Utah Lake Water Quality Study Funding Request

August 24, 2016

Scott Daly
Division of Water Quality
Utah Department of Environmental Quality

Introduction

The Division is conducting a water quality study on Utah Lake to:

- Evaluate the role of excess nutrients on beneficial use impairments
- Identify appropriate in-lake nutrient endpoints

Driving Factors

- Continuation of previous studies
- Additional nutrient related 303(d) impairments
- Recent HAB events
- Regulatory certainty

Hardship Grant funding is requested to assist the Division in obtaining contractual assistance to complete Phase 2 tasks.

Utah Lake Work Plan 2015-2019

Phase 1: 2015-2016

Task 2: Data Information and Management:
- Water chemistry
- Hydrology
- Biological data (Phytoplankton, zooplankton, fish)
- Continuous data

Informs: 1, 2, 4, 5, 6

Task 3: Beneficial Use Assessment:
- Aquatic Life (Biology, fish data)
- Recreation use survey data (Utah Lake Commission)
- Secondary Water Uses (TDS, algal, cyanotoxins)

Informs: 2, 4, 7

Task 4: Source & Nutrient Loading Analysis
- Updated water budget
- Calculate pollutant loads
- Loading by season and hydrologic condition

Informs: 4, 5, evaluation of 'g' factors

Task 5: Model Development
- Model selection
- Calibration and Validation Report
- Nutrient Scenarios

Informs: 3, 5, JR TMDL Phase 3

1. Delisting
2. Assessment Unit Split
3. Characterize ecosystem shift
4. Refine Impairment
5. Additional Monitoring/projects
6. Support for upgrading Rec Use to 2A
7. Public Health Advisory process for Harmful Algae Blooms

Phase 2: 2017-2018

Alternative C: Use Attainability Analysis

Alternative A: TMDL for Utah Lake

Alternative B: Site Specific Standards

* Off-ramp TBPEL

* Off-ramp TBPEL

Phase 3: 2018-2019

Non Point LAs → Implementation

WLAs
- POTWs
- Storm water
- Industry

→ Permit Limits

Task 1: Stakeholder Involvement

Stakeholder Involvement (Task 1)

Utah Lake Water Quality Stakeholder Group

Tiered from Utah Lake Commission TAC

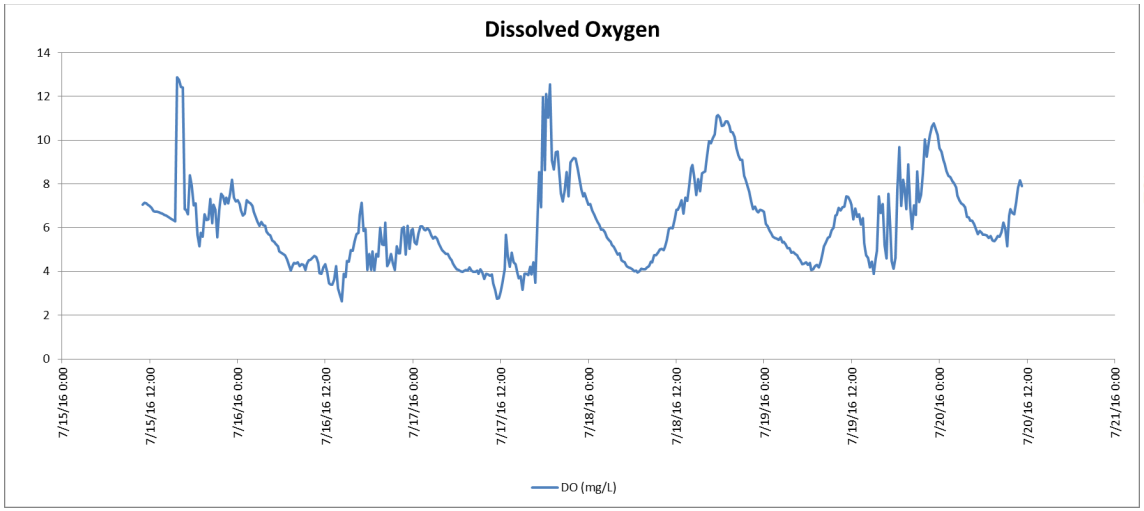
- 80 representatives:
  - Local municipalities and Utilities
  - POTW's
  - Local Universities
  - Private Consulting
  - Advocacy Groups
  - State, local and federal government

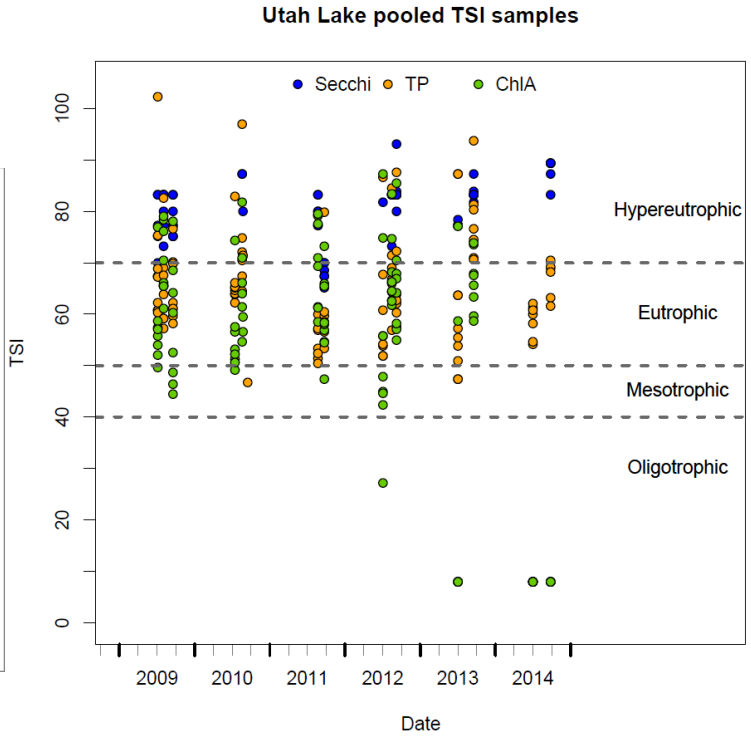
Water Quality Subgroups

- Data and Information Management (Task 2)
- Beneficial Use Assessment (Task 3)
- Load Analysis (Task 4)
- Model Selection and Development (Task 5)

Project Status: Data and information management (Task 2)

- Coordination of ongoing monitoring activities
- Data compilation and database development
- Data analysis
- Data gap identification
- Literature Review





Project Status: Beneficial Use Assessment (Task 3)

2016 Integrated Report

- New listings for harmful algae, ammonia, and pH

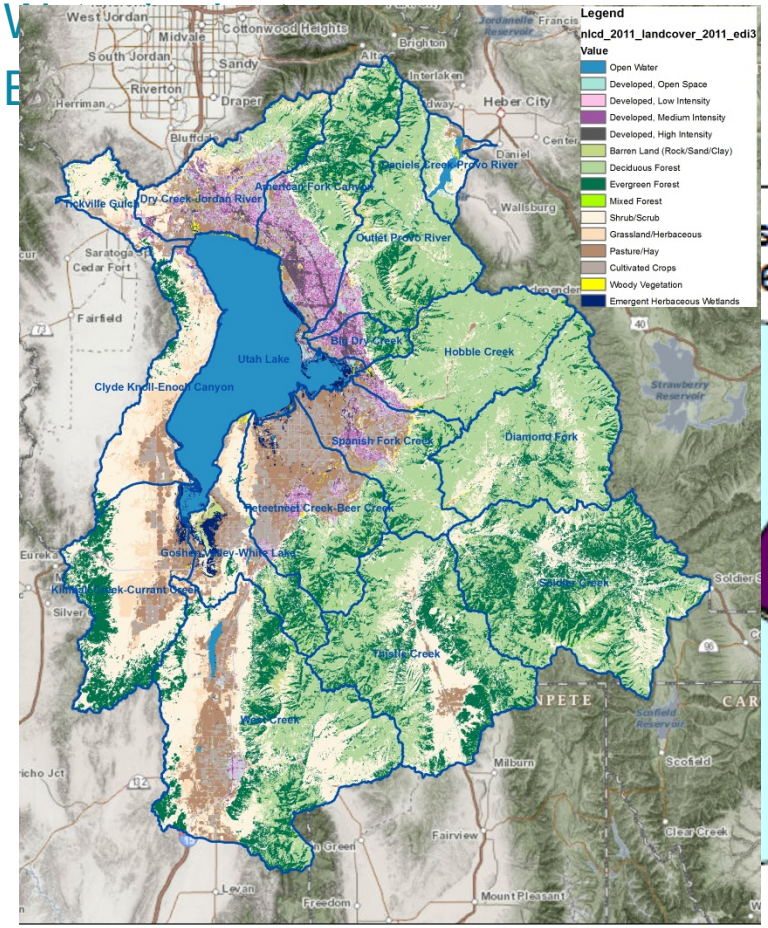
Evaluate existing use classes

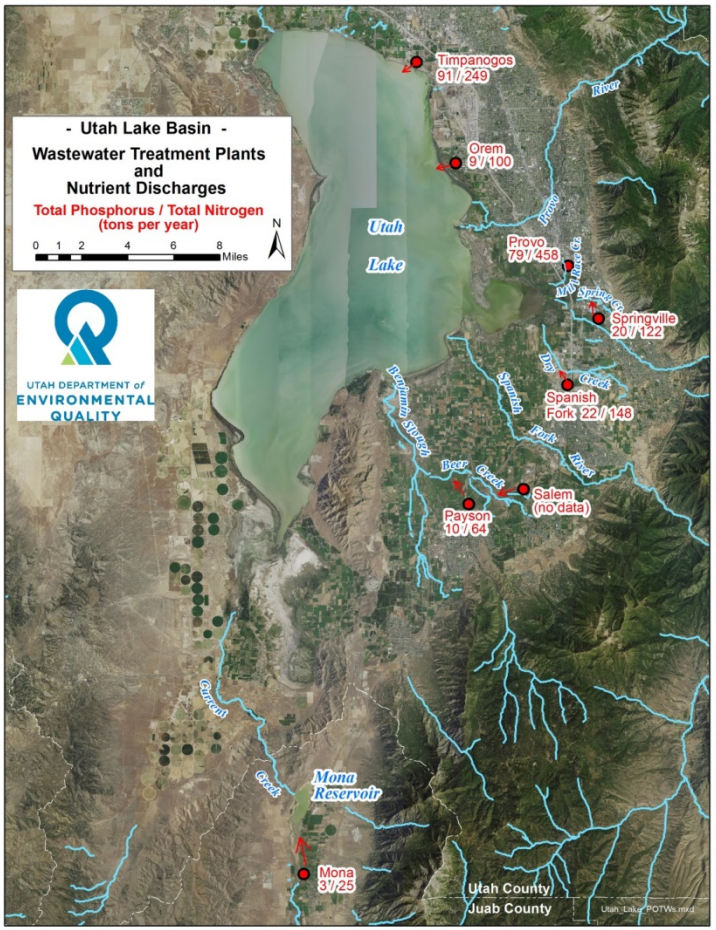
- Recreation, aquatic life, and secondary water use

Utah Lake State Park

Salt Lake County Canals fed by Utah Lake

Project Status: Source and nutrient load analysis (Task 4)





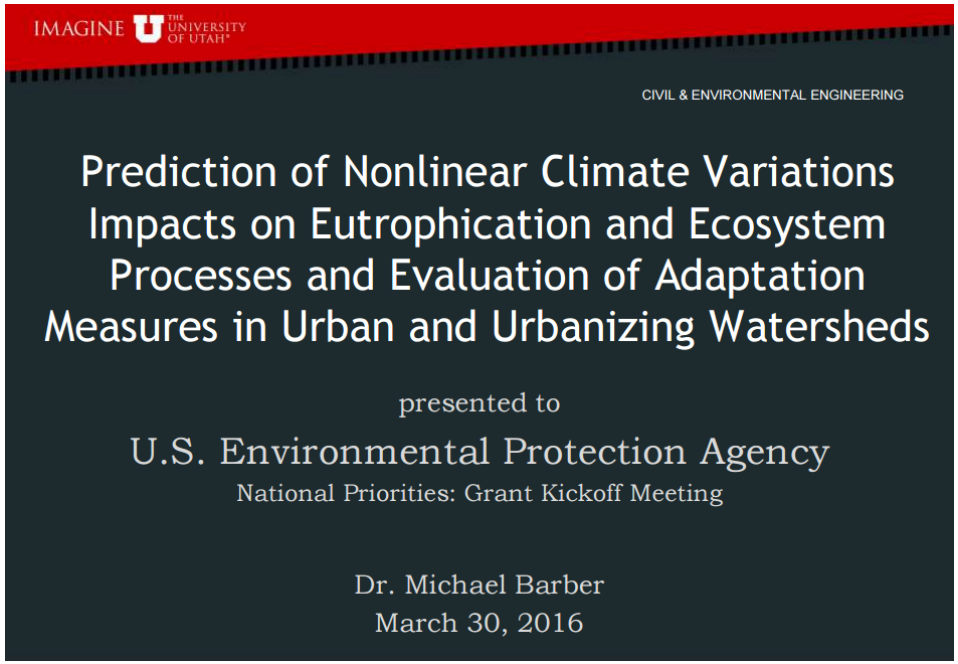
Project Status: Model Selection and Development (Task 5)

Model Selection

- WASP

Model Development:

- Collaboration with U of U

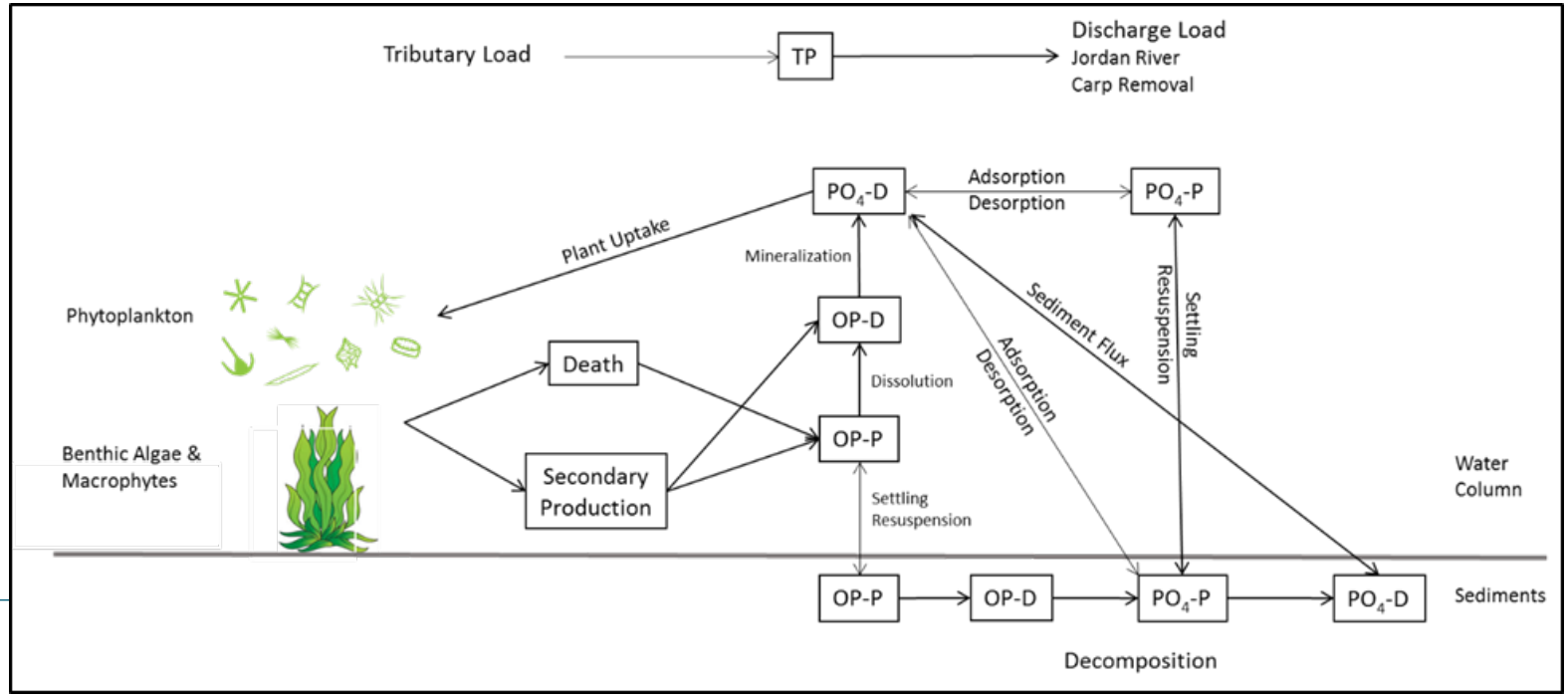


Model Name	WASP	CAEDYM	PCLAKE	CE-QUAL-W2
Spatial Dimension	1D-H	1D-V	0D	2D-V
Stratification	-	+	-	+
Inorganic Sediment Groups	3	2	1	>3
Littoral Zone	-	+	+	-
Phytoplankton Groups	3	7	3	>3
Zooplankton Groups	1	5	1	>3
Benthic Algae Groups	1	4	1	>3
Macrophyte Groups	+	1	1	>3
Macroinvertebrate Groups	0	3	1	0
Fish Groups	0	3	3	0
Bird Groups	0	0	0	0
Hydrodynamics	+	+	±	+
Temperature Dynamics	+	+	+	+
Oxygen Dynamics	+	+	+	+
Inorganic Carbon (CO2/DIC) Dynamics	+	+	-	+
Organic Carbon (DOC/POC) Dynamics	+	+	+	+
Microbial Dynamics	+	+	±	+
Internal Phosphorus Dynamics	+	+	+	+
Phosphorus Sorption to Sediment	±	+	±	±
Internal Nitrogen Dynamics	+	+	+	+
Internal Silica Dynamics	+	+	±	+
Sedimentation/Resuspension	±	+	±	±
Sediment Diagenesis	+	+	±	+
Fisheries Management	-	±	+	-
Dredging	-	-	+	-
Mowing	-	-	+	-
Ice Cover	+	-	-	+
Clear-Turbid State Transition	-	±	+	±

Primary Study Questions

Nutrient Dynamics

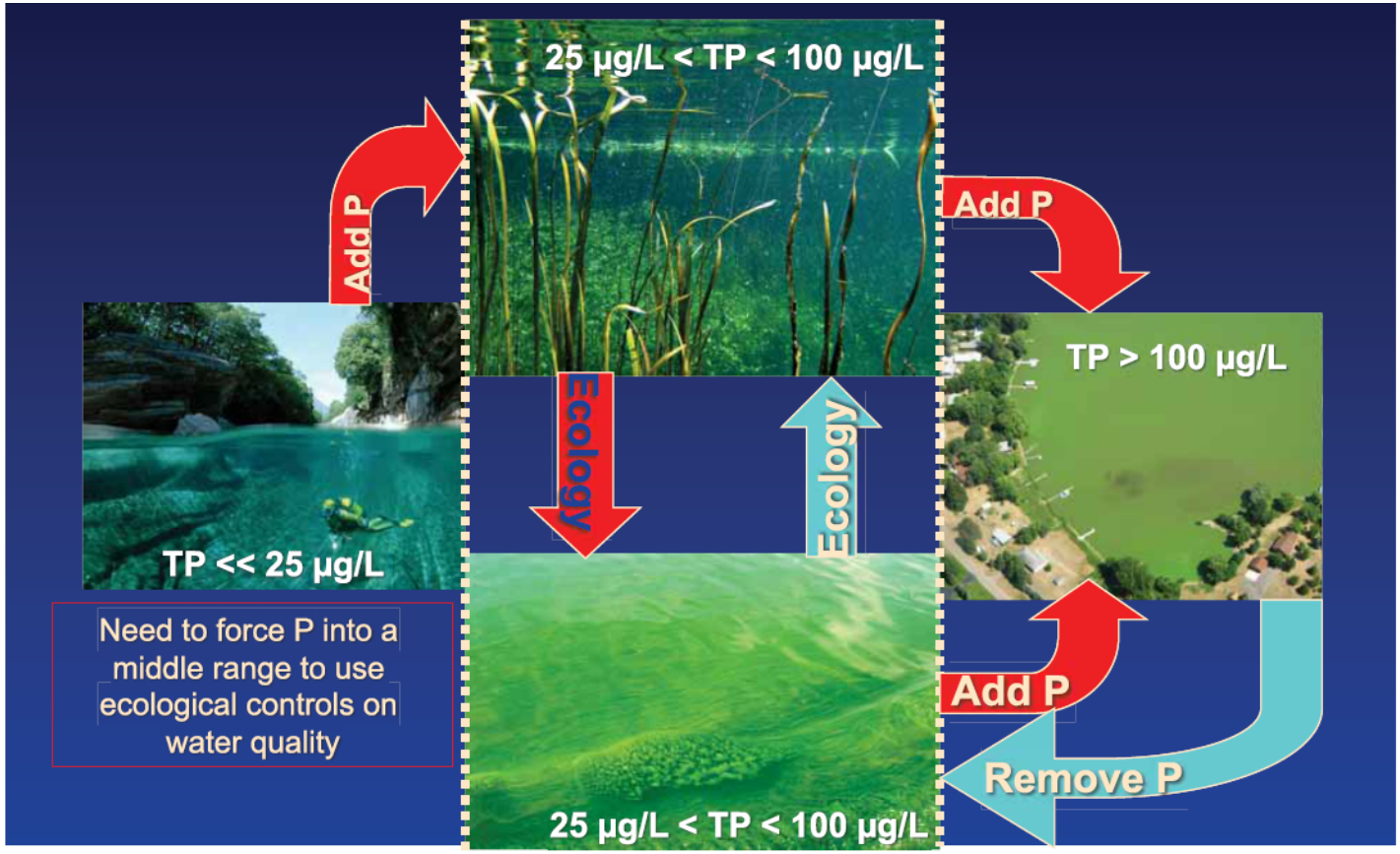
- What is the role of internal lake processes on nutrient cycling and bio-availability?
  - Nutrient cycling
  - Nutrient mineralization
  - Food web dynamics
  - Legacy loading from lake-bed sediments
  - Lag-time response



Primary Study Questions

Ecological Influence

- What is the ecological influence on water quality conditions in Utah Lake?
  - Carp, nutrient cycling, and restoration potential
  - Turbid vs. clear water stable state
  - Historical shifts in ecological conditions

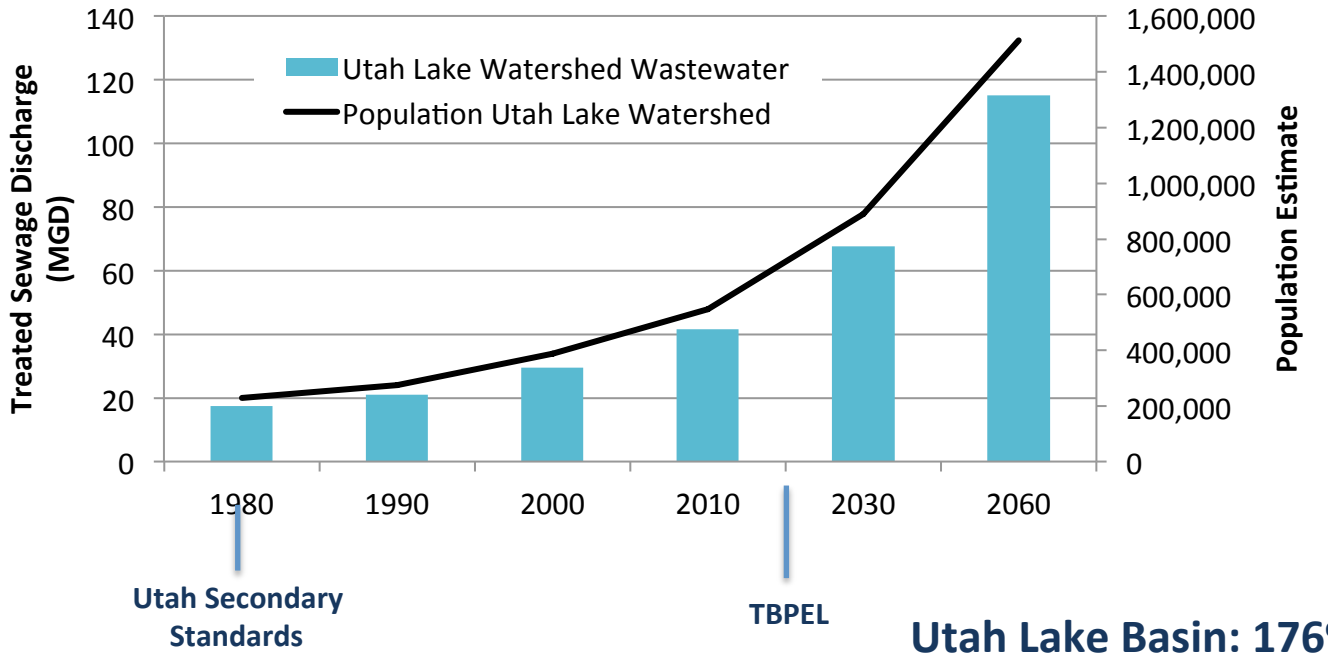


Source: David Austin, P.E., Senior Ecologist – ESA, CLM – NALMS Global Technology Lead – Natural Treatment Systems, CH2M Hill

Primary Study Questions

Loading Characteristics

- What are the characteristics of nutrient loading to Utah Lake?
  - Origin, timing, and magnitude
  - Population growth and urbanization
  - Tributary nutrient cycling



Utah Lake Basin: 176% Growth

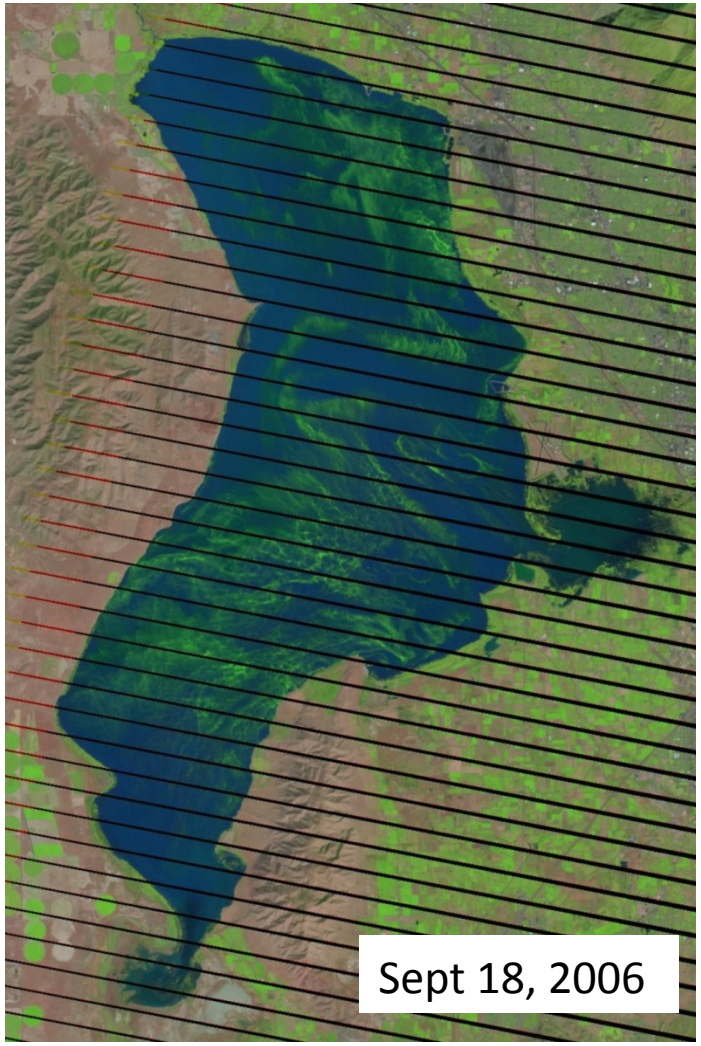
Primary Study Questions

Beneficial Use Classification

- What is the desired condition for recreational users?
- Do recreationists change behavior based on water quality conditions?

Harmful Algal Blooms (HABs)

- Can HABs be predicted in Utah Lake?
  - Linkage to nutrients
  - Use of satellite imagery and water chemistry for HAB early warning
- What are the economic and social costs of HABS in Utah Lake?
- What are potential treatment options for HAB events in Utah Lake?



Estimated Phase 2 Budget

Study Category	Amount
Lake Ecology	$150,000 - $250,000
Internal Nutrient Processes	$150,000 - $250,000
Nutrient Loading	$150,000 - $250,000
Beneficial Use Classification	$50,000 - $150,000
HAB Prediction	$50,000 - $150,000
Economic Impacts Analysis	$50,000 - $100,000
HAB Treatment Option Investigation	$15,000 - $35,000
TMDL/Site Specific Standard Development	$50,000 - $150,000
Total	$1,000,000

QUESTIONS?