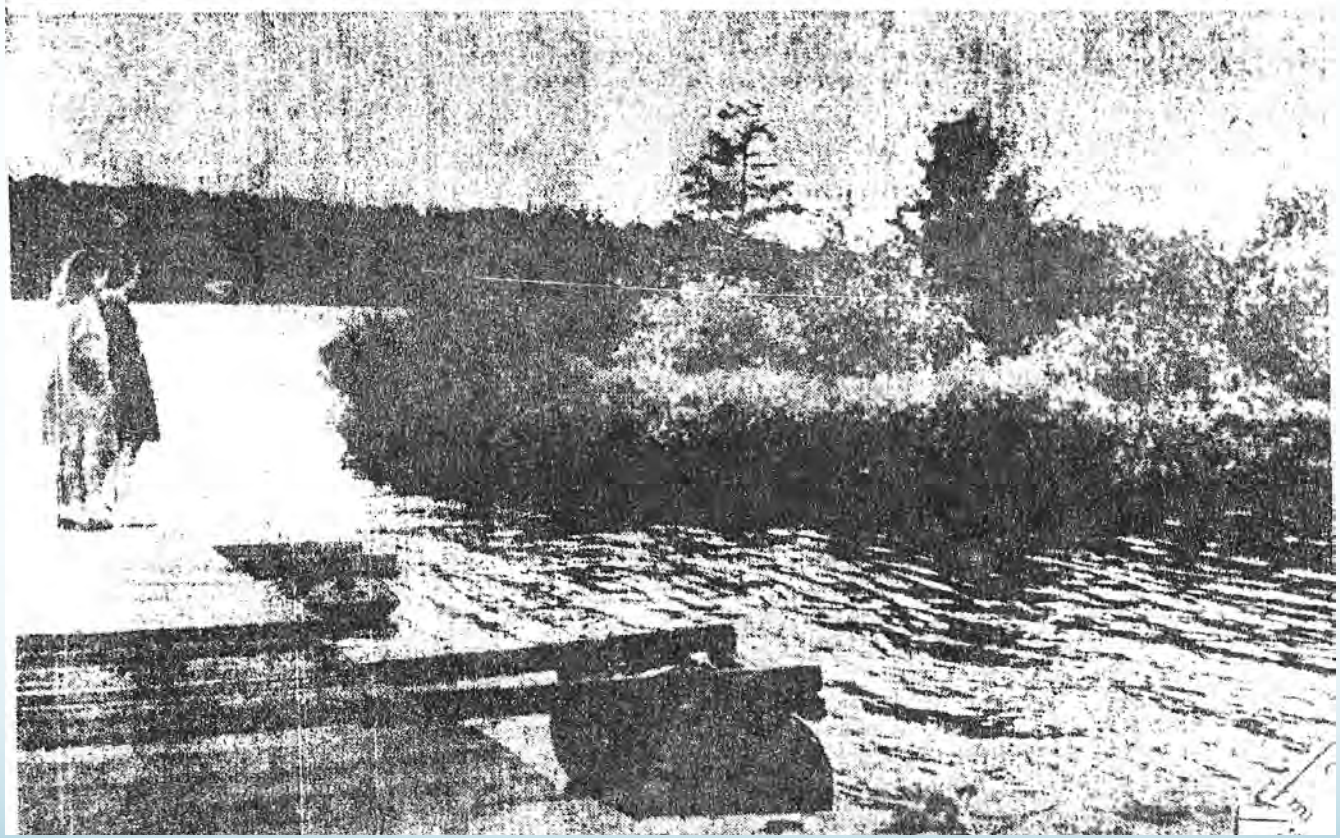
Development Drove the Formation of the Lakes (1857 map)

- 1832 Patten Fitch dammed Cedar Swamp to impound water to power Willimantic mills(Lower Lake formed)
- 1855-Bolton Reservoir and Water Power Company created the Willimantic Reservoir with two earthen dams. This raised level of lower lake and created Middle Lake (up 7 feet).
- 1938 hurricane washed out lower dam due to rusted sluice gate
- 1939-Lakes are turned over to State of CT "in order that all of the public might enjoy the recreational and scenic values of the reservoir"
- 1941 rebuilt dam, which washed out again
- 1994 Major dam repairs

Over Time Areas of Cedar Swamp Have Periodically Broken off or even Risen From the Bottom

MANCHESTER EVENING HERALD, MANCH

Island for Sale, Cash and Carry



The Watershed is Distributed Across 4 Towns

(the State Owns and controls the Lake Water)

the Bolton Lakes Watershed Conservation Alliance (BLWCA) was organized to gain collaboration among the towns

Town	Acres of Watershed
Tolland	535
Coventry	706
Vernon	436
Bolton	168

The BLWCA is focusing its attention on the Upper Lake and Cedar Swamp

with its

Unique stand of Atlantic White Cedars

Water Flow
(and nutrients)
Through the Watershed

Ref. Dr G Knoecklein, 2014

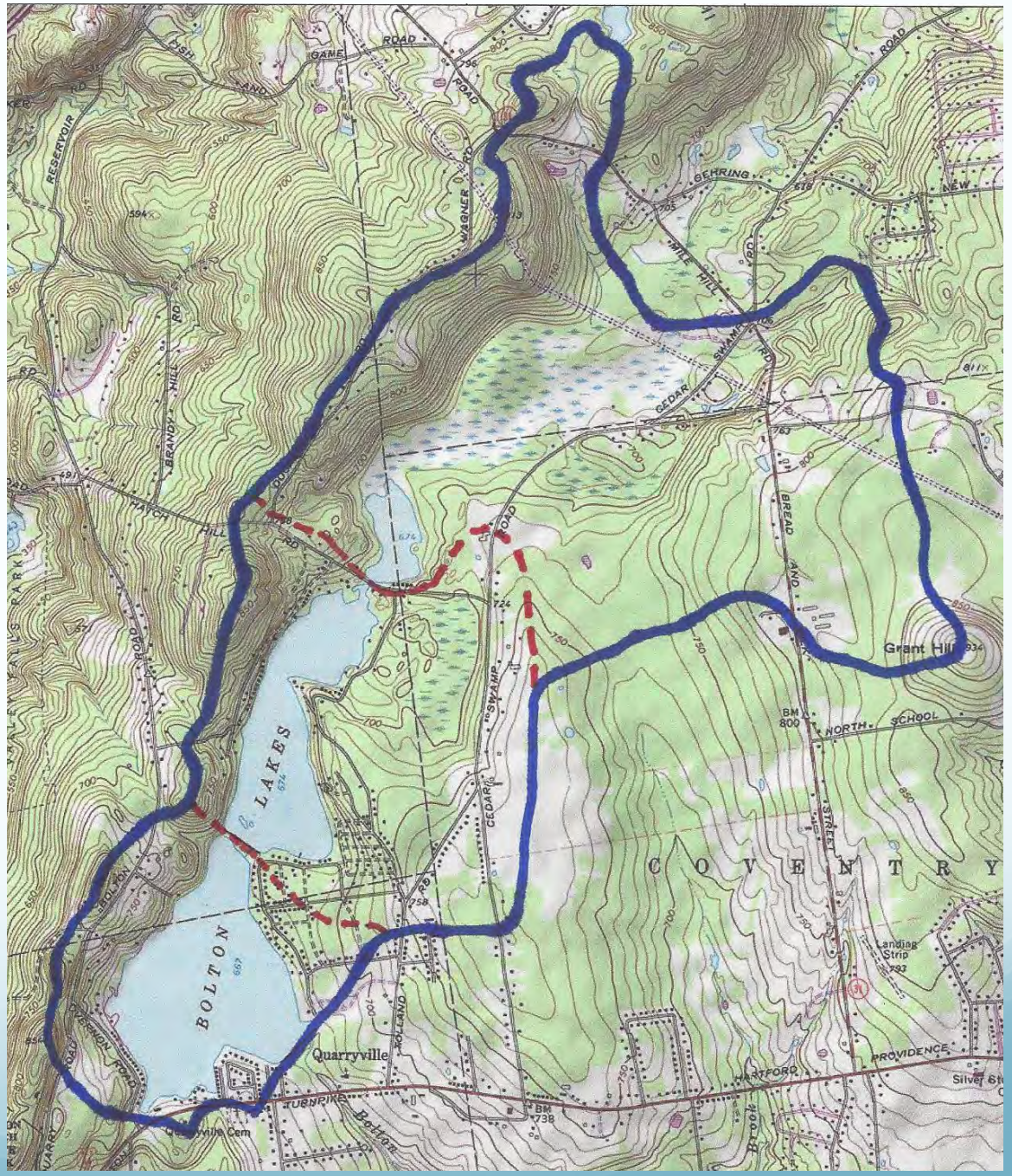
Lower Bolton Lake = 2,379 acres

Middle Bolton Lake = 1,946 acres

Upper Bolton Lake = 1,293 acres

<u>Specific drainage basins:</u>
Lower Bolton = 258 acres
Middle Bolton = 532 acres
Upper Bolton = 1,243 acres

<u>Percentage upstream basin:</u>
Lower Bolton = 88 %
Middle Bolton = 71 %
Upper Bolton = 100 %



Managing the Flow

Avert flooding-Protect shoreline-Control water & nutrient flow

Dams, Spillways & Culverts control top water flow

Dams and Spillways

Culverts

(current concern for emergency response capability)

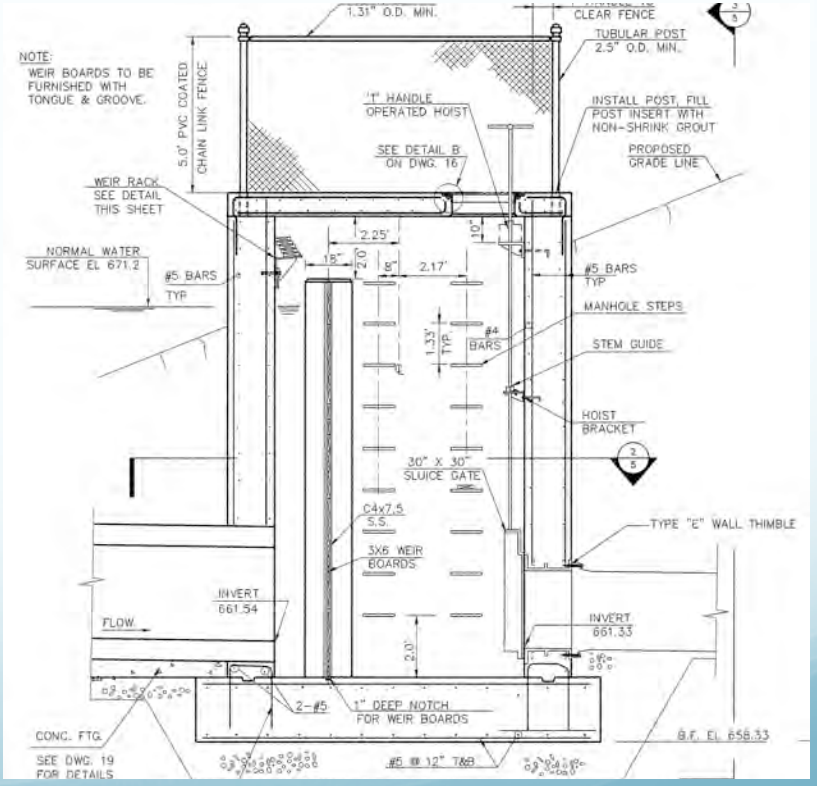
Managing the Flow

Avert flooding-Protect shoreline-Control water & nutrient flow

Collieries, Weir Boards & Sluice Gates control bottom water flow

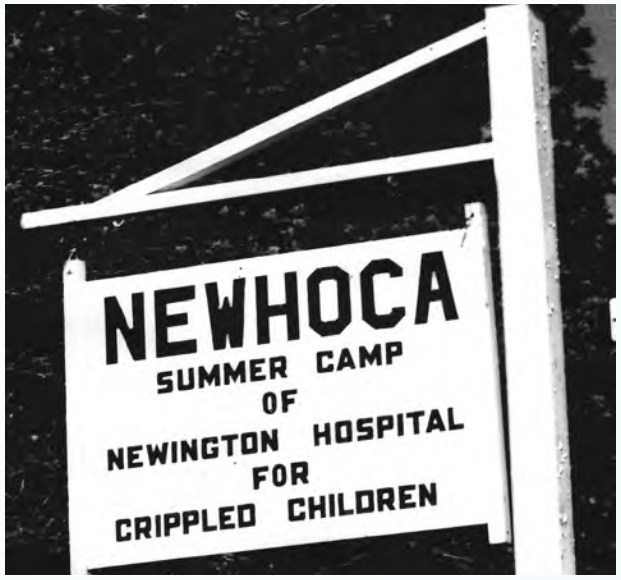
Colliery

Weir Boards & Sluice Gates



Camp Newhoca

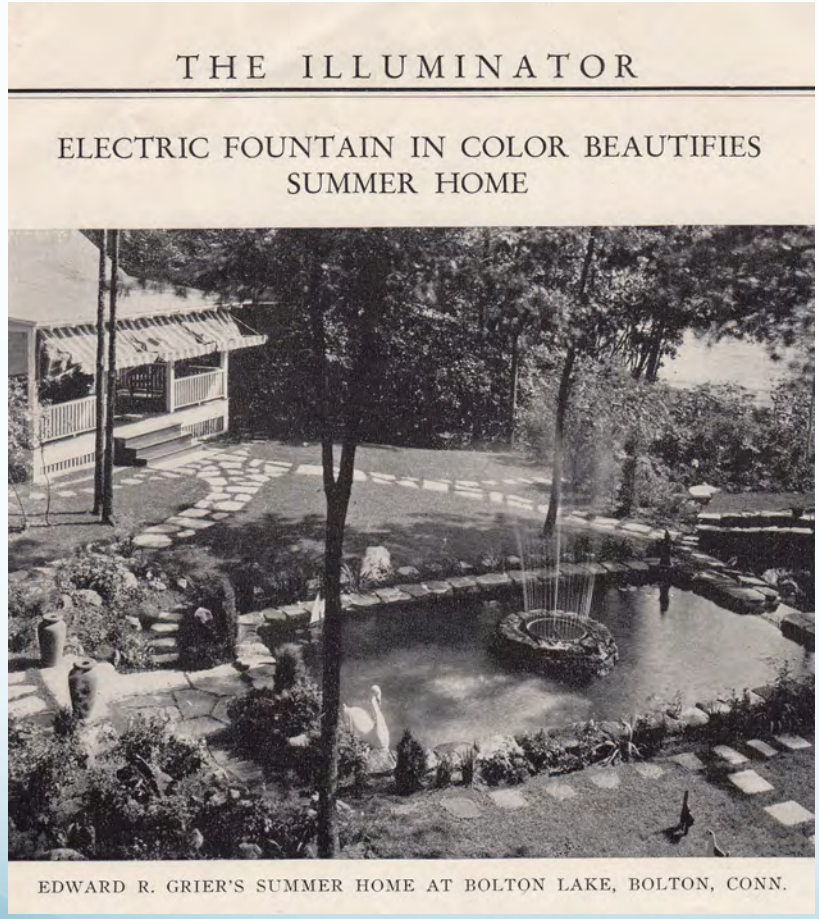
- Originally a private compound with buildings, dance hall and 5 car private garage with chauffer's quarters
- Purchased and run by the Newington Home and Hospital for Crippled Children (1950-1971)
- First called "Camp Oak Hill' then changed to Newhoca in 1960
- All campers had surgery or long term care at the hospital
- Three week session for campers aged 8-16. Campers came back for many years.
- "*No reading, no TV, no Bingo, no movies—It's an outdoor camp—so do everything outdoors*"
- "*even if you were in wheel chairs or braces—everyone was playing and working outside*"
- Purchased by Town of Vernon in 1971



The Grier Family Compound developed beginning in 1928

Extra Cottages for Guests
Dock and Boats for Play

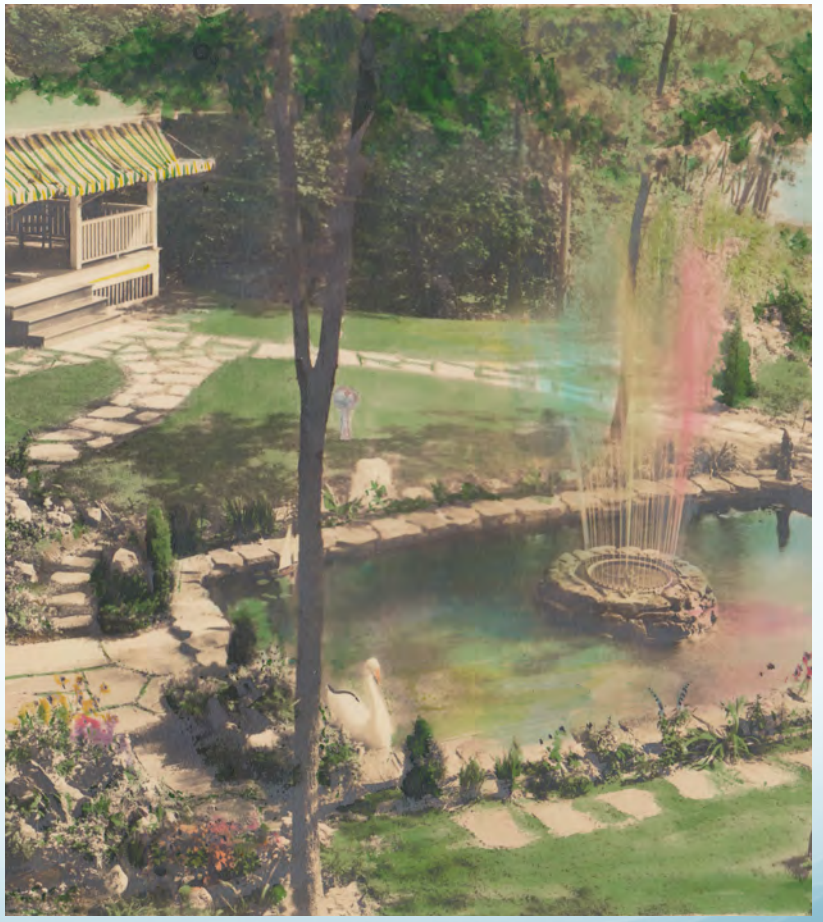
A Multi Colored Water Display preceded the Fireworks Displays we Have Now



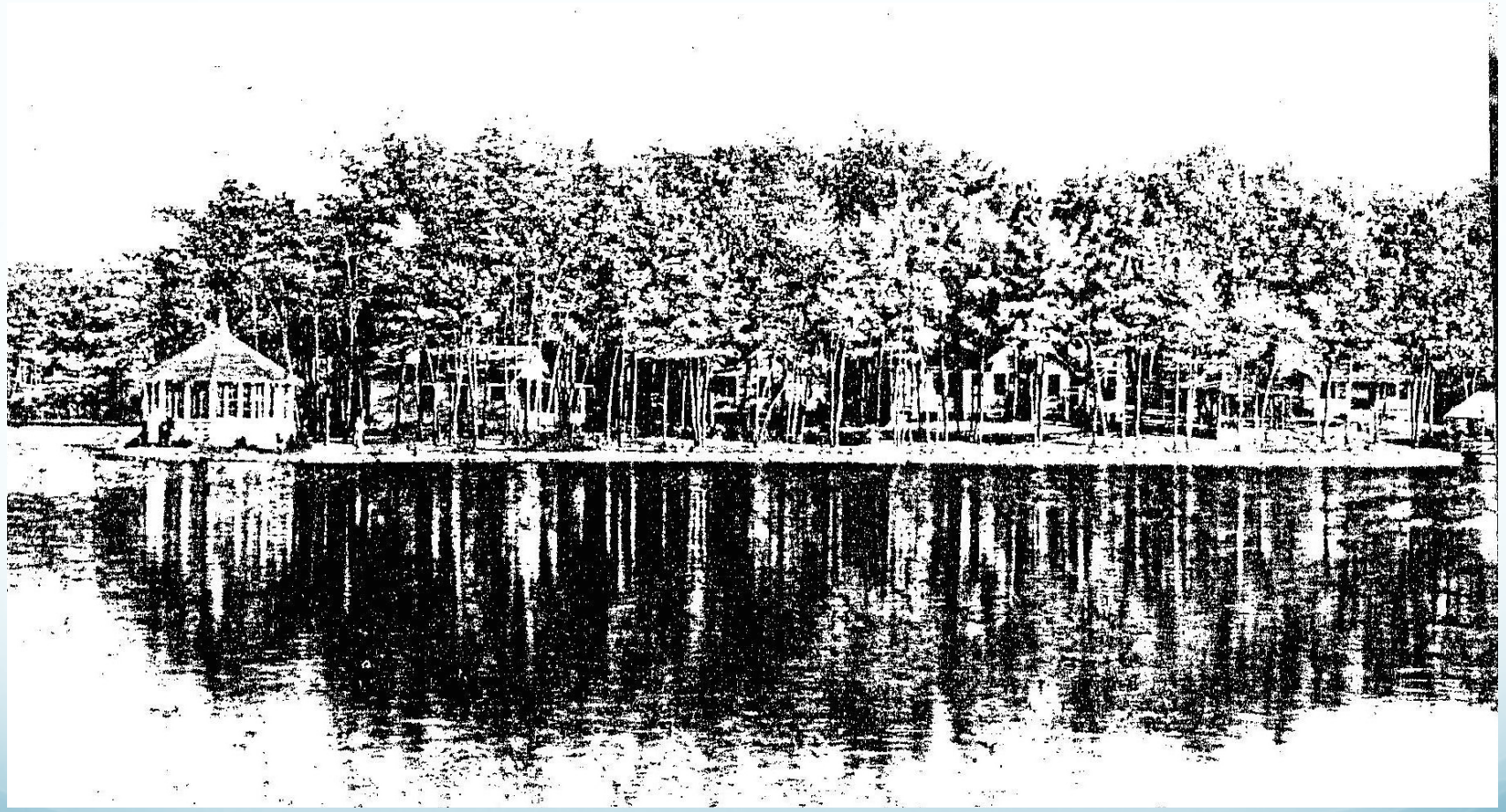
THE ILLUMINATOR

ELECTRIC FOUNTAIN IN COLOR BEAUTIFIES SUMMER HOME

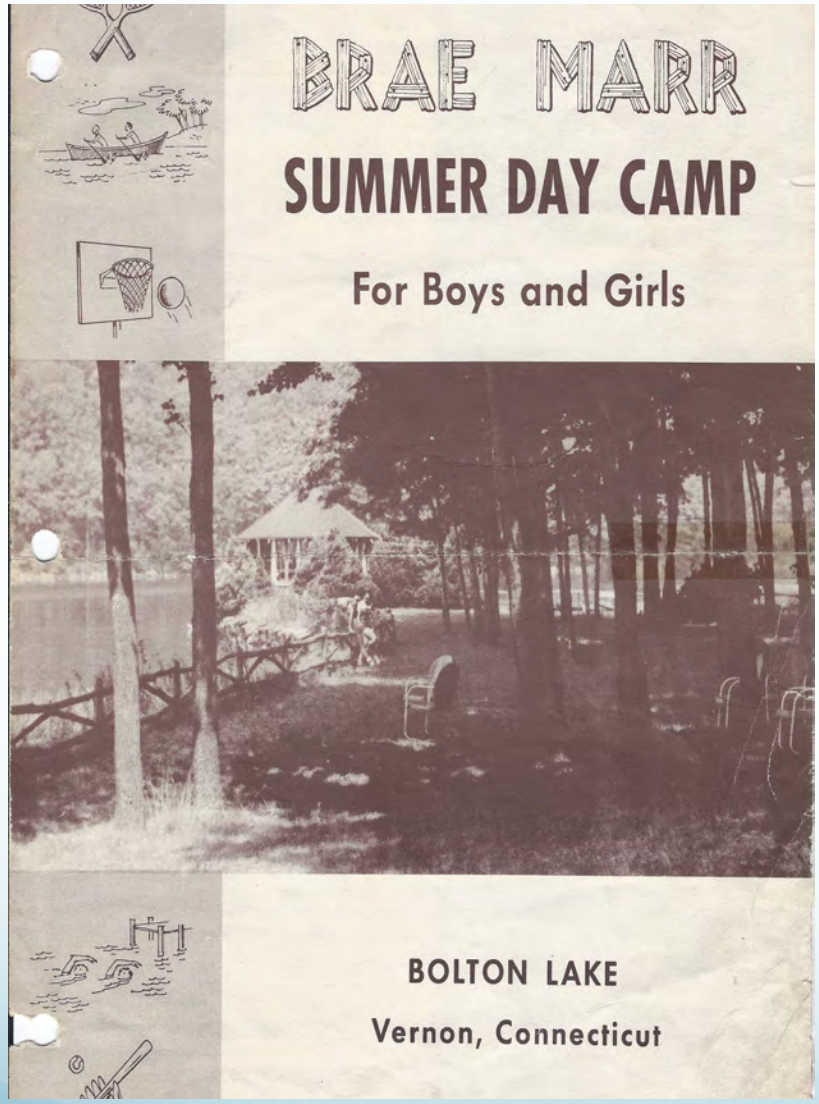
EDWARD R. GRIER'S SUMMER HOME AT BOLTON LAKE, BOLTON, CONN.

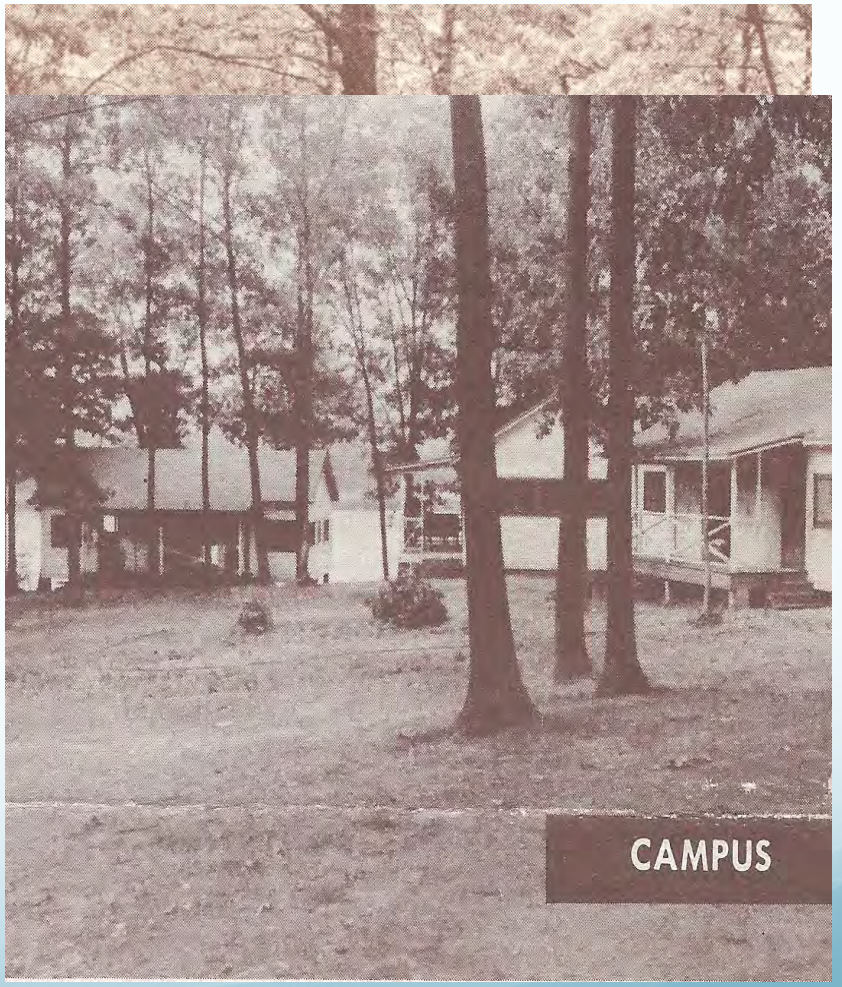


A Gazebo was Added in the 1930's with more Cottages



Eventually it became a camp

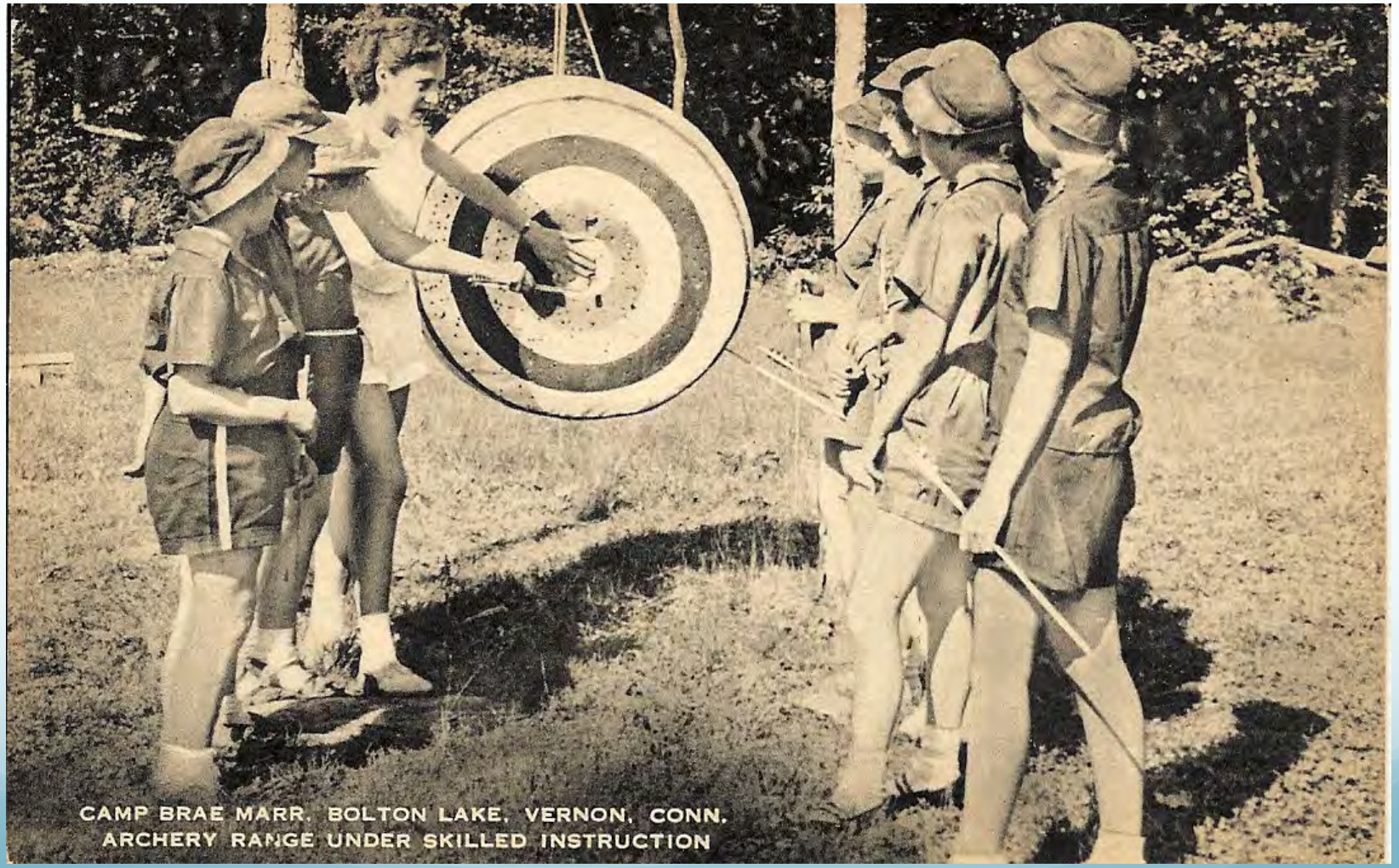


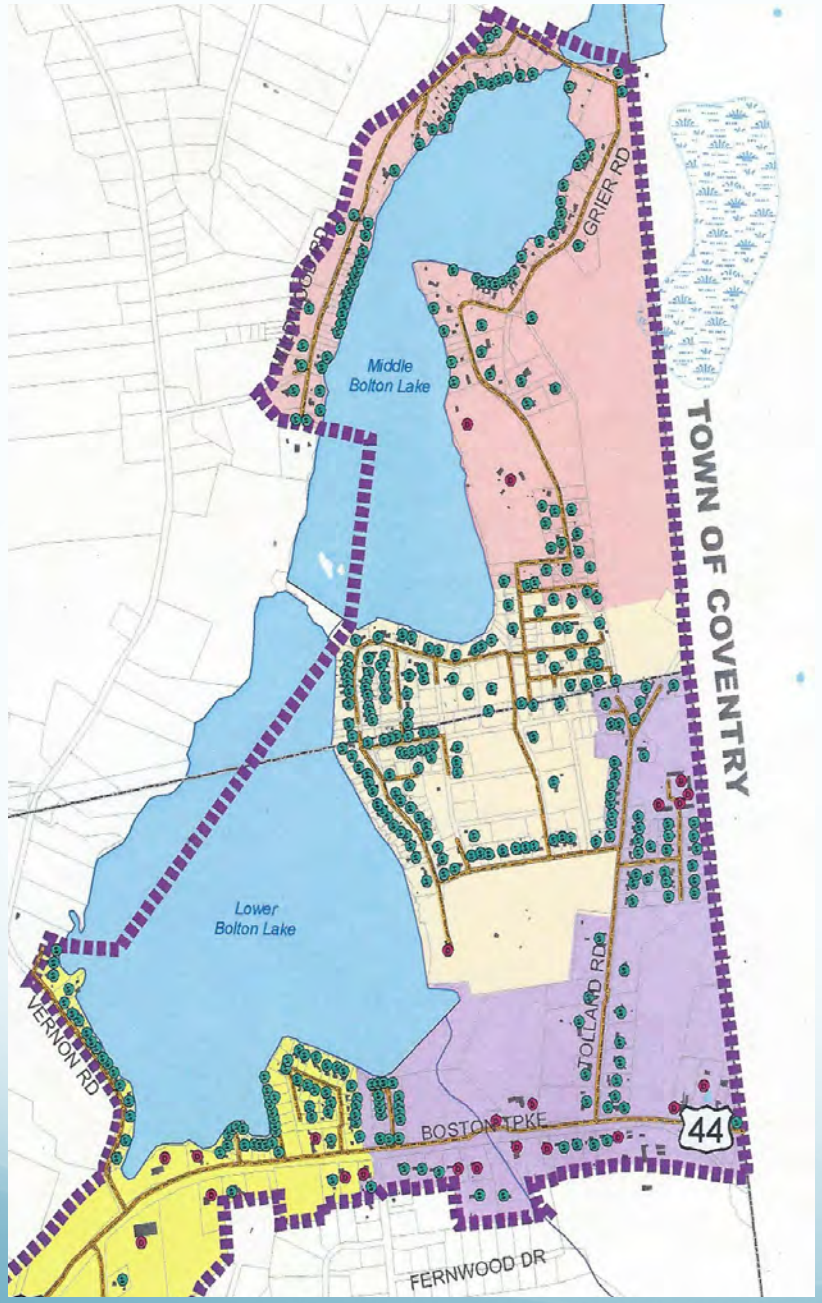


Campers came from a distance

"Miss Carol Giroud will spend the summer at Camp Brae Marr, Lake Bolton, Connecticut"
(Raritan Township and Fords Beacon Newspaper, June 24, 1954)

If you find arrow heads they may not be from the original indians on the lakes





Bolton Lakes Regional Water Pollution Control Authority

- An entity created by Ordinances in Vernon and Bolton in 2003 in compliance with DEEP requirements
- Based on studies over years to arrive at best solution to address health and environmental issues.
- Hookups completed in 2015
- Includes regulations for development in the watershed

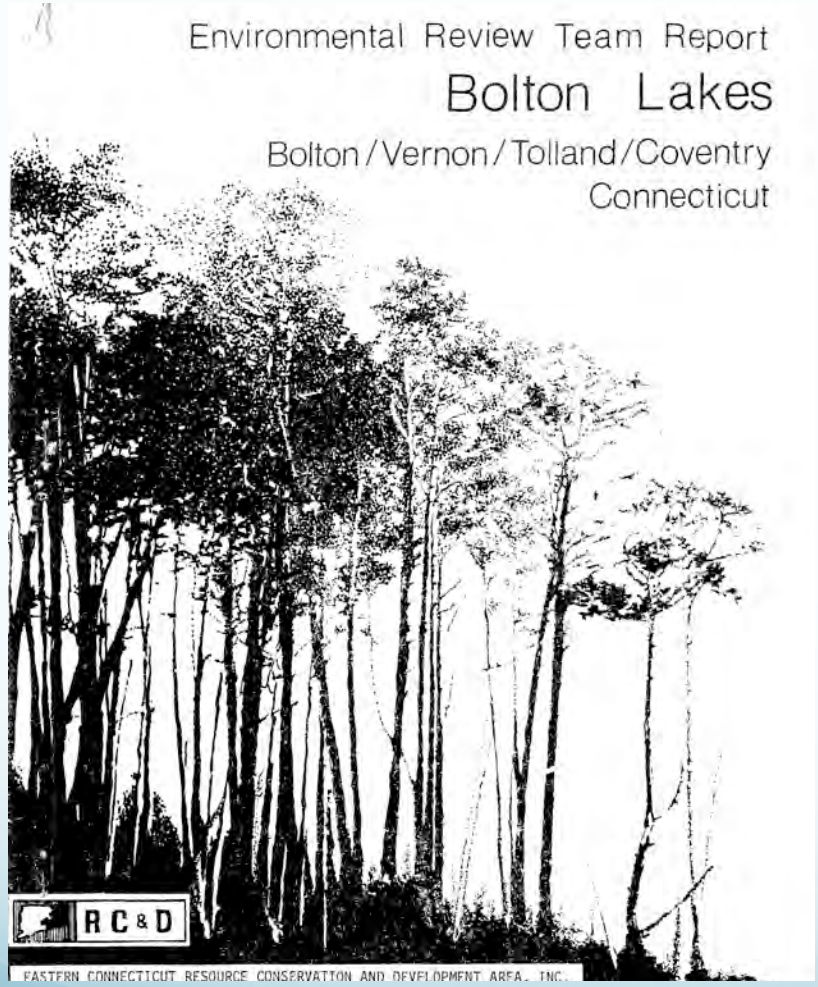
What has the history of development taught us?

- Early industrial development led to the impoundment of the flow of water and nutrients to create today's lakes.
- The water and nutrients continue to flow, but are now controlled by man made structures.
- Recreational and residential development progressed over many years
  - The state took ownership of the waters
- Remedial steps to development have been found necessary and have begun (sewers)
  - A Regional Water Pollution Control Authority was created
  - This has demonstrated the ability for multi-town collaboration to address watershed issues

4 Perspectives

- A history of development
- A history of studies and reports
- A history of actions and reactions
- Future

Many Studies Including 1978 and 2014 Environmental Review Team Reports



Bolton Lakes Watershed
An Update

Bolton, Vernon, Tolland & Coventry

Eastern Connecticut
Environmental Review Team Report

Eastern Connecticut
Resource Conservation & Development Area Inc.

There Have Been Many Studies of the Lakes and Watershed over the Years---1978-1997

(Marked in red include recommendations for watershed management)

Watershed/Lake Report	Date	Content
CT Environmental Review Team Report	1978	Survey study of Bolton Lakes Watershed
Phase I Diagnostic/Feasibility Study of Middle and Lower Bolton Lakes By CT DEP, Water Compliance Unit	1979	Review & survey of Middle and Lower Lakes with Watershed Management Recommendations and Lake Management Alternatives
Pilot Study of Lake Management Techniques for MBL Assoc by Ecosystem Consulting Service	Oct 1986	Detailed analysis intended to define management approaches for Middle Lake and noting concern for effects on Lower Lake
Draft Facilities Plan for Wastewater Disposal by Lombardi Assoc	1992	Study of septic capabilities
Fuss and ONeill Memo from Chris Ecsedy re Bolton Lakes Water Quality Evaluation (was included with Memo from L Shaffer in 2001 noted below)	Aug 1995	A summary of significant water quality issues for the Bolton Lakes using previous water quality analyses and calculations of loading factors and predicted P concentrations
Draft Report, Bolton Lakes Wastewater Mgmnt Study By Fuss & ONeill	Jan 1997	

There Have Been Many Studies of the Lakes and Watershed over the Years---2001-2011

(Marked in red include recommendations for watershed management)

Watershed/Lake Report	Date	Content
Memo From Laurence Shaffer, Vernon Town Administrator	June 2001	-email from Peter Grose of Fuss and ONeill 6/14/01 -1995 Memo on Water Quality and calculations of P flow by Chris Ecsedy
Annual Monitoring Report for Middle Bolton Lake for the Town of Vernon By Dr G. Knoecklein, Northeast Aquatic Research	2002	Report on Middle Lake survey and analysis with review of management alternatives to control weeds (primarily watermilfoil)
Ct Agricultural Exp Station Invasive Aquatic Weed Program	July 18-21, 2005	
Ct Agricultural Exp Station Invasive Aquatic Weed Program	July 15-20, 2010	
Ct Agricultural Exp Station Invasive Aquatic Weed Program	August 1, 2011	
Baseline Water Chemistry from Lower Bolton Lake Letter to Robert Morra from Dr. G. Knoecklein	Oct 6, 2011	

There Have Been Many Studies of the Lakes and Watershed over the Years---2012-present

(Marked in red include recommendations for watershed management)

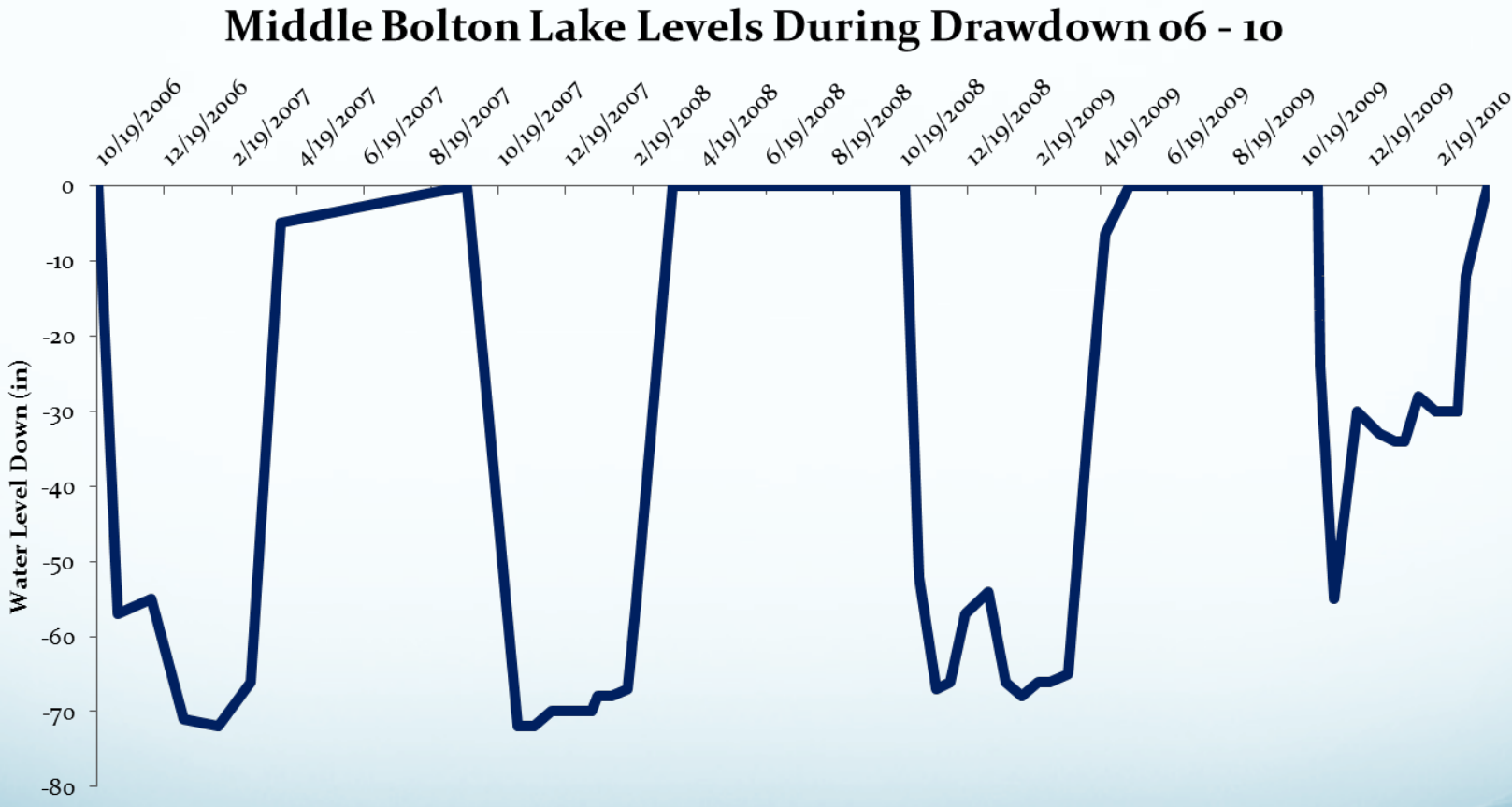
Watershed/Lake Report	Date	Content
UConn MS Thesis by Christopher McDowell Thesis number 18120	2012	Summary of 2006-2009 DEEP Dept of Fisheries & Uconn cooperative study on the effects of 3 years of 6 ft drawdowns on fish spawning. (5 lake comparison including Middle Bolton Lake)
Dr G. Knoecklein Presentation to Residents	Nov 26, 2012	Power Point Summary of status
CT Environmental Review Team	April 2014	Requested by the Conservation Commissions of the 4 Watershed Towns-Bolton, Coventry, Tolland and Vernon Lake was visited on Sept 26, 2012 Use STEAP grant for watershed assessment of all three interconnected Bolton Lakes.
Reports of Northeast Aquatic Research findings and data obtained under Bolton's STEAP Grant funding will continue to be reported and listed on the Bolton Town Web Site	2012 to 2017	Monitoring and analysis of water quality & inflow, , invasives and algae growth, and educational interpretation.

Cooperative R&D by CT Dept of Fisheries and Uconn – 2006-2009

-5 Lakes studied (2 with 6 ft drawdowns) effects on spawning

-*Lower Lake not monitored or drawn down in tandem with the Middle Lake*

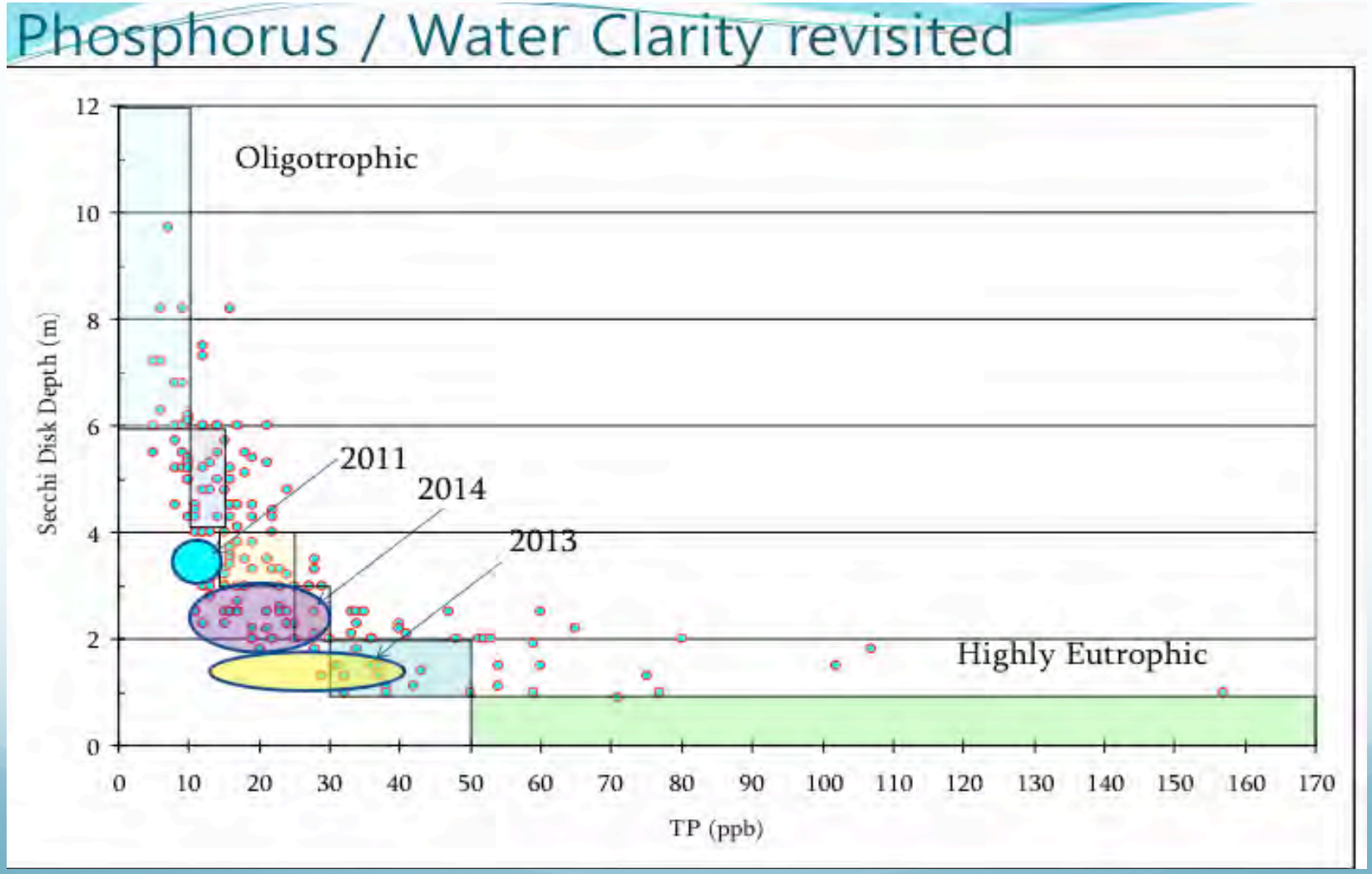
(ref data from thesis and Dr G Knoecklein, 2014)



Dr G Knoecklein & his Northeast Aquatic Research Team

are Monitoring and Analyzing Lakes and Watershed Inflows

(Ref. Phosphorous levels critical—April 1, 2015 briefing)



What have we learned from these reports??

- Water and nutrient flows down through the watershed are critical to what happens
- Plant and algae growth vary over time and are nutrient dependent.
- The limiting nutrient for plants and algae is phosphorous
  - It has both natural and man made sources in the watershed
  - There are cycles of its release, availability and flow
- Invasive plants will enter the watershed over time and can take over if not slowed or eliminated
- Any actions taken in the watershed should be taken in coordination/collaboration across the watershed
- **All comprehensive studies recommended the creation of a Watershed Management Plan that can be pro-active, not just reactive**

4 Perspectives

- A history of development
- A history of studies and reports
- A history of actions and reactions
- Future

Actions-Reactions-Observations—1955-79

Date	LBL Event	LBL Observation	MBL Event	MBL Observation	Draw down Differential
1955	CT State Bd of Fisheries Survey	Less than 5% of "shoal area weeds"	CT State Bd of Fisheries Survey	60% of shoal area (less than 3ft deep) has weeds (no milfoil)	
Summer 1978	DEP and ERT plant survey	No significant plants	DEP and ERT plant survey	Dense milfoil in 3 to 9ft	
Fall 1978	36" drawdown		96" draw down		60"
Summer 1979	DEP Study	No significant plants	DEP Study	No significant milfoil	
1978	$675 copper sulfate trtmnt		$344 cupper sulfate trtmnt		

Actions-Reactions-Observations—1979-2005

Date	LBL Event	LBL Observation	MBL Event	MBL Observation	Draw Down Differential
Summer 1979	DEP Study	No significant plants	DEP Study	No significant milfoil	
1994	60-84” Draw down	Dam Repair	60-84” Draw Down	Dam Repair	0
1995-2004	24-36” Draw Downs		24-36” Draw Downs		0-14”
August 2005	Ag Station Survey	Sparse Weeds	Ag Station Survey	Milfoil out to 9ft depth	

Actions-Reactions-Observations—2005-2015

Date	LBL Event	LBL Observation	MBL Event	MBL Observation	Draw Down Differential
August 2005	Ag Station Survey	**Sparse Weeds**	Ag Station Survey	**Milfoil out to 9ft depth**	
2006-2010	10" to 33"Annual Drawdown		36"-72" Annual Drawdown		12-62"
2009		Residents observe najas present			
Aug 2010-Sept 2011	Ag Station Survey	**Najas growing almost everywhere**	Ag Station Survey	**Patches of various plants**	
Aug 12, 2012		Cyanobacteria Bloom – Lake closed to swimming			
May & June 2013	Treatment for najas & algae				
June-July 2014	FBL Weed Survey	**Patches of plants**	FBL Weed Survey	**Extensive 3-9 ft areas of milfoil**	
July 28, 2014			Diquat Spot treatment	Milfoil deteriorates quickly	
Aug 2014			N Central Health District posts parts of Lake	**Local regions of Algae blooms**	
May 2015		Invasive curly pondweed patches		**Milfoil not observed**	
August 2015		**Blue Green Algae bloom and Loss of Transparency**			

What Have We Learned from These Events?

- Vigilance, monitoring and early warning are critical to effective management and response
- Citizen involvement and govt collaboration are necessary
- Both chemicals and water flow/exchange can cause effects
- Actions in one part of the watershed can lead to reactions in other parts of the watershed
- We are not in a “cycle” but a “spiral”

What Has Happened since the Lower Bolton Lake was Treated in 2013?

- STEAP Grant was obtained
  - Thanks to the combined efforts of residents, Town of Bolton and State Rep Pam Sawyer & colleagues
- Friends of Bolton Lakes formed
- Bolton Lakes Watershed Conservation Alliance formed (4 town Conservation Commissions)
- Sewer installation is completed
  - They were begun much earlier, but are now being completed. Thanks to many years of Bolton/Vernon collaboration

4 Perspectives

- A history of development
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What do we want in the future?

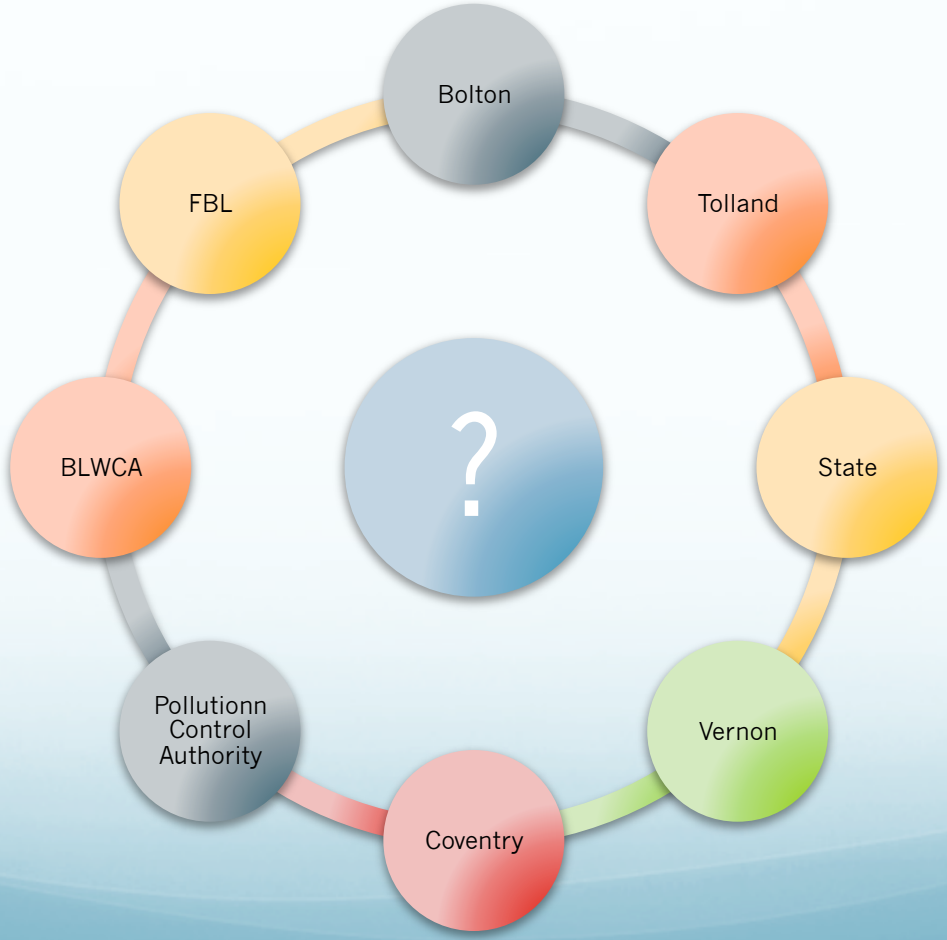
- Sustainable, long term health of the lakes and surrounding watershed enabled by:
  - Proactive collaboration of residents, towns and state to improve watershed health and minimize deterioration
  - Vigilance and monitoring to ward off threats and assure early detection of changes and invasives
  - Affordable, environmentally sound methods to counteract any unwanted events/changes
  - **Organized & planned, long term Watershed Management**

The Stakeholders are organized and interested

But

"We have been here before. We have had lots of data, reports and advice—what's going to be different?"—

(*long time Bolton Lakes resident)*



The Bolton Lakes and Watershed are a wonderful place to live and to enjoy

With your help they can continue to thrive

- Thank You—to all those who provided information and anecdotes to this historical perspective.
- We were only able to present a fraction of the information available
- This history is incomplete—its an ongoing project
- If you see errors or opportunities to add information—please send your comments to Karl Prewo prewokm@aol.com)