MONITORING LAKE TROUT IN THE ADIRONDACKS

Margaret H. Murphy, Ph.D

Integrated Aquatic Sciences LLC

OVERVIEW

- Historical background

- Current information based on existing data

- Outline of study to determine status of each population, prey resources, habitat conditions
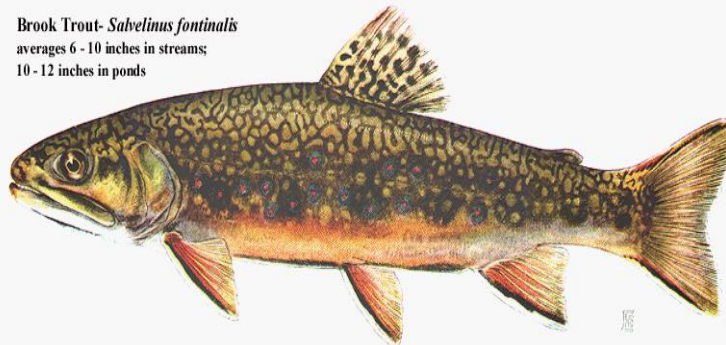
- How to better inform long-term management of LT

Integrated
Aquatic
Sciences LLC

TERMINOLOGY

- What do we mean by Water Quality? Fisheries? Limnology?

- Importance of linking fisheries and limnology for holistic understanding

FISHERIES: a population or community of fishes subject to capture by humans along with the physical, biological, and sociological environment

-typically single species management

Brook Trout- *Salvelinus fontinalis*
averages 6 - 10 inches in streams;
10 - 12 inches in ponds

EPILIMNION

degrees centigrade.

Sea Grant
Michigan

Summer (layering)

Integrated
Aquatic
Sciences LLC

NATIVE ADIRONDACK FISH COMMUNITY

Upland fish fauna originally consisted of glacial relicts following retreat of Laurentian ice sheet

Brook trout

Lake trout

Round whitefish

Pearl dace

Common Shiner

Eastern blacknose dace

Lake chub

Northern redbelly dace

Creek chub

Longnose dace

Brown bullhead

White sucker

Pumpkinseed sunfish

Slimy sculpin

Integrated Aquatic Sciences LLC

WHY LAKE TROUT?

- "dweller of the deep"

- Require very cold 10-12C (50-54F) and well oxygenated water

- Longest lived salmonid

- Reproduce at older age

- Can represent other coldwater species (Cisco, Round Whitefish)

Integrated
Aquatic
Sciences LLC

HISTORICAL DATA

- Factors leading to loss:
  - Habitat degradation
  - Acid Rain
  - Overfishing
  - Climate change
  - Non-native species

Adirondack Lake Trout Lakes

- ● Present – natural reproduction
- ● Present – maintained through stocking
- ▲ Extirpated
- □ Believed present – population status unknown

Adirondack Park

New York State

N

1 in = 16 miles

Integrated Aquatic Sciences LLC
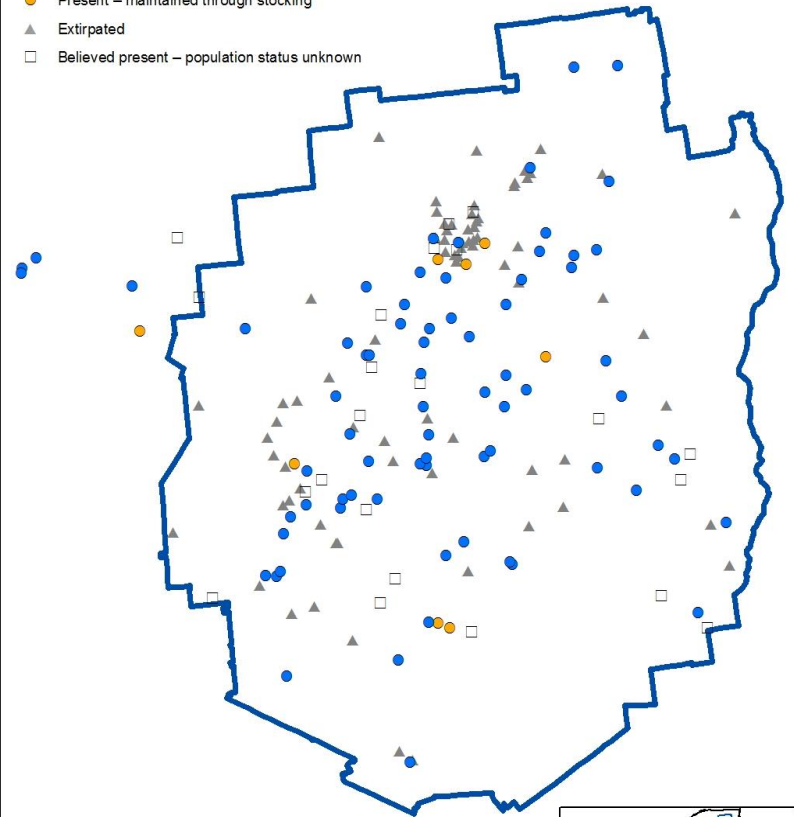
LAKE TROUT AND CLIMATE CHANGE IN THE ADIRONDACKS

2014 Status and long-term viability

A survey report for the Adirondack Chapter of The Nature Conservancy By Mary Thill

The Nature Conservancy
Protecting nature. Preserving life.™
Adirondack Chapter

Integrated Aquatic Sciences LLC

CLIMATE RESILIENCY ASSESSMENT

- Adirondack Chapter of The Nature Conservancy is assessing "climate resiliency" of the 105 lakes

- Modeled using lake characteristics and Lake Trout population characteristics on the 105 lakes from Thill 2014 report

  - Major parameters

    - lake volume

    - trophic state

    - Not included on NYSDEC list of impaired lakes

  - Data not available on all lakes – so parameters estimated

  - Lake Trout have not been surveyed in over a decade on some lakes
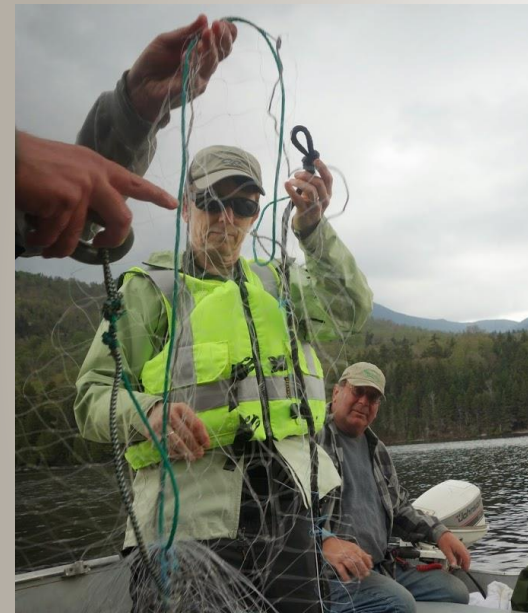
UPPER AUSABLE LAKE
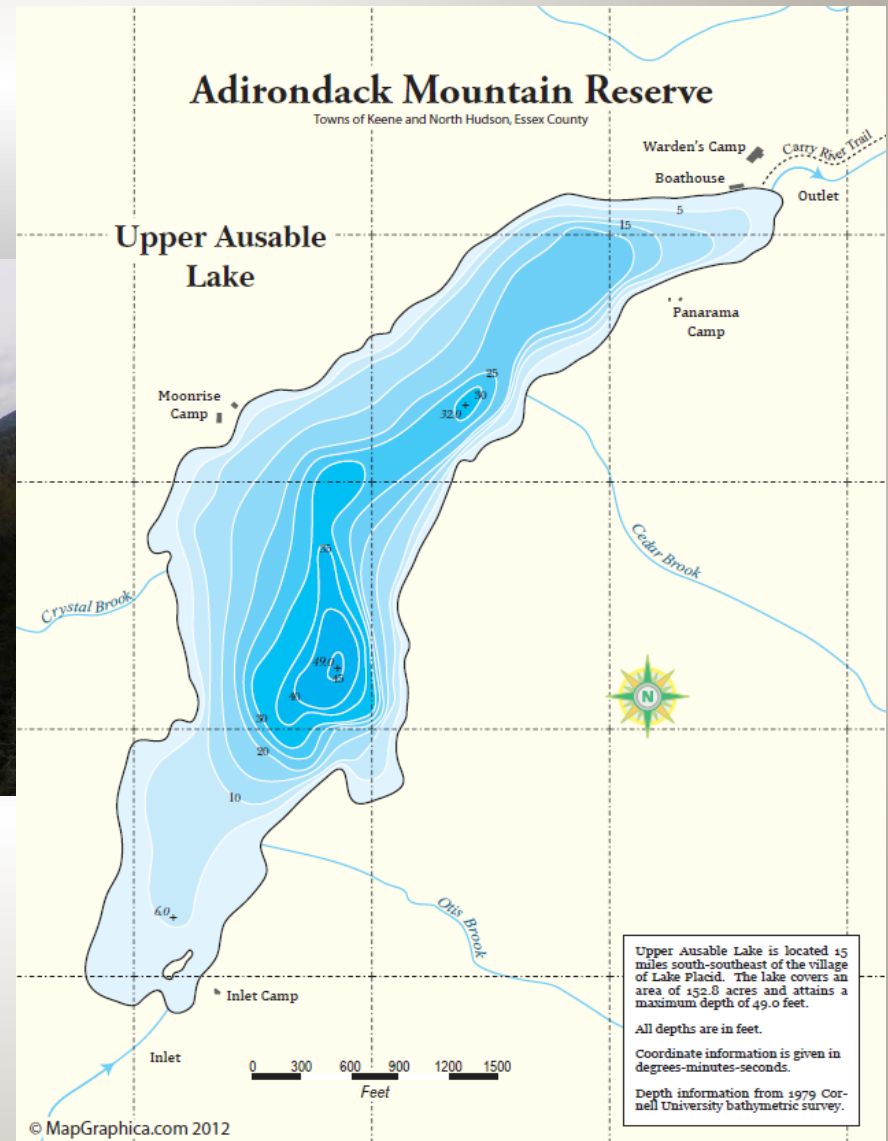
UPPER AUSABLE LAKE – INDEX GILLNETTING FOR LAKE TROUT

Year	Count	Length range (mm)	Gill Net
2010	3	610-820	Fine Mesh (1.5")
2011	1	505	Fine Mesh (1.5")
2012	0		Fine Mesh (1.5")
2014	0		Fine Mesh (1.5")
2015	Did not use this method		Fine Mesh (1.5")
2014	7	549-780	Large Mesh (>2.5")
2015	4	536-686	Large Mesh (>2.5")

**Note: Large Mesh effort in 2015 was 2-3 times greater than 2014

- Lake Trout population critically low with no evidence of recent recruitment
- Recovery, if it occurs, could take a decade or more

Integrated
Aquatic
Sciences LLC

UPPER AUSABLE LAKE WATER QUALITY

Depth (m)	5/22/11 Temp (C)	5/22/11 DO (mg/L)	7/20/11 Temp (C)	7/20/11 DO (mg/L)	8/16/11 Temp (C)	8/16/11 DO (mg/L)	8/24/11 Temp (C)	8/24/11 DO (mg/L)
0	12.8	9.3				7.8		6.9
1	12.8	9.3	22.8	7.1	20.6	6.8	19.4	6.6
2	11.7	9.8						
3	11.1	9.8						
4	10.0	9.9						
5	8.9	9.8	14.4	5.0	15.0	2.6	16.7	3.0
6	7.8	9.9						
7	7.8	9.9						
8	7.2	10						
9	7.2	10	12.2	3.8	8.9	2.5	8.3	1.3
10	6.7	10						
11	6.7	10.1						
12	6.7	10						
13	6.7	9.8						
14	6.1	9.1					7.8	0.2
15	6.7	0.3						

- Water Quality of concern

  - DO in bottom water low in summer limiting habitat suitability – climate resiliency ranking (94th out of 105 lakes) reflected this

  - Lake Trout: Preferred Temperature 8.9-11.1C (48-52F), Dissolved Oxygen greater than 5 mg/L

Integrated
Aquatic
Sciences LLC
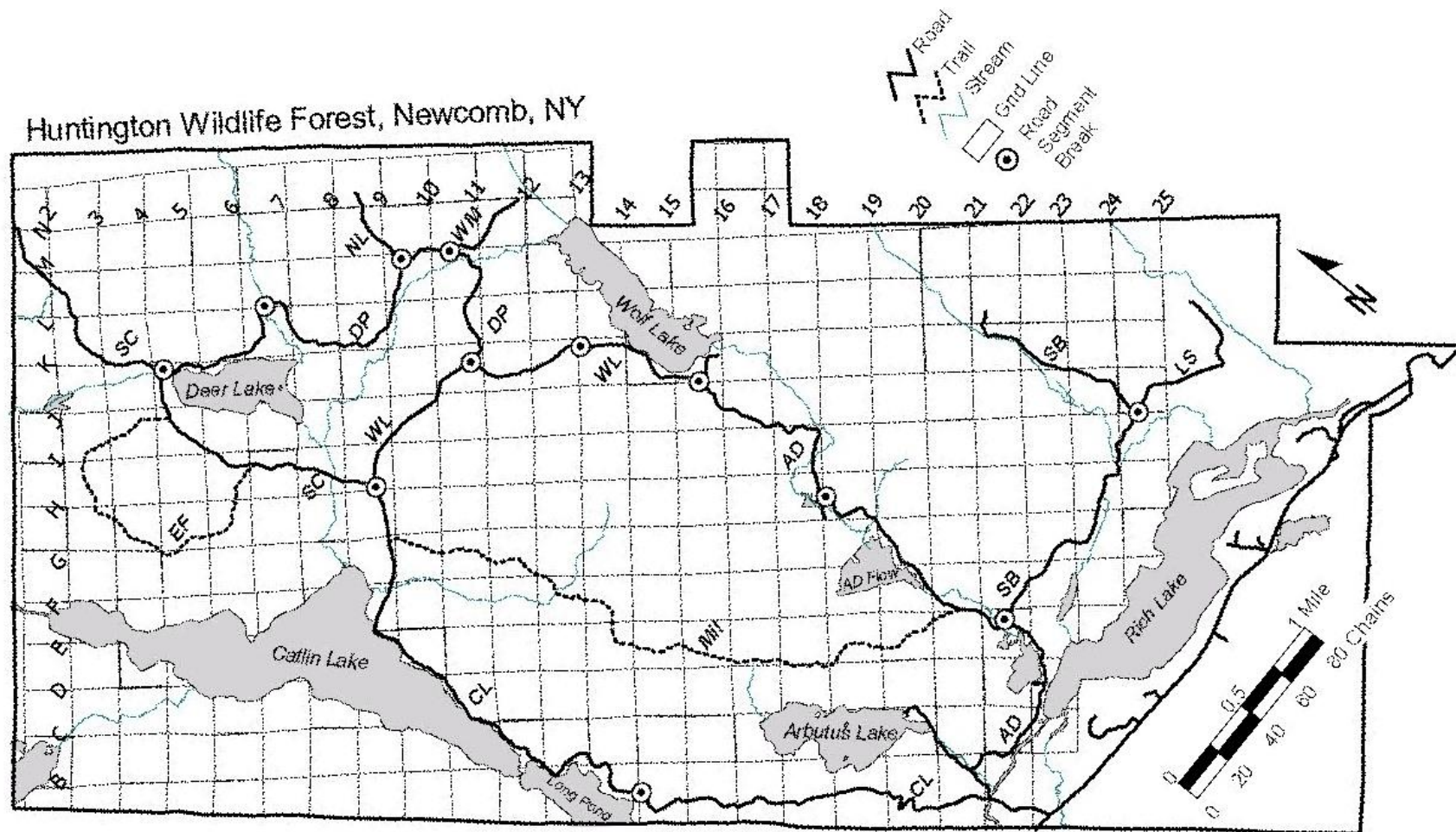
CATLIN AND RICH LAKES

- Both lakes historically had Lake Trout

- Both now have bass; Rich Lake also has northern pike and walleye

- Unable to document any trout in Catlin Lake in 2016 and 2017

- Brook Trout documented in Rich Lake in 2017, no Lake Trout captured

RICH LAKE WATER QUALITY

Depth (m)	6/7/17			7/6/17			8/2/17		
	Temperature (C)	DO (mg/L)		Temperature (C)	DO (mg/L)		Temperature (C)	DO (mg/L)	
0	15	9.35		20.5	7.51		24.1	7.31	
1	14.8	9.2		20.4	7.26		23.6	7.2	
2	14.6	9.21		20	7.36		21.7	7.11	
3	14.2	9.28		19.8	6.55		21.1	6.84	
4	13.9	9.21		19.4	6.6		19.9	5.95	
5	13.7	9.2		18.3	6.9		18.2	4.46	
6	13.7	9.12		17.4	6.41		16.6	3.94	
7	13.7	9.07		15.5	6.3		13.2	4.6	
8	13.7	9.07		12.1	6.9		11.8	4.8	
9	13.7	9.04		10.8	6.5		10.3	4.85	
10	13.7	9.02		10.2	6.35		9.8	4.75	
11	13.6	8.92		9.5	6.79		9.3	4.64	
12	13.6	9		9.1	6.63		9.1	4.59	
13	13.2	9.06		8.8	6.59		9	4.51	
14	13.7	9		8.5	6.42		8.8	4.39	
15	8.1	8.89		8.4	6.4		8.8	4.35	
16	7.6	8.49		8.3	6.46		8.8	4.29	
17	7.5	8.42		8.2	6.16		8.6	4.06	

- Rich Lake Water Quality indicates summer habitat limitation for Lake Trout
- Rich and Catlin lakes scored relatively high on climate resiliency (26th and 27th out of 105 lakes), despite lack of recent observations

Integrated Aquatic Sciences LLC

PROPOSED STUDY

- Study the lakes that currently are thought to have Lake Trout

- Population surveys and water quality (temperature and oxygen) profiles

- eDNA assessment – is this a viable alternative for indicating presence/absence?

- Verify the model and parameters used to assess climate resiliency

  - Important for applying model to the Northeast region

  - Are there parameters missing?

  - Can we simplify the model?

Integrated
Aquatic
Sciences LLC

WHY STUDY?

- Need current assessment of Lake Trout to determine if parameters in model are good predictors of

  - Presence/absence

  - Population structure

  - Genetic structure is largely unknown

    - Are there unique "heritage" populations similar to Brook Trout?

- Climate change concerns

  - Warmer surface waters

  - Longer period of stratification

    - Increased risk of low oxygen in hypolimnion

- Winter impacts – largely unknown winter ecology

WHEN TO STUDY?

- Spring surveys just after ice out

  - Could sample lakes at low elevation first and work to higher elevation lakes

  - Before surface water temperatures reach 12C (54F)

- Collect deep water samples in mid-summer for eDNA analysis

- Collect water quality profiles in mid to late summer

Integrated
Aquatic
Sciences LLC

FUNDING NEEDED!
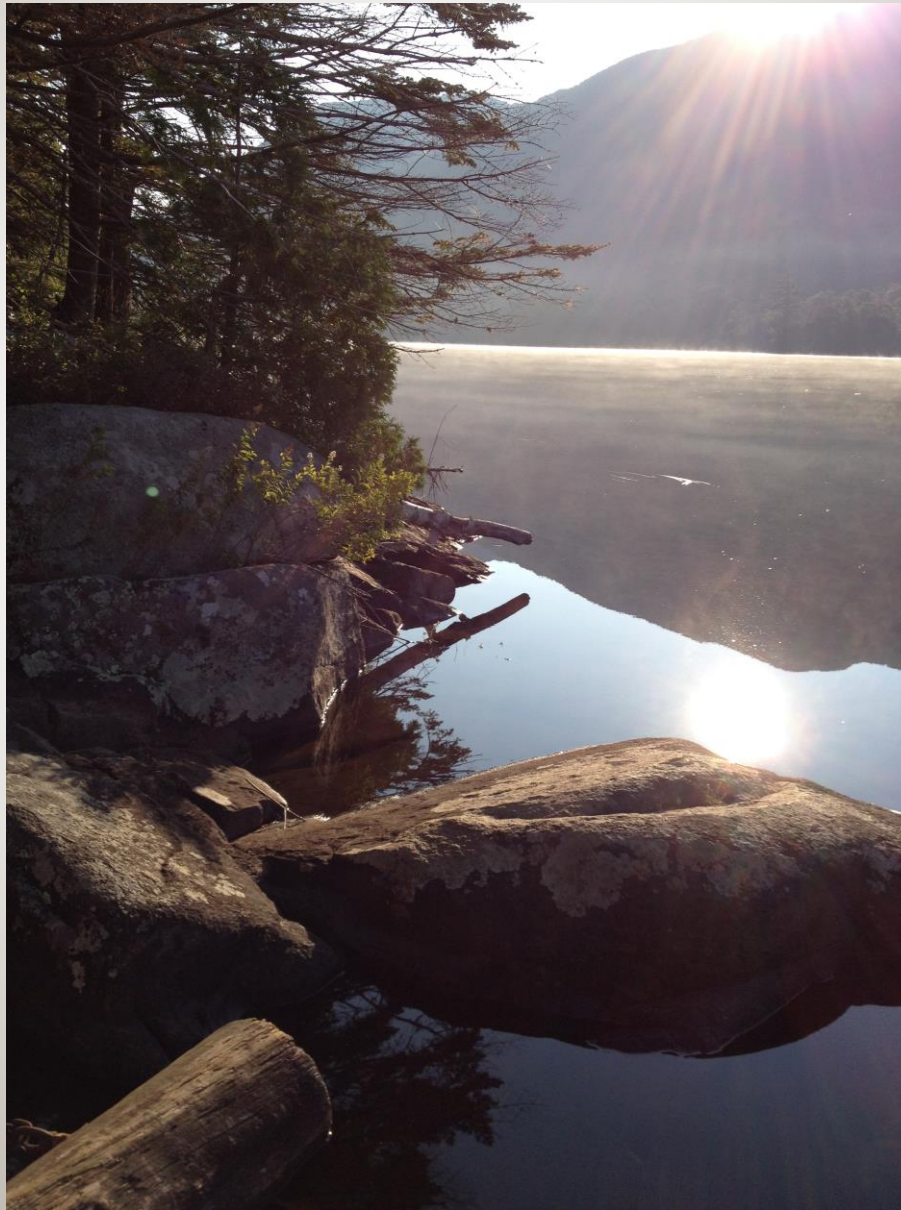
CONCLUSIONS

- Lake Trout are iconic Adirondack species and represent cold, high water-quality lakes

- Climate change IS occurring – Lake Trout are at risk – we need management to reflect this

- Monitor and protect the Lake Trout populations throughout the Adirondacks

- Conduct study to verify climate resiliency model, assess potential for a simpler model

Integrated
Aquatic
Sciences LLC

QUESTIONS?

Integrated
Aquatic
Sciences LLC