Introduction to Phase 3 – Implementation Planning

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
WATER QUALITY

ULWQS Steering Committee
August 25, 2021

Erica Gaddis
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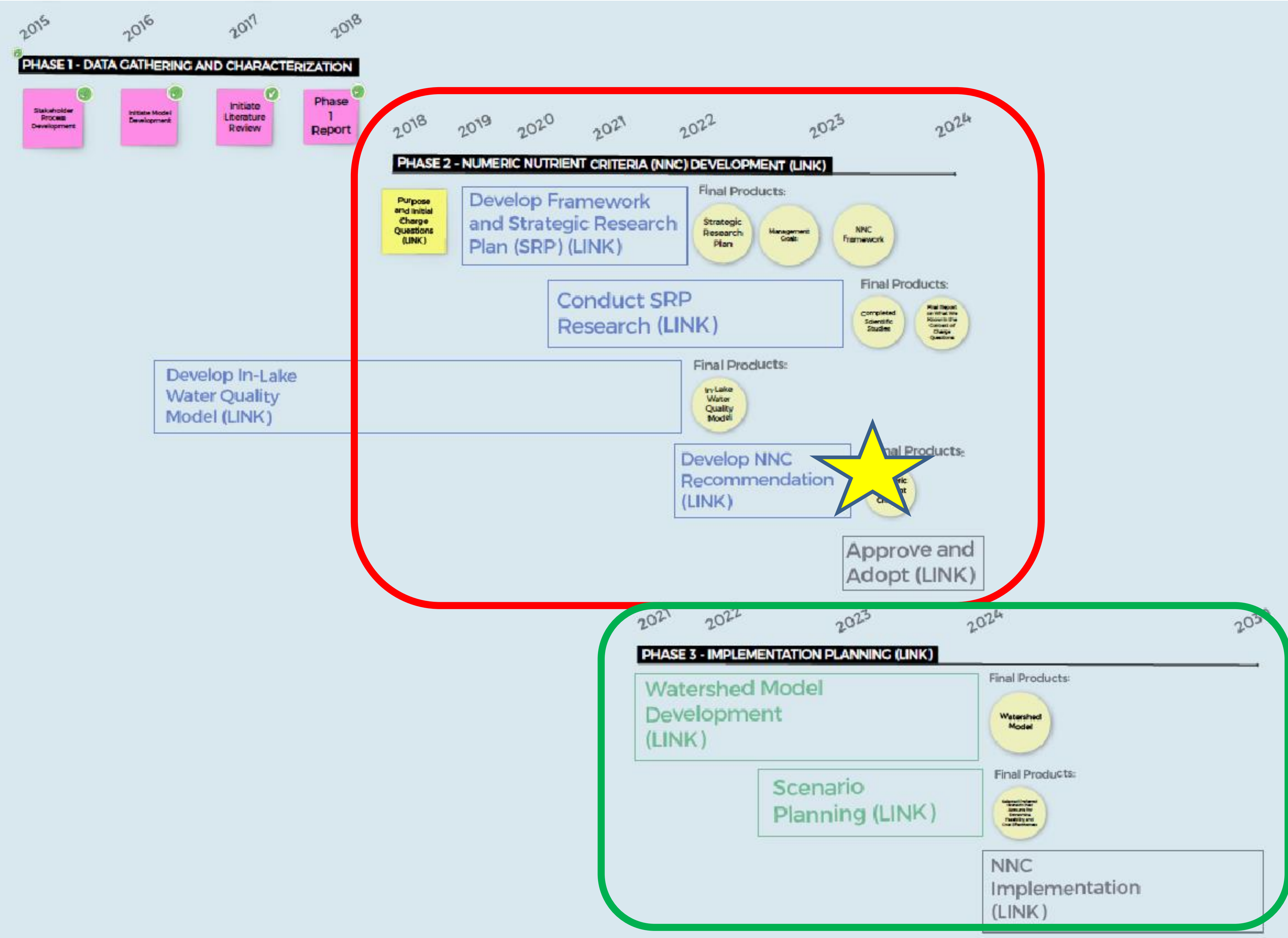

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Purpose of an Implementation Program

Approach for on the ground implementation

- Identify location and magnitude of nutrient sources
- Evaluate potential management scenarios (how to get there)
- Incorporate growth and uncertainty

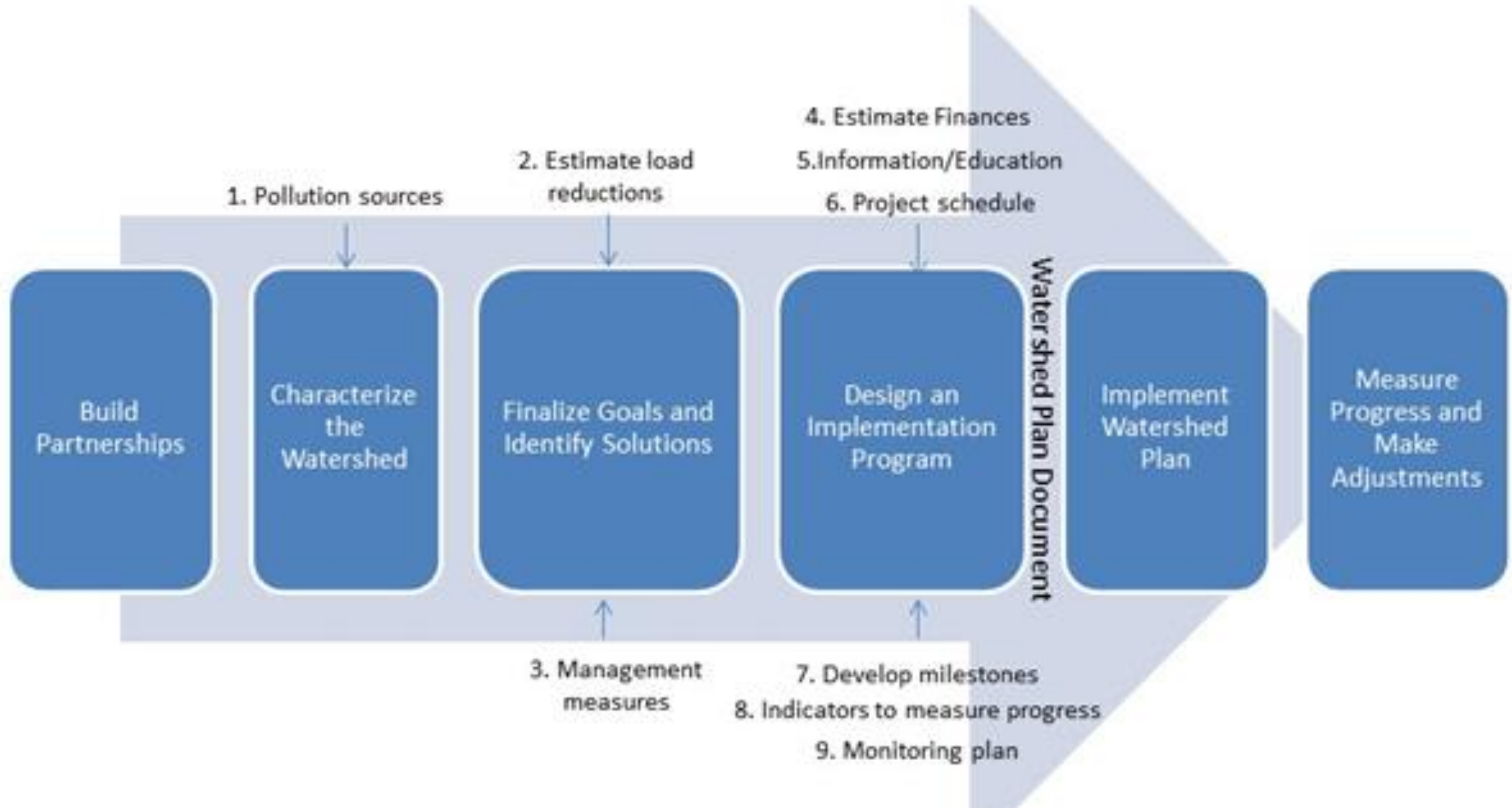
Cost and feasibility

- Define what it means to be economically and technologically feasible
- Evaluate and determine cost to regulated sources as required in 19-5-105

Determine regulatory implementation components

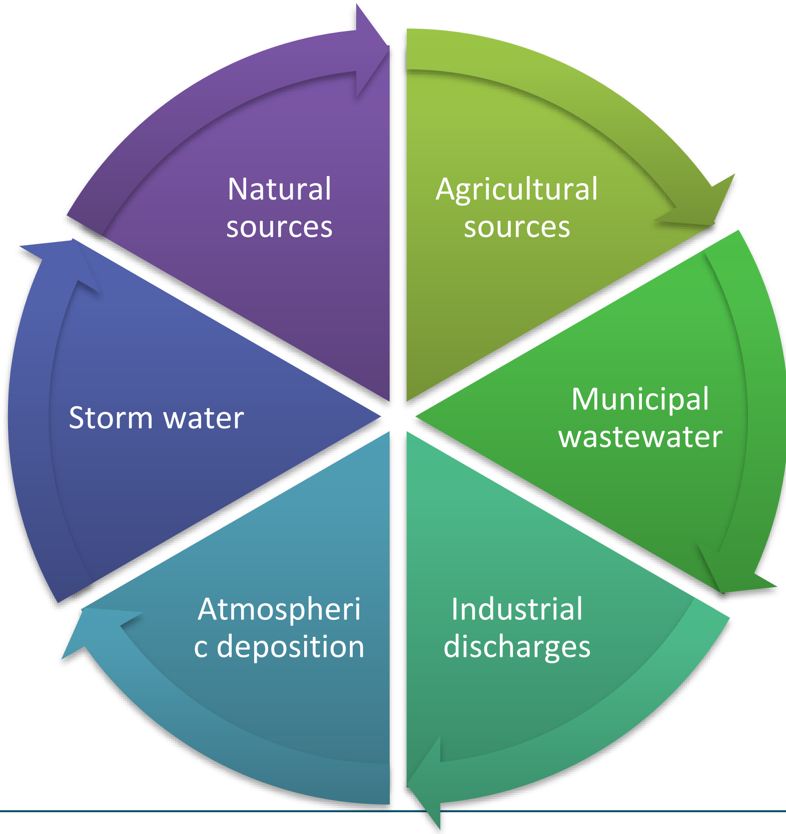
- Adoption of criteria into Utah Administrative Code
- Monitoring and assessment methodology
- Permitting approach
- Explore Water Quality Trading

Nine Elements of a Watershed Plan



How do we get there

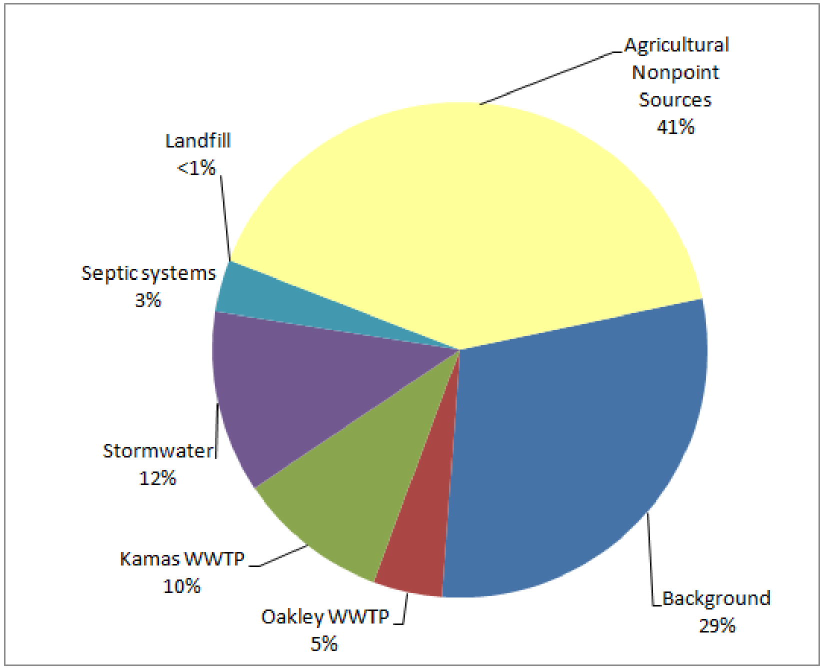
Are there sources of nutrient pollution that you want to see explicitly addressed in the implementation plan? Or, which pie pieces are missing?



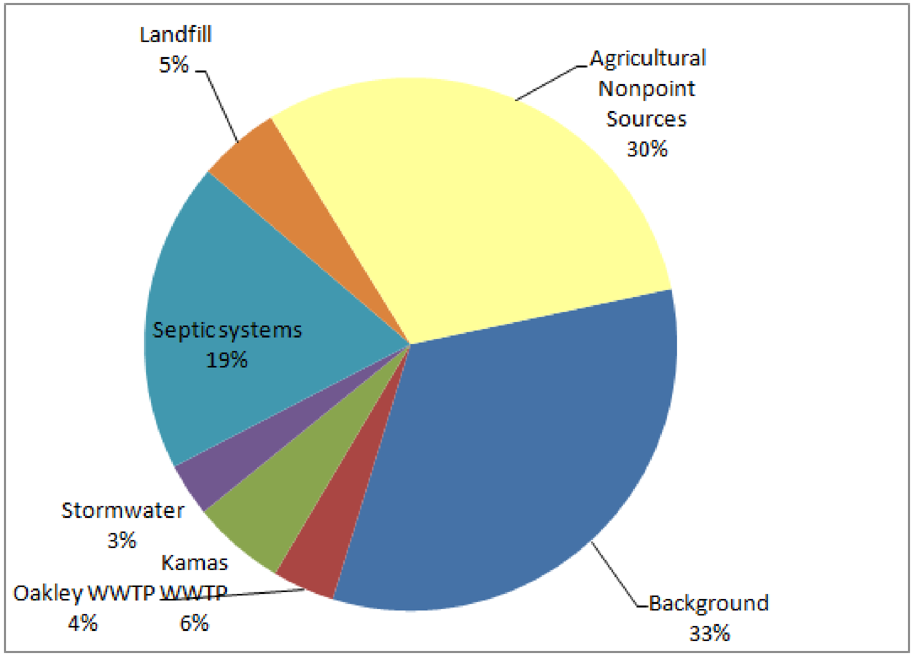
Nutrient Loads to Rockport Reservoir

	Dry (2004)	Average (2007)	Wet (2011)
Total Phosphorus	3,230	2,337	13,558
Total Nitrogen	22,962	18,574	-----

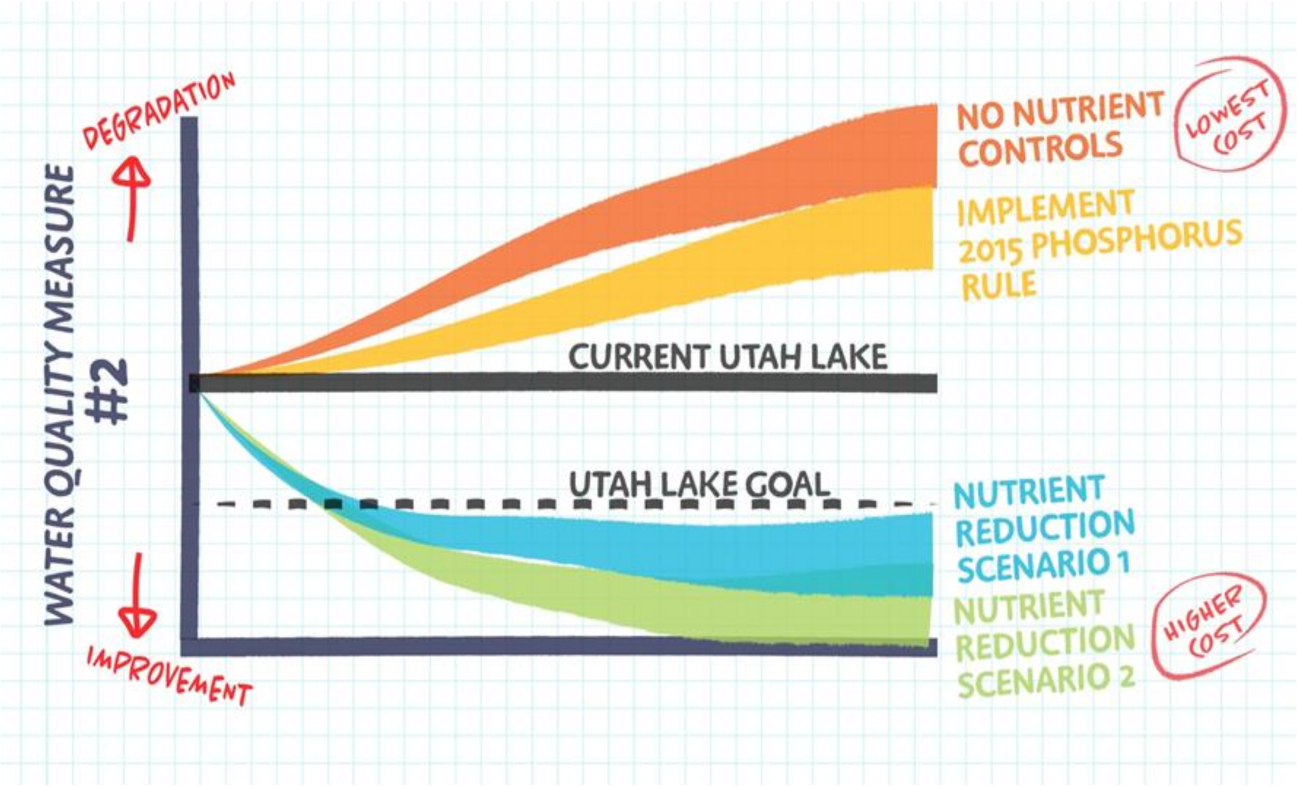
PHOSPHORUS LOAD —
Proportion of total spring-summer season.



NITROGEN LOAD —
Proportion of total spring-summer season.



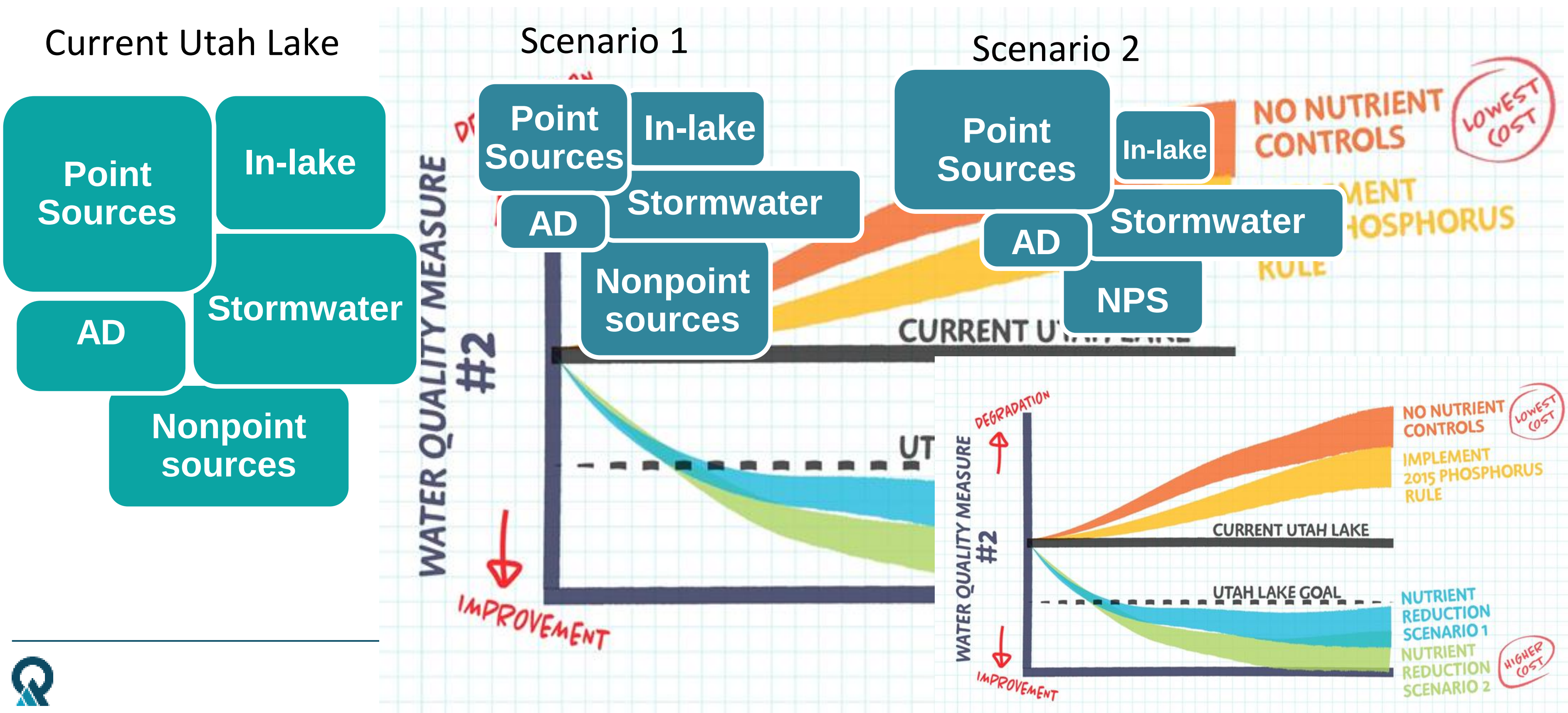
Are there some key scenarios that you would like to see evaluated that would inform implementation planning?



How Do We Get There?

Define on the ground nutrient management scenarios

- What nutrient management practices to implement
- When and where?



How can the implementation plan be drafted to be most actionable and user friendly?

Stormwater

Total Seasonal Nutrient Load

	Rockport	Echo
TP (kg)	278	683
% total	12%	13%
TN (kg)	601	933
% total	3%	2%

Implementation Options

- Detention ponds
- Constructed wetlands
- Infiltration trench/basin
- Permeable pavement
- Sand and organic filters
- Grassed swales

On-going Watershed Projects

- Proposed contractor training sessions on stormwater remediation techniques

Effectiveness and Costs

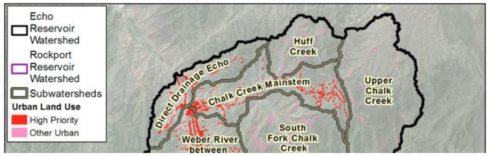
- Costs range from $5,000 to $15,000 per acre (construction and maintenance)
- Effectiveness range from 20% to 90% reduction

Source Description

Residential and commercial development has increased the amount of impervious surface area in the Rockport and Echo Reservoir watersheds, contributing to increases in stormwater runoff. Stormwater transports nutrients that have accumulated on surfaces during dry periods. The runoff generally begins as diffuse flow (e.g., off a parking lot), which is then directed to curbs, gutters, and storm drains. These drains route stormwater into pipes and tunnels until it is ultimately discharged into a stream.

Critical Areas and Priorities

Due to its more rural nature, Rockport Reservoir watershed generates a smaller stormwater nutrient load when compared to Echo Reservoir watershed. However, both watersheds contain significant amounts of impervious cover including the I-80 and US-40 corridors. These road systems and high density urban areas, especially those near streams and reservoirs, are considered critical areas for stormwater generation and are priorities for implementation plans.



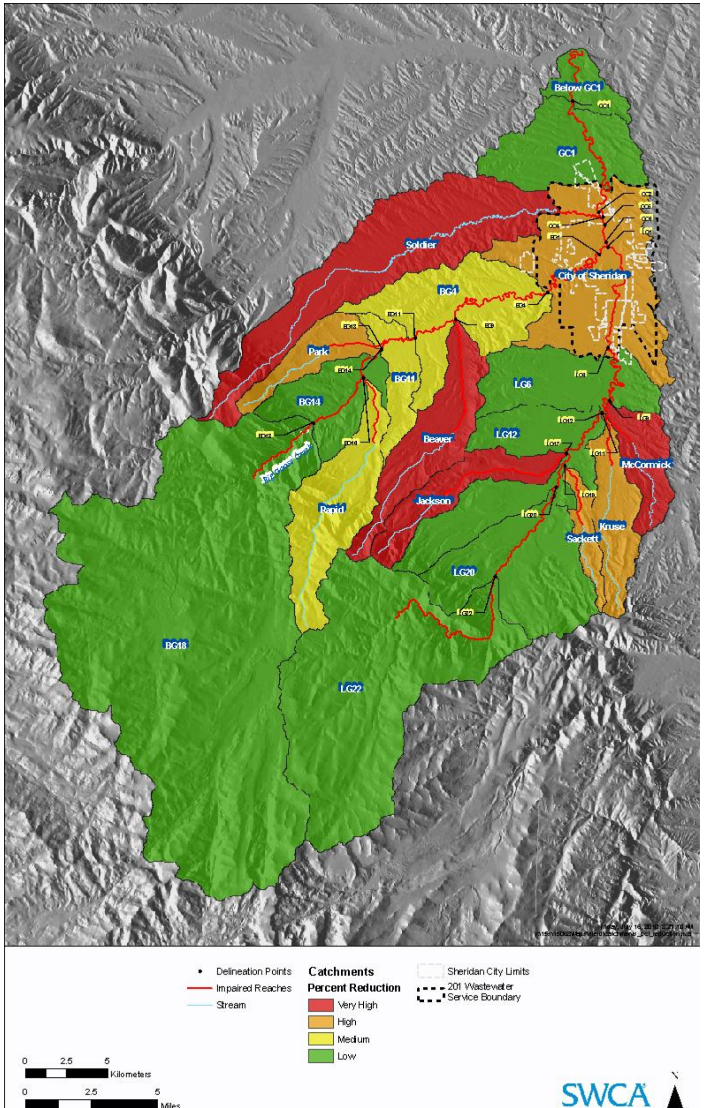
Example Priority Areas

Based on percent reduction required to attain water quality standards

Categories

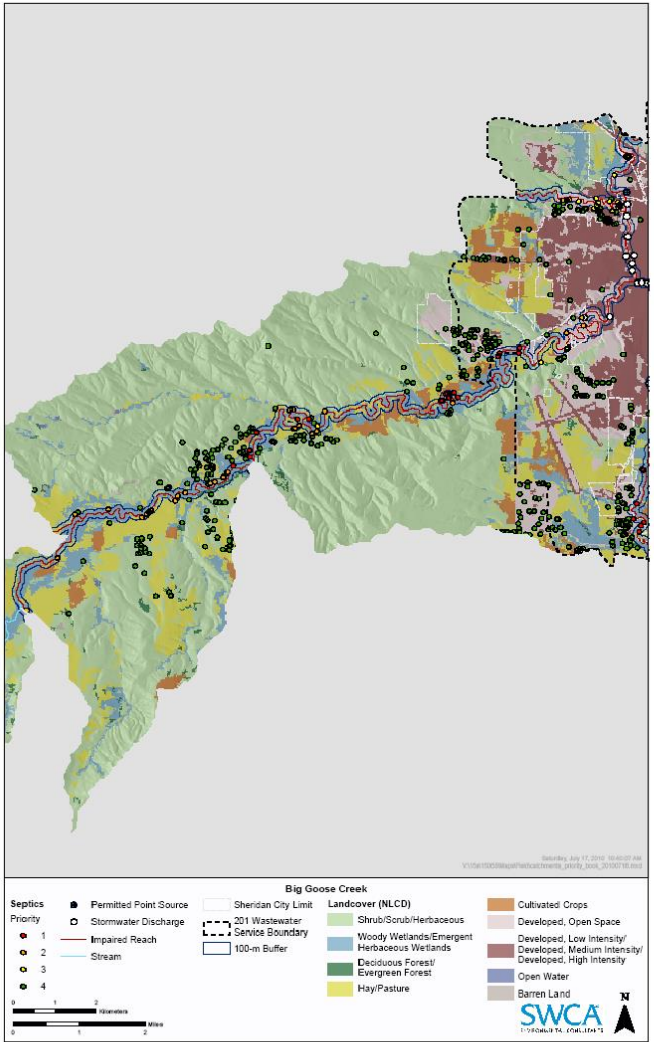
- Very high > 75% reduction
- High : 65% to 74% reduction
- Medium : 41% to 64% reduction
- Low : < 40% reduction

Should be used to prioritize implementation projects



Priority Areas for Septic Improvements

- Priority 1 Criteria (62 systems)
  - Within 100 meters of the creek
  - In high aquifer sensitivity areas
  - In irrigated areas
- Priority 2 Criteria (71 systems)
  - Within 100 meters of the creek
  - In high sensitivity areas *or* in irrigated areas
- Priority 3 Criteria (11 systems)
  - Within 100 meters of the creek
- Priority 4 Criteria (996 systems)
  - All other septic systems in Sheridan County

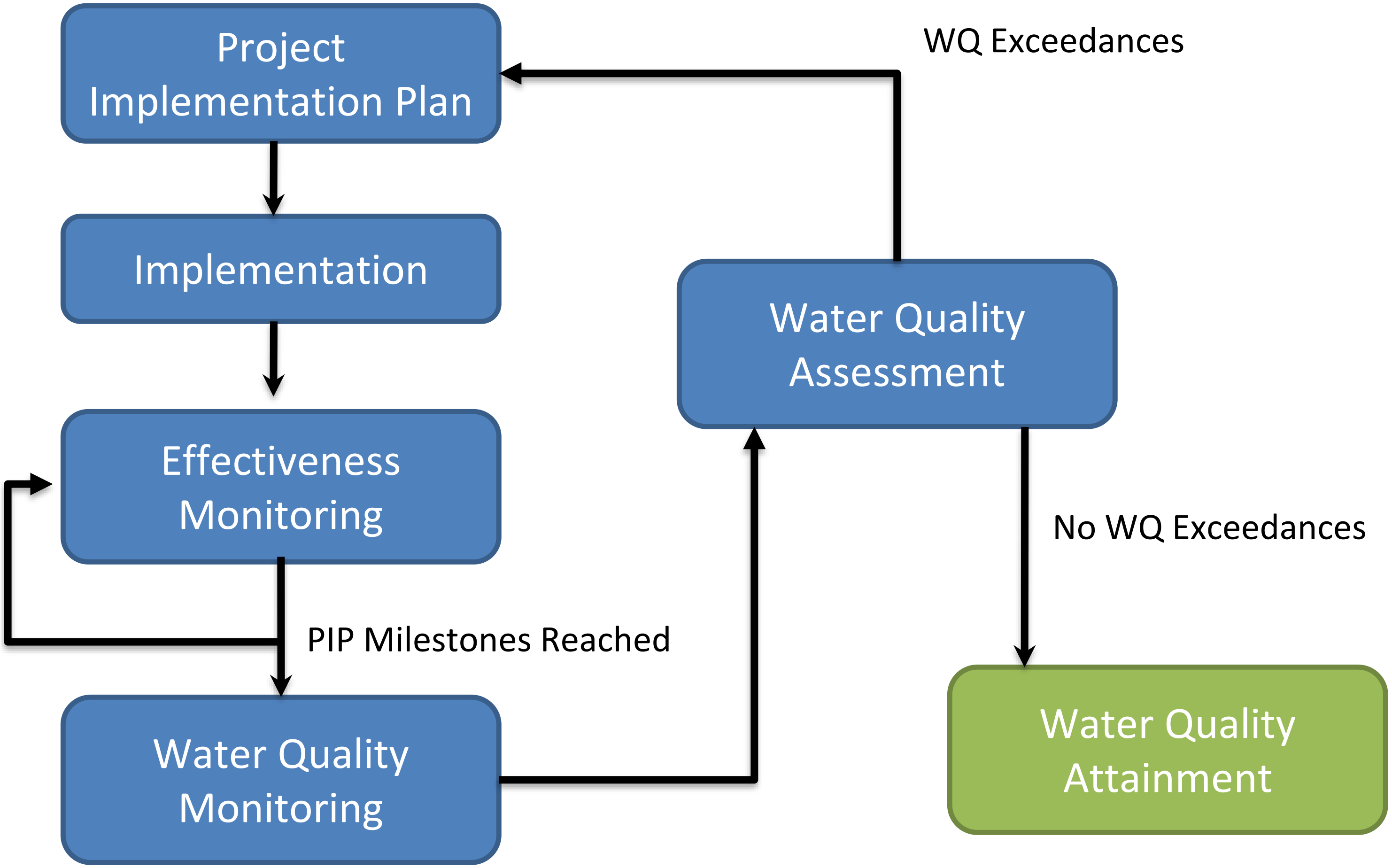


Example Assessment by Land Ownership

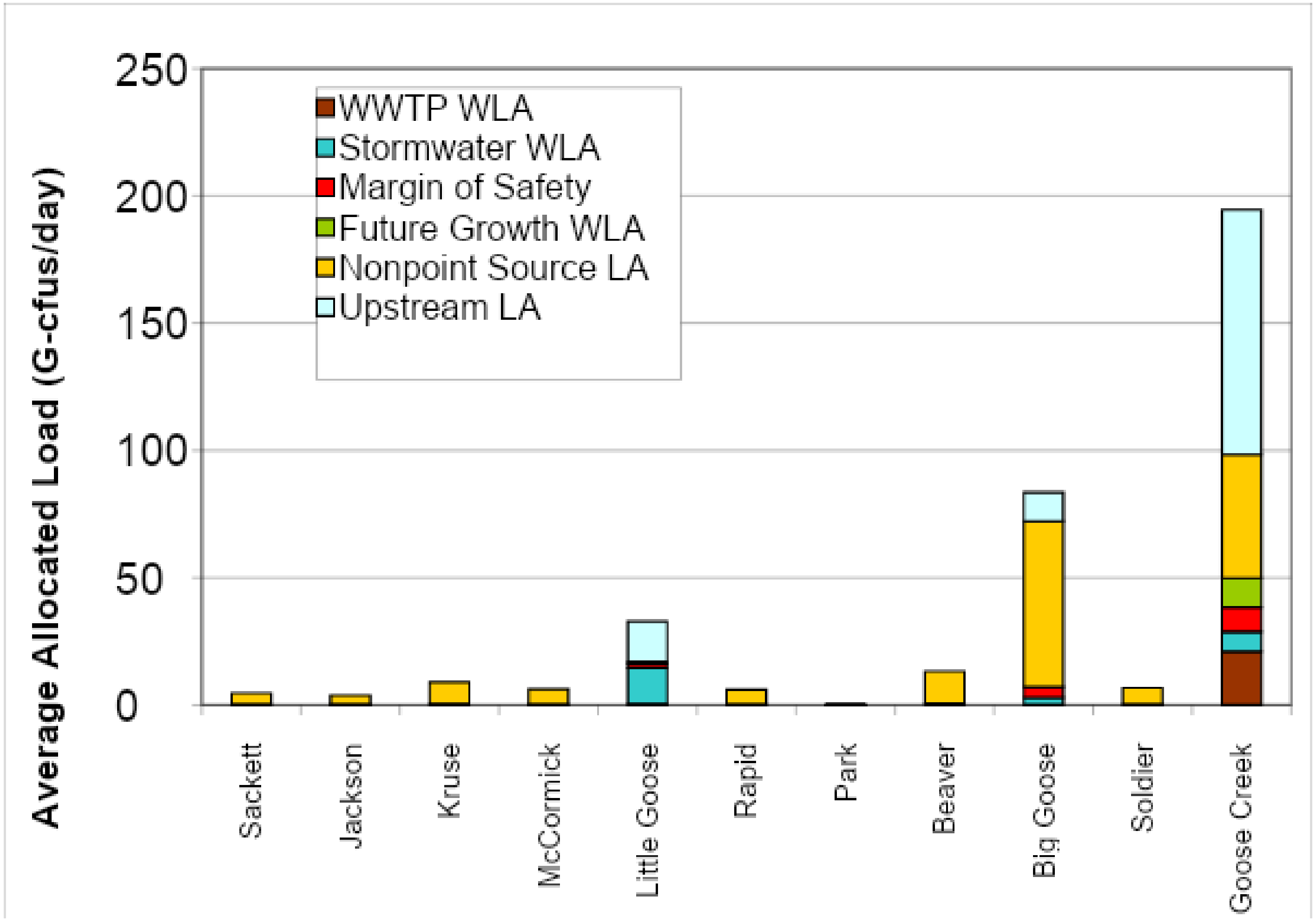
Summary of Load Reductions Required from Nonpoint Sources to Attain Pathogen TMDL and Water Quality Standards

Pathogen Sources **Nonpoint Sources**	**Area**	**Daily Average Load of *E. coli*** **(G-cfu/day)**	**Load Allocation of *E. coli*** **(G-cfu/day)**	**Expected Load Reduction Required to Attain TMDL**
On-site Wastewater Treatment (septic systems)	USFS	1.0	1.0	0%
	Sheridan Co.	110.6	27.7	75%
	City of Sheridan	220.9	72.9	67%
Grazing on Public Lands	USFS	11.2	11.2	0%
	Sheridan Co.	0	0	0%
	City of Sheridan	0	0	0%
Pastured Animals on Private Land	USFS	0	0	0%
	Sheridan Co.	305.3	76.3	75%
	City of Sheridan	–	–	0%
Wildlife (big game and waterfowl)	USFS	6.8	6.8	0%
	Sheridan Co.	33.9	8.5	75%
	City of Sheridan	16.7	5.5	67%
Domestic Animals	USFS	0.1	0.1	0%
	Sheridan Co.	9.2	2.3	75%
	City of Sheridan	–	–	0%
Total Nonpoint Sources	USFS	19.0	19.0	0%
	Sheridan Co.	459.0	114.8	75%
	City of Sheridan	237.6	78.4	67%

What are your thoughts about the timeframe that the implementation plan should cover?



Example of uncertainty and growth incorporated into implementation



Who are the key implementation partners and when/how should we engage them?

- Utah Lake Commission (or future Utah Lake Authority)
- Federal agencies (e.g. USFS, NRCS)
- State agencies (UDWQ, UDAF, UDOT, UDNR)
- Utah County (Health Department, Storm water, Planning and Zoning)
- Municipalities (MS4s, POTWs, and others)
- Utah Lake Water Users
- Water and Wastewater Districts (TSSD, CUWCD)
- Private partners (Homeowner associations, industry, recreation concessionaires)
- Nonprofit organizations (Audubon)

Cost and Feasibility

Who should do the economic analysis and what should it include?

Wastewater Infrastructure

Public health

Storm water systems

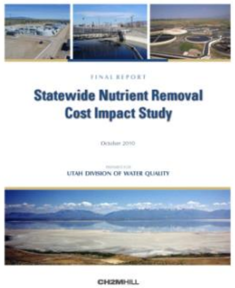
Aquatic life

Nonpoint source reduction

Secondary water

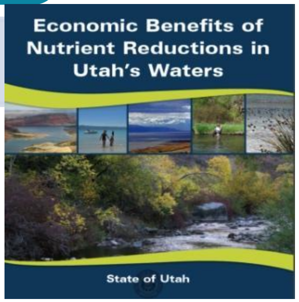
Habitat restoration

Recreation

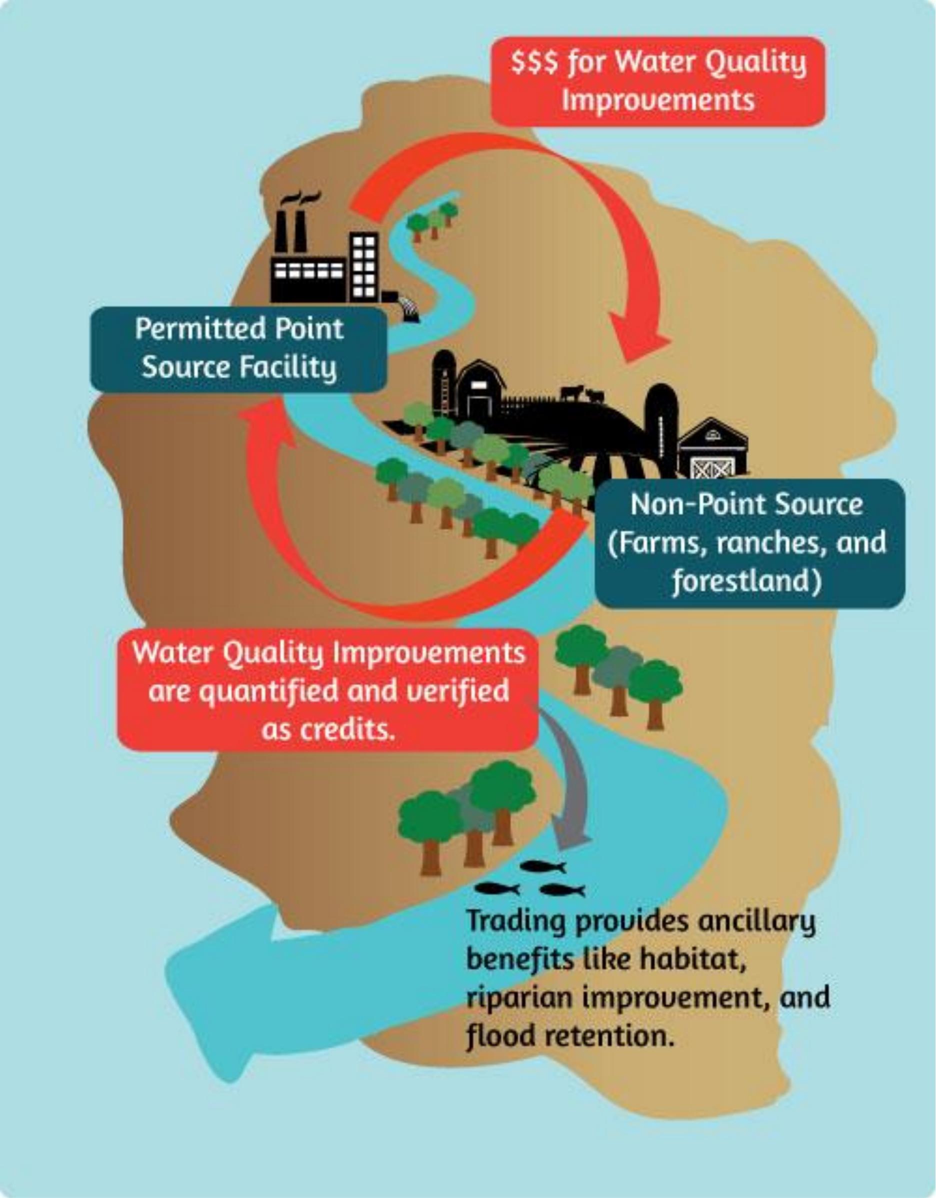


Costs

Benefits



Should the implementation plan explore a formal water quality trading program? What elements should be included?



Discussion

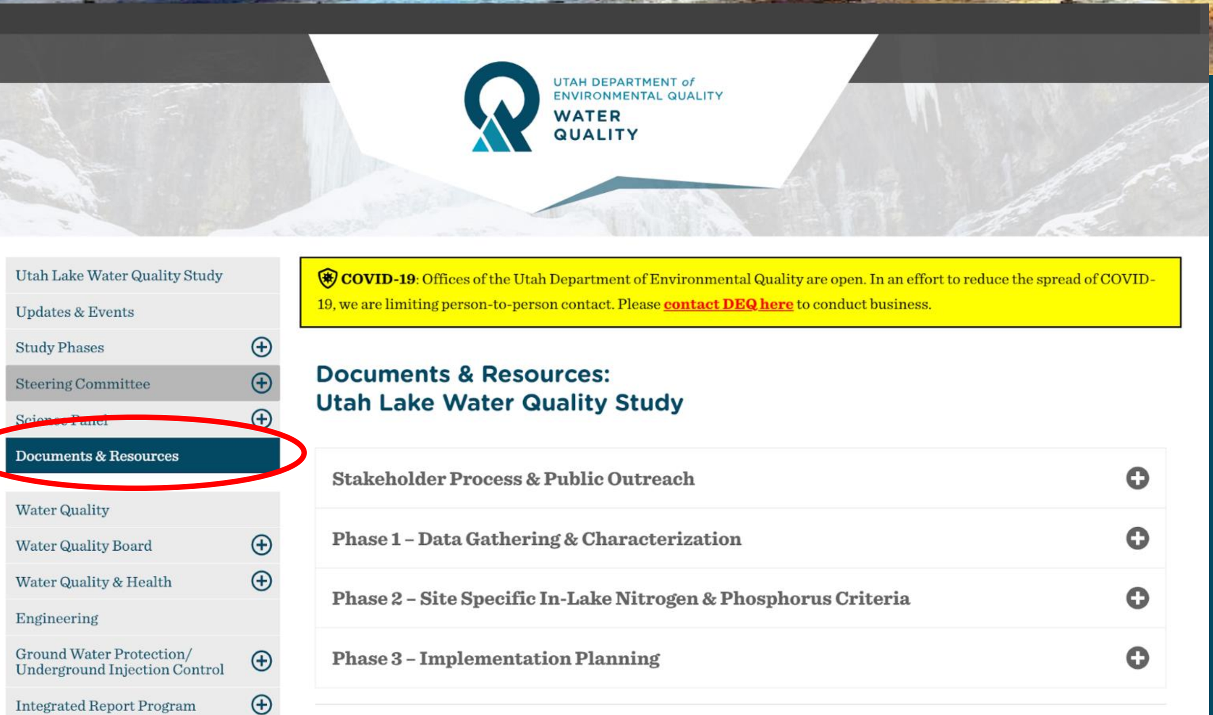


Photo: Utah Lake Commission

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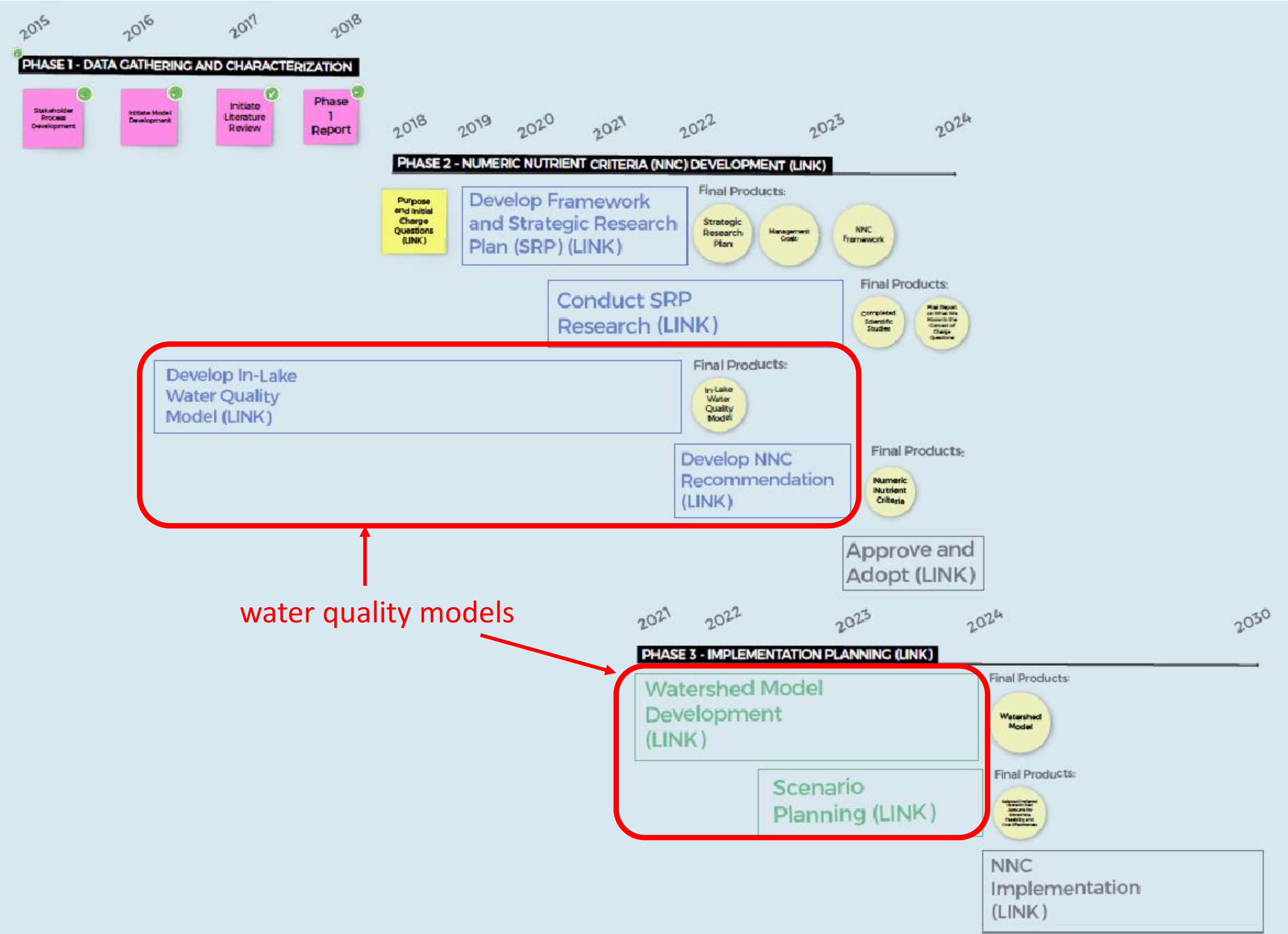
Water Quality Modeling Introduction

UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY
WATER QUALITY

ULWQS Steering Committee
August 25, 2021
Scott Daly



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IMAGINE THE UNIVERSITY OF UTAH

CIVIL & ENVIRONMENTAL ENGINEERING

Prediction of Nonlinear Climate Variations Impacts on Eutrophication and Ecosystem Processes and Evaluation of Adaptation Measures in Urban and Urbanizing Watersheds

presented to

U.S. Environmental Protection Agency

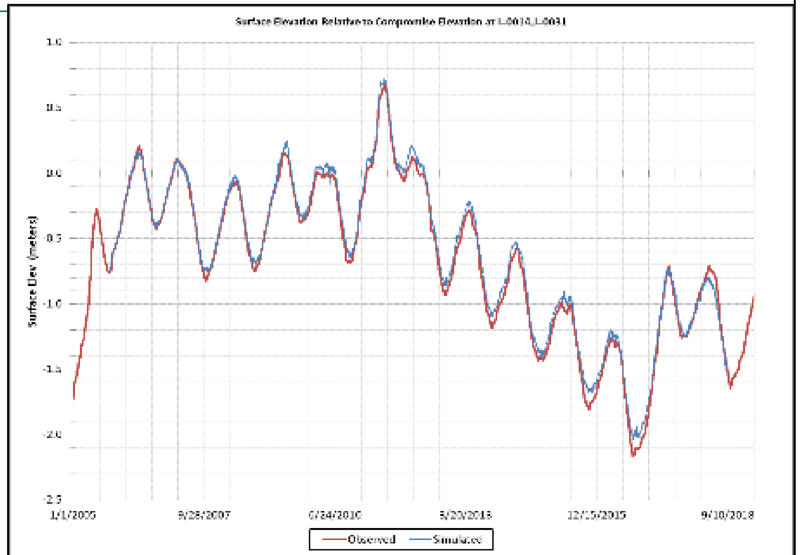
National Priorities: Grant Kickoff Meeting

Dr. Michael Barber

March 30, 2016

Research Team

- Michael Barber, Ph.D.
- Steve Burian, Ph.D.
- Ramesh Goel, Ph.D.
- Sarah Hinners, Ph.D.
- Brett Clark, Ph.D.



UTAH LAKE HYDRODYNAMIC (EFDC) AND WATER QUALITY (WASP) MODEL REPORT

IN SUPPORT OF EPA PROJECT NUMBER 835866-01: PREDICTION OF NONLINEAR CLIMATE VARIATIONS IMPACTS ON EUTROPHICATION AND ECOSYSTEM PROCESSES AND EVALUATION OF ADAPTATION MEASURES IN URBAN AND URBANIZING WATERSHEDS

University of Utah
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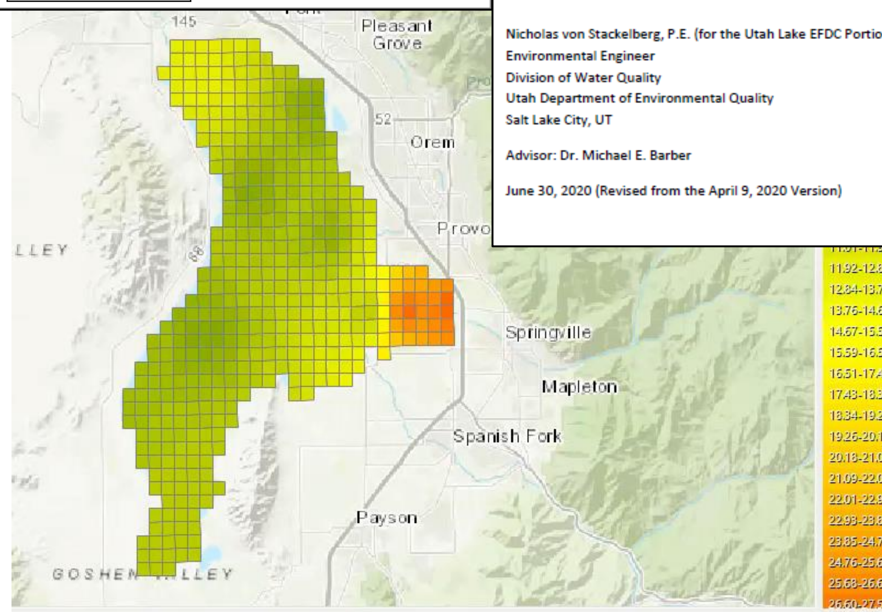
Salt Lake City, UT

Advisor: Dr. Michael E. Barber

June 30, 2020 (Revised from the April 9, 2020 Version)



Outcomes

- In-lake models – delivered to the Science Panel (June 2020)
- Watershed models – In draft

Technical Support Contractor

Science Panel Review

- Review of models
- Model Gaps Memo → Structural and performance limitations
- Prioritization of limitations

RFP Development

- Lake model – enhance and apply
- Watershed model – select, build, and apply

Proposal Evaluation & Selection

- Science Panel – Subject matter experts

TETRA TECH

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UTAH LAKE WATER QUALITY MODEL DEVELOPMENT

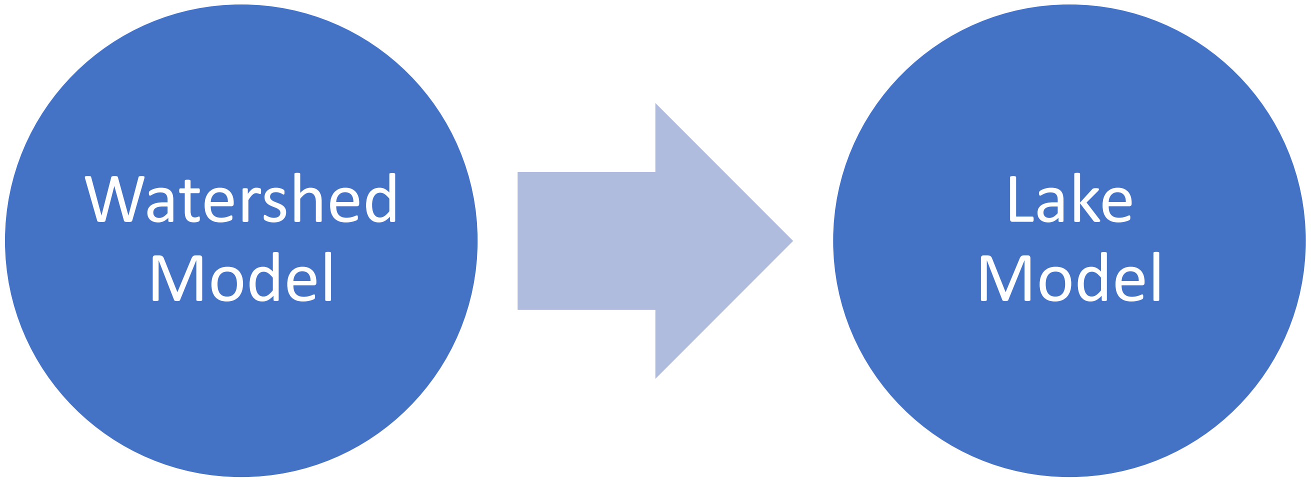
ULWQS Steering Committee Meeting
2021-08-25
Presented by Kevin Kratt, Tetra Tech

TOPICS

- Why are we developing models for Utah Lake and its watershed?
- What is a lake model?
- What is a watershed model?
- Next steps

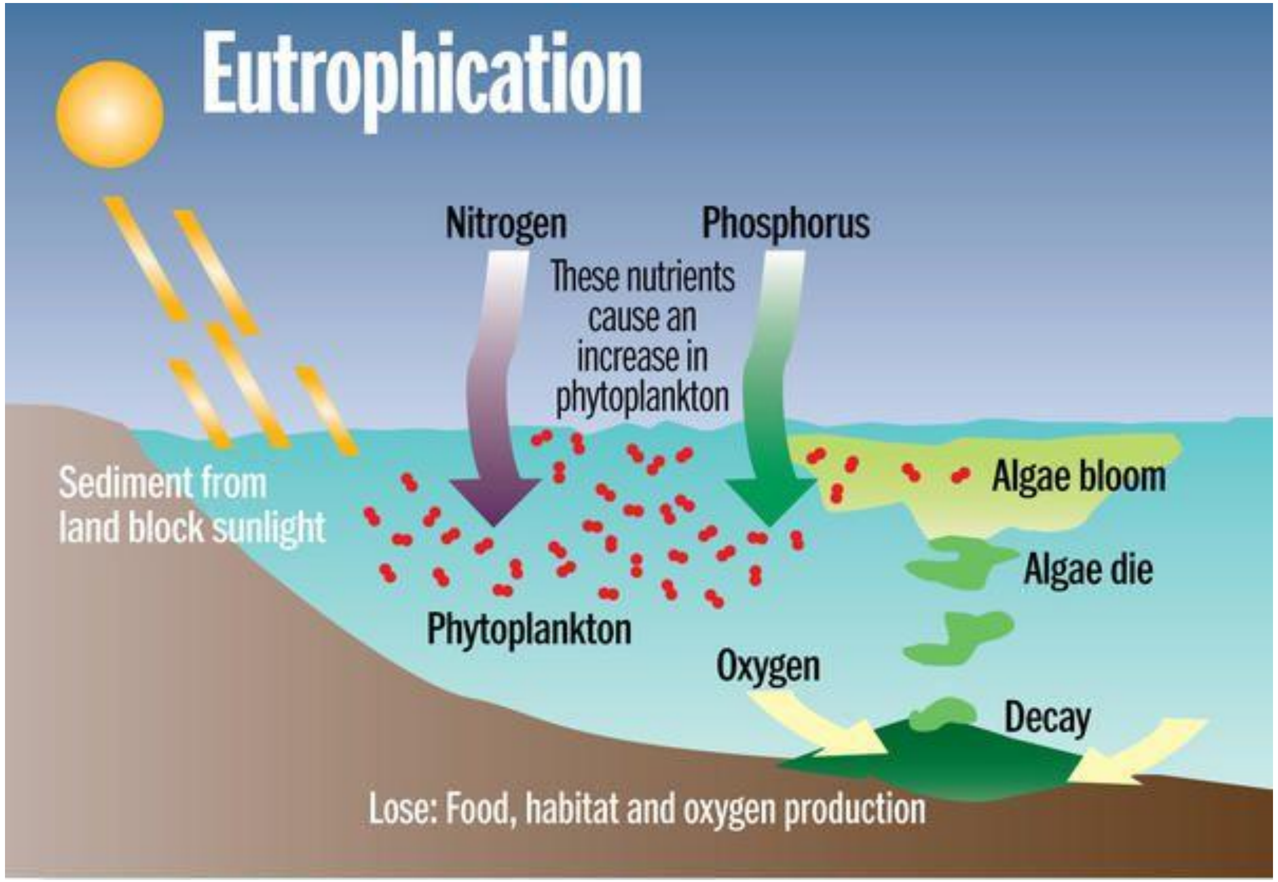
WHY ARE WE DEVELOPING MODELS FOR UTAH LAKE AND ITS WATERSHED?

- Watershed Model
  - Scientifically defensible decision support tool for evaluating nutrient load reduction scenarios.
- Lake Model
  - Scientifically defensible decision support tool for establishing Numeric Nutrient Criteria for Utah Lake.



What is a lake model?

Watershed Model → Lake Model



Model Inputs:
- Weather
- Flow and Loads from Tributaries and Other Sources
- Bathymetry

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Model Algorithms for Key Internal Lake Processes

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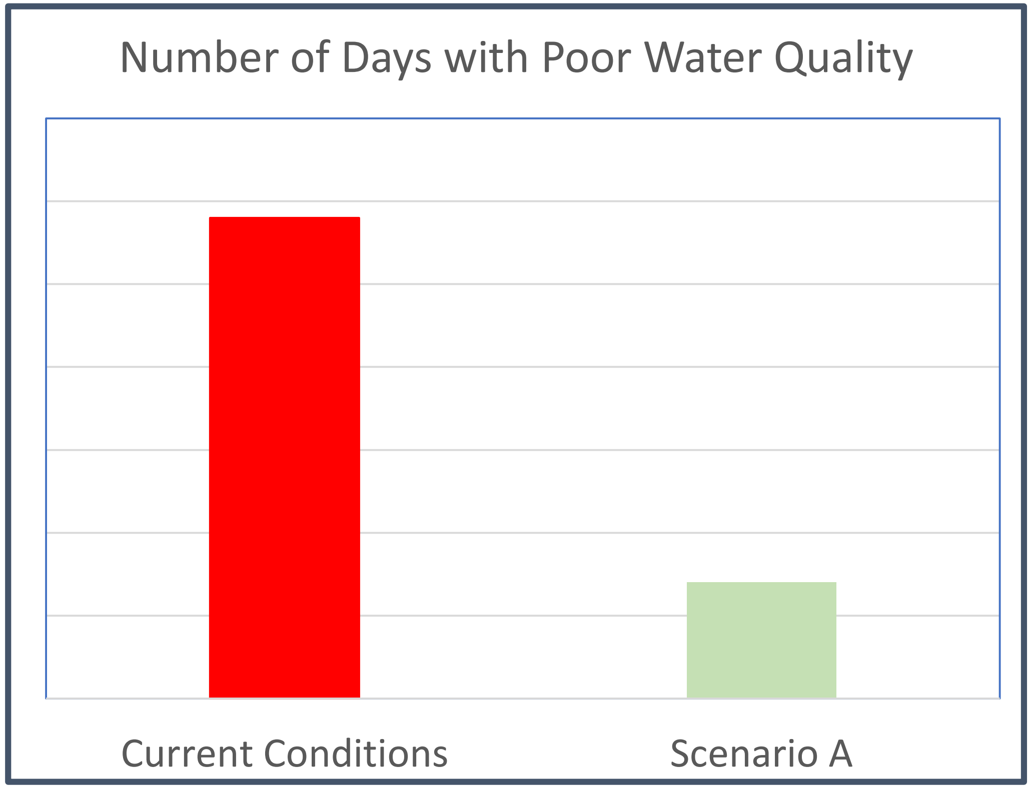
Model Outputs:
- Water Levels
- Internal Nutrient Loading
- Water Quality (e.g., Concentrations of Nitrogen, Phosphorus, Chlorophyll, Dissolved Oxygen)

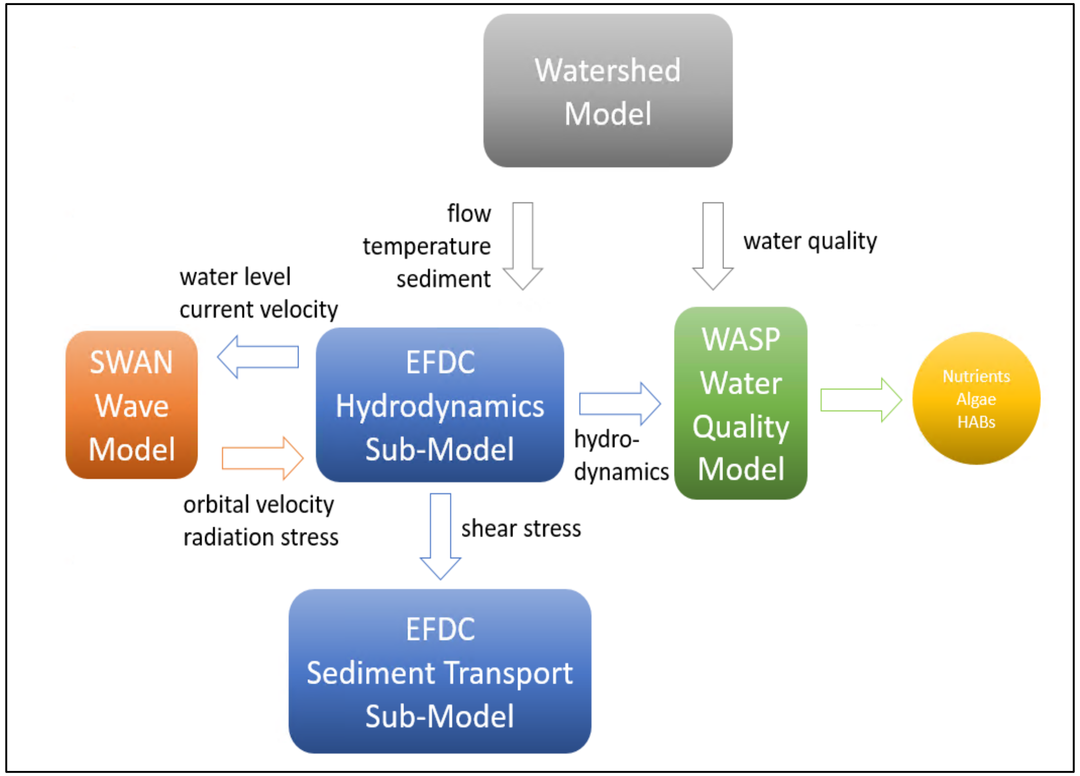
How will the lake model be used to inform the Utah Lake Water Quality Study?

- Better Understanding of the System
  - Significance of In-lake Processes that Affect Nutrient Concentrations
  - Relationship Between Nutrients, Algae, and Other Measures of Water Quality
- Framework Lines of Evidence
  - Stressor Response
  - Reference/Natural Conditions
- Charge Questions
  - Is there an improved stable state?



Status of the Lake Model

- University of Utah built and calibrated a coupled hydrodynamic and water quality model
- Science Panel identified needed enhancements and calibration refinements
- Tetra Tech contracted to complete model enhancements by Summer/Fall 2022.



What is a watershed model?

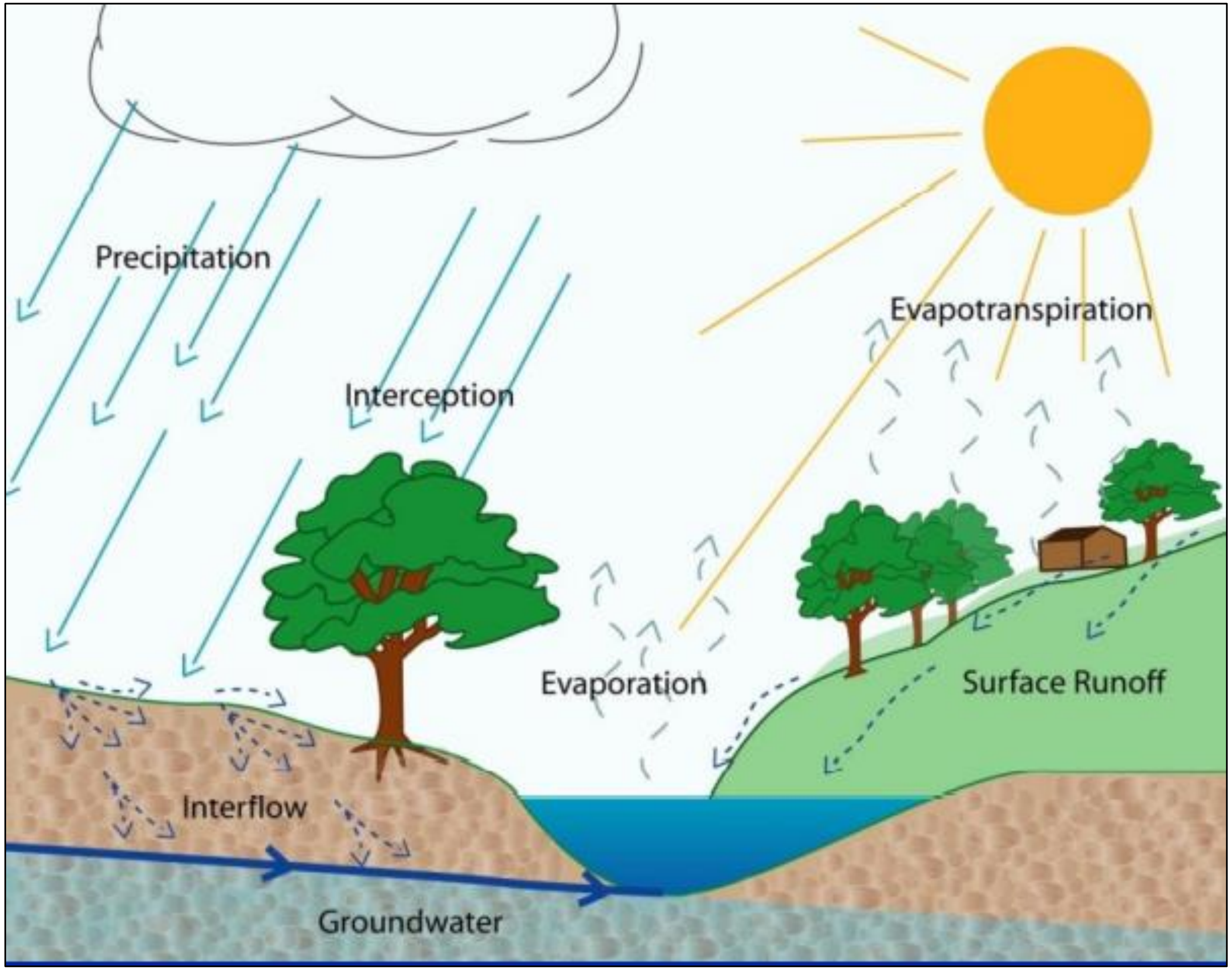


Image source: https://www.epa.gov/sites/production/files/2015-07/documents/lecture-2-intro-to-hspf-model-application.pdf

Watershed Model → Lake Model

Model Inputs:
- Weather
- Point source discharges
- Atmospheric deposition
- Topography
- Stream characteristics
- Land use/cover, soils, etc.

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Model Algorithms for Key Surface Runoff, Subsurface Runoff, and Instream Processes

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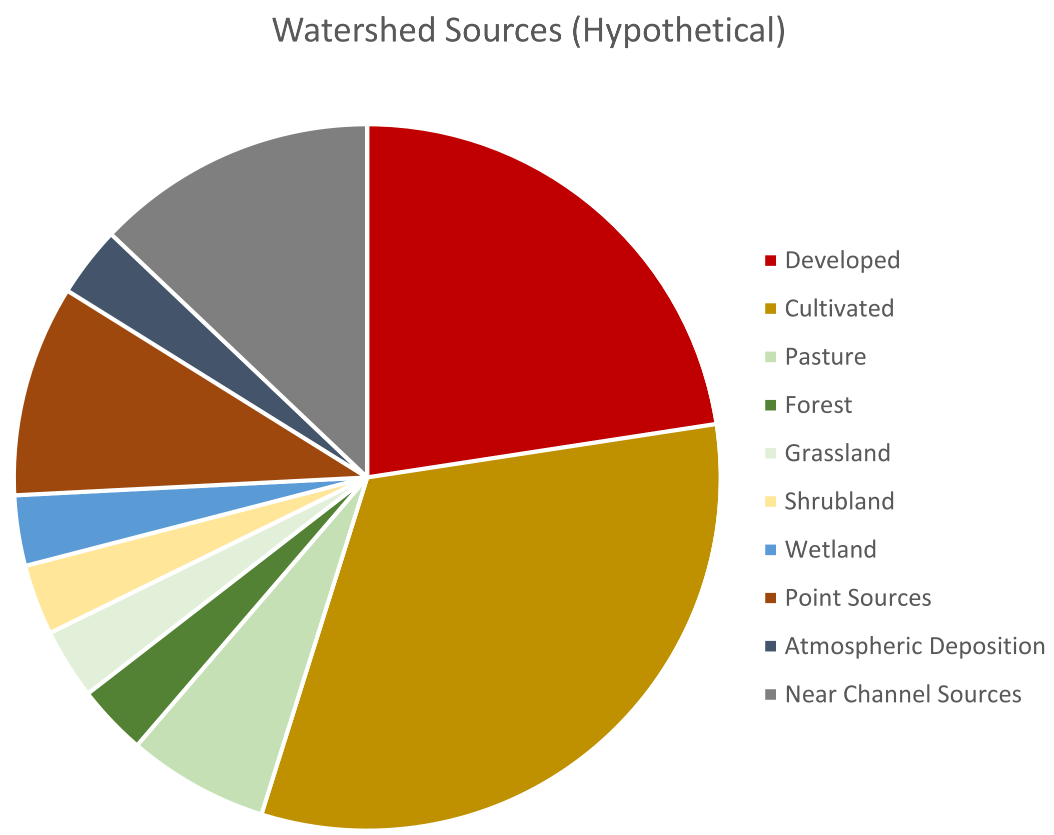
Streamflow and water quality for tributaries and direct drainage to Utah Lake

How will the watershed model be used to inform the Utah Lake Water Quality Study?

- Source Assessment
- Critical Source Area Identification
- Scenario Analysis
  - Natural Condition
  - Source Reduction - Urban, Agriculture, Point Sources
  - Future Growth
  - Extreme Weather/Post-Fire Conditions
- Link to lake model
  - The natural condition scenario reduces watershed loading of nutrients by X%. What changes in lake water quality is predicted by the linked lake model?



Watershed Modeling Tasks Identified by the Science Panel

To Do:

1) Select an appropriate watershed model(s)
2) Setup and calibrate the watershed model to existing conditions
3) Use the calibrated watershed model to run scenarios and deliver output to the lake model

Watershed model selection

1. Define objectives for the watershed model
2. Identify criteria based on the objectives
3. Evaluate and rank multiple models by the criteria
4. Recommend a model(s) for study

NEXT STEPS

- Currently evaluating existing lake model and preparing a memorandum with our findings
  - Next step is to start making model updates
- Also working with Science Panel to develop watershed model objectives and selection criteria
  - Next step is to recommend a watershed model to Science Panel and Steering Committee