

Jordan River Total Maximum Daily Load Study

Presented By:

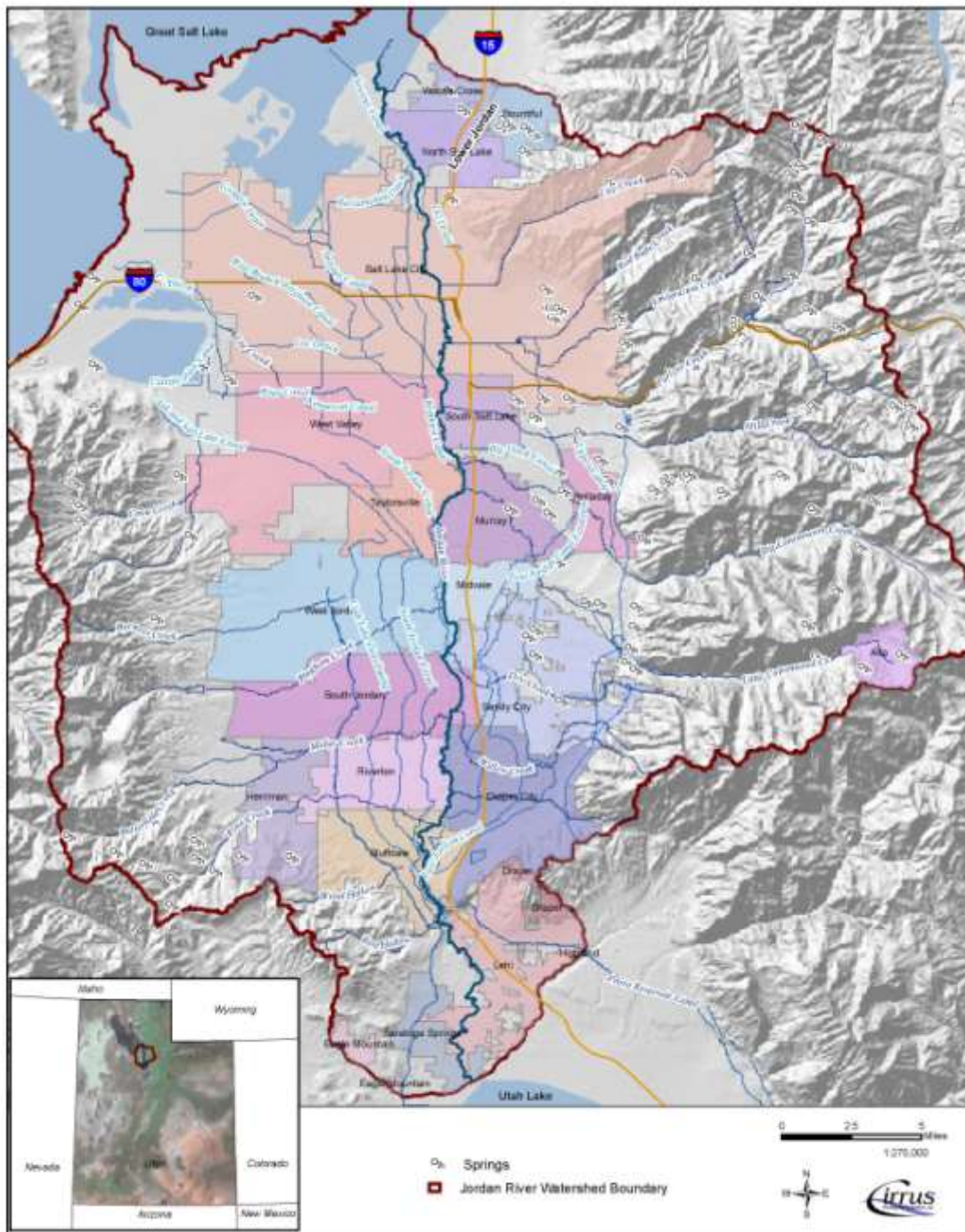
James Harris

Utah Division of Water Quality

Jordan River Watershed

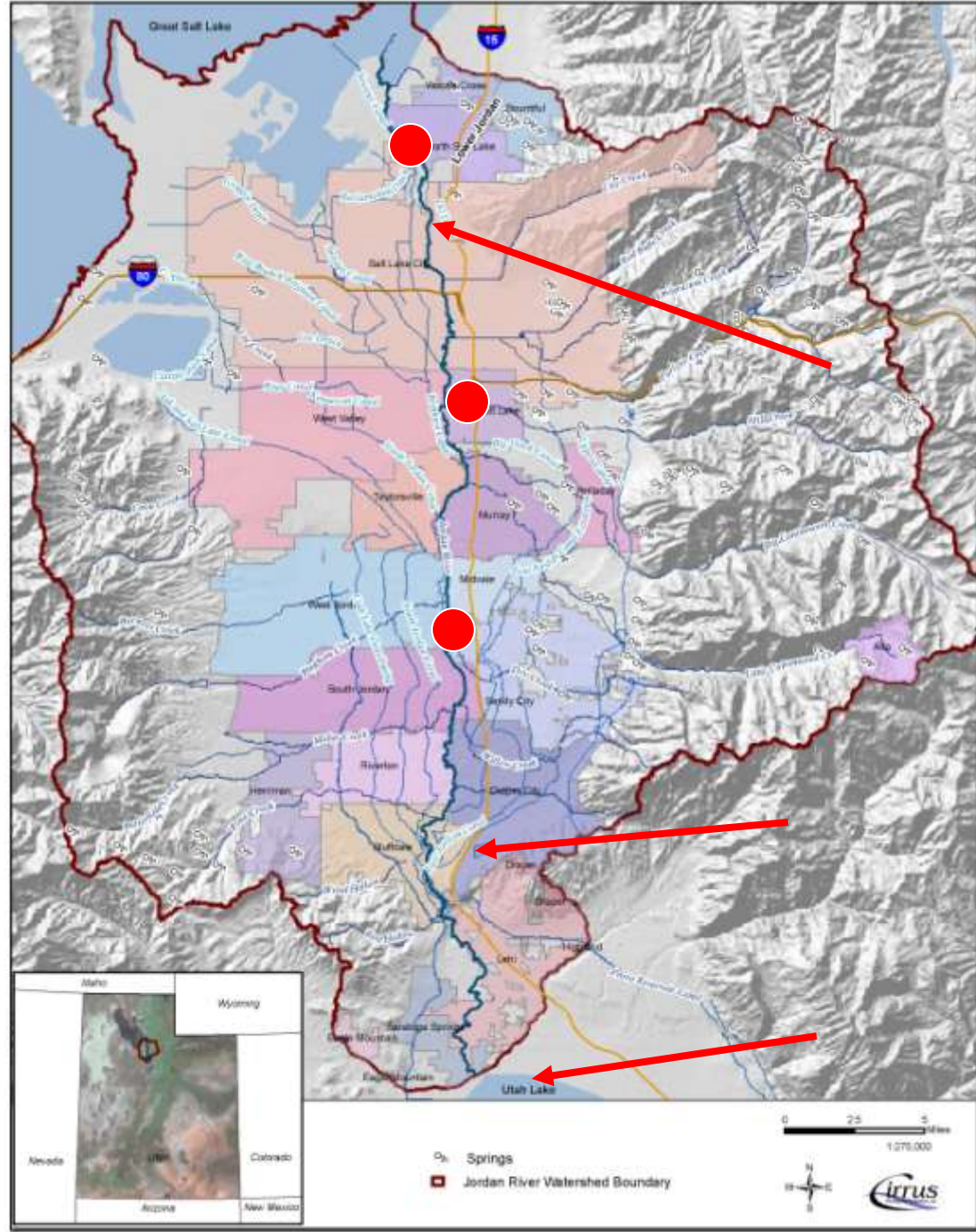
TMDL Study Area

No Introduction
Necessary



A Few Things to Point Out....

- Lower River - Flood Control
- Several Wastewater Sources
- Several Major Diversions
- Utah Lake



TMDL Process

- Water Quality Standards
 1. Waterbody Definition
 2. Designated Beneficial Uses
 3. Water Quality Criteria
 - Indicators (Total Phosphorus)
- Routine Monitoring
- 303(d) List – Waterbodies Requiring Development of TMDLs

TMDL Components

- $TMDL = \sum WLA + \sum LA + MOS$

WLA = Waste Load Allocation (Point Sources)

LA = Load Allocation (Nonpoint Sources)

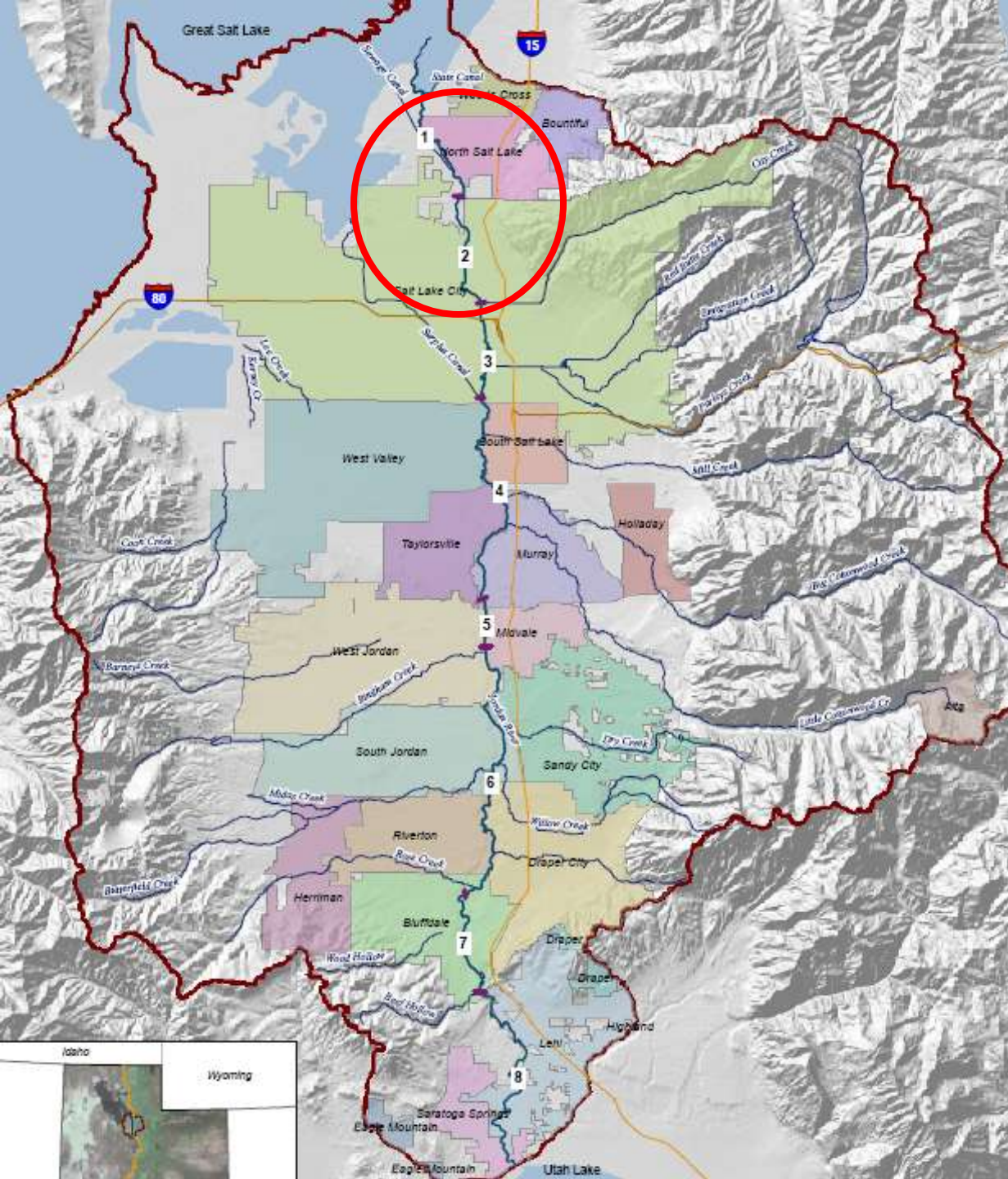
MOS = Margin of Safety

- Source Identification
- Load Reductions
- Implementation Strategy

Impaired Uses

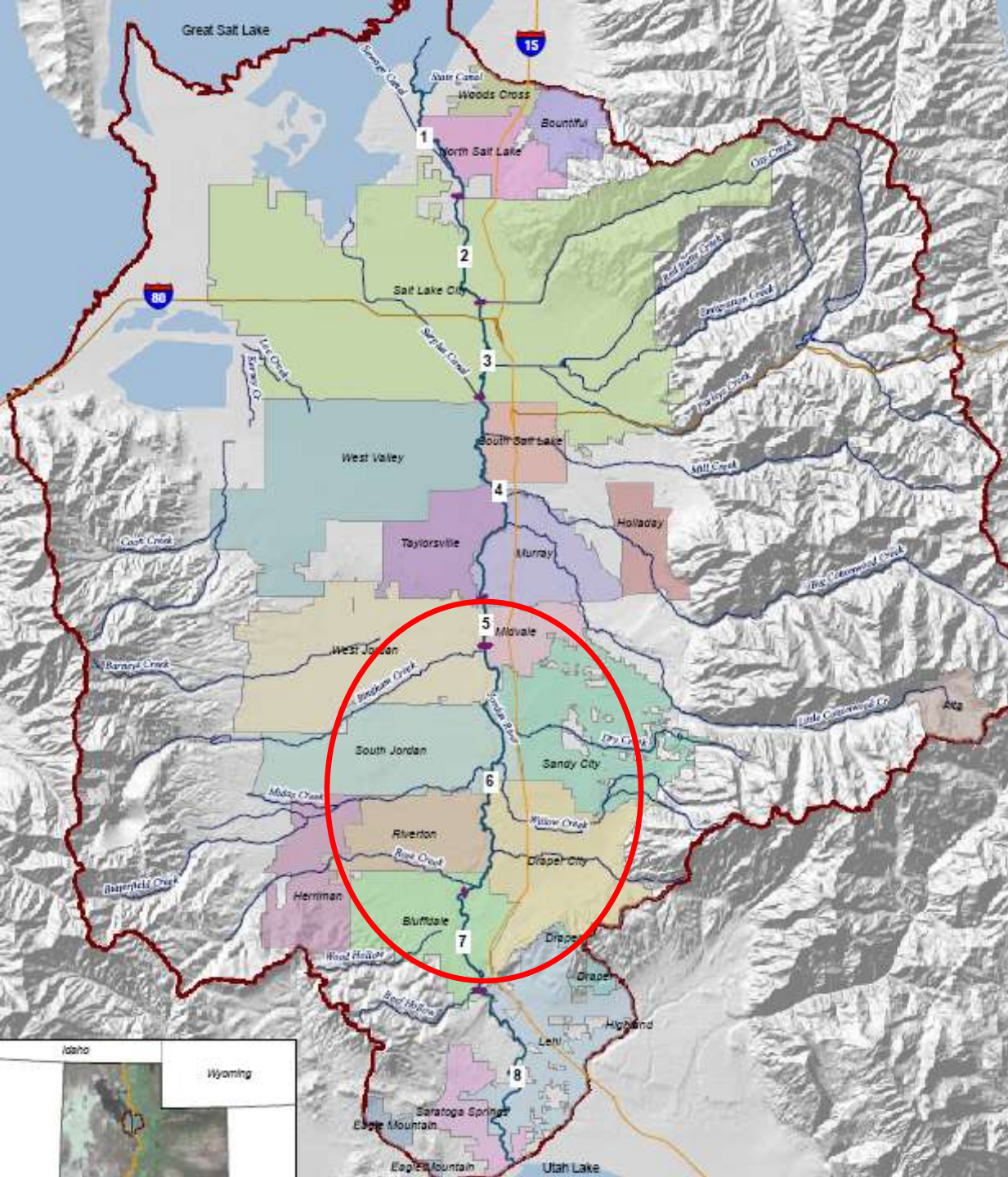
Beneficial Use	Parameter of Concern
Coldwater Fishery	Temperature
Warmwater Fishery	Dissolved Oxygen
Recreation	E. coli
Agriculture	Dissolved Solids

Impaired Segments



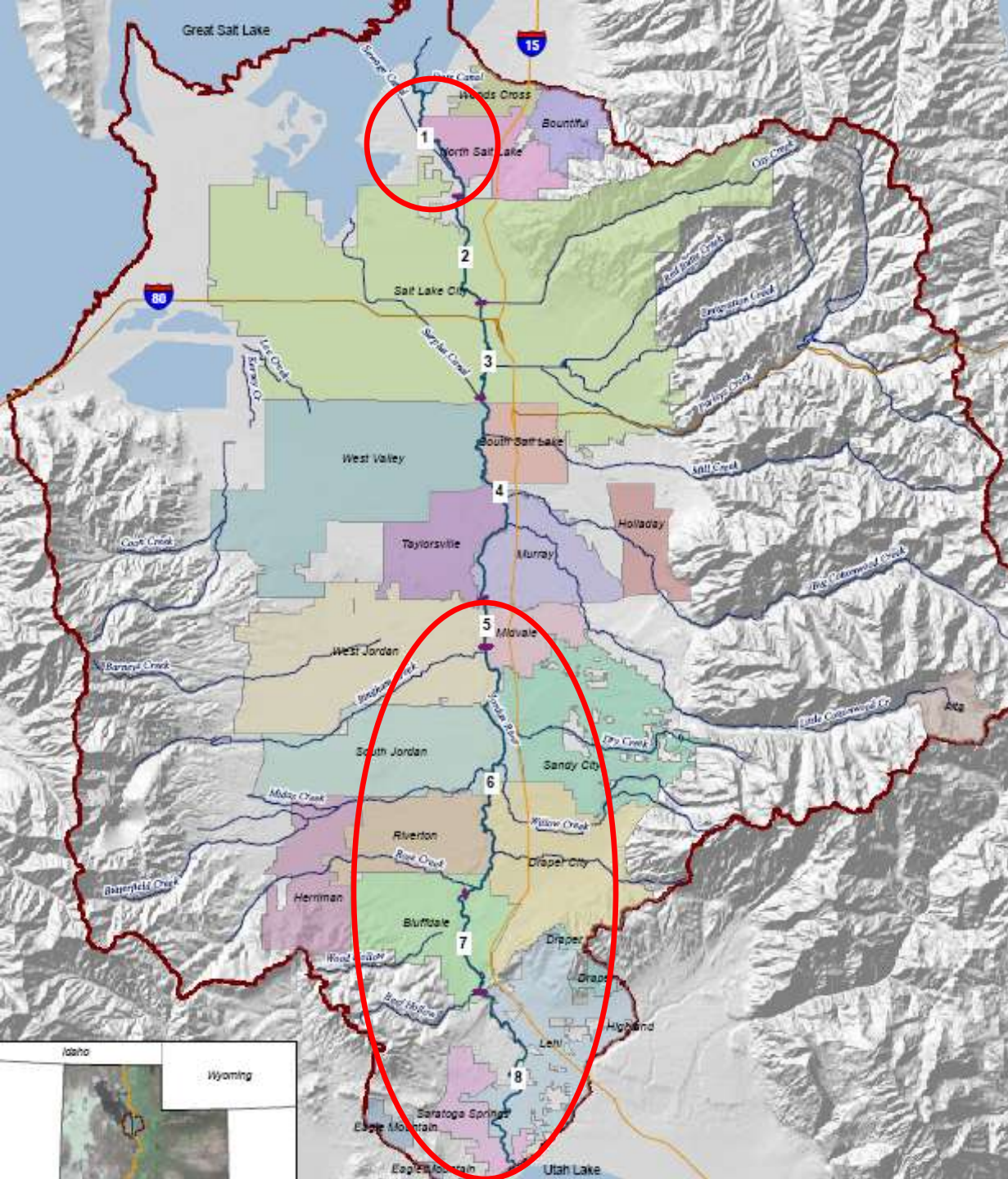
Parameters of Concern	Impaired Segments
Dissolved Oxygen	1, 2
Temperature	5, 6, 7
TDS	1, 5, 6, 7, 8
E. coli	2, 3, 5

Impaired Segments



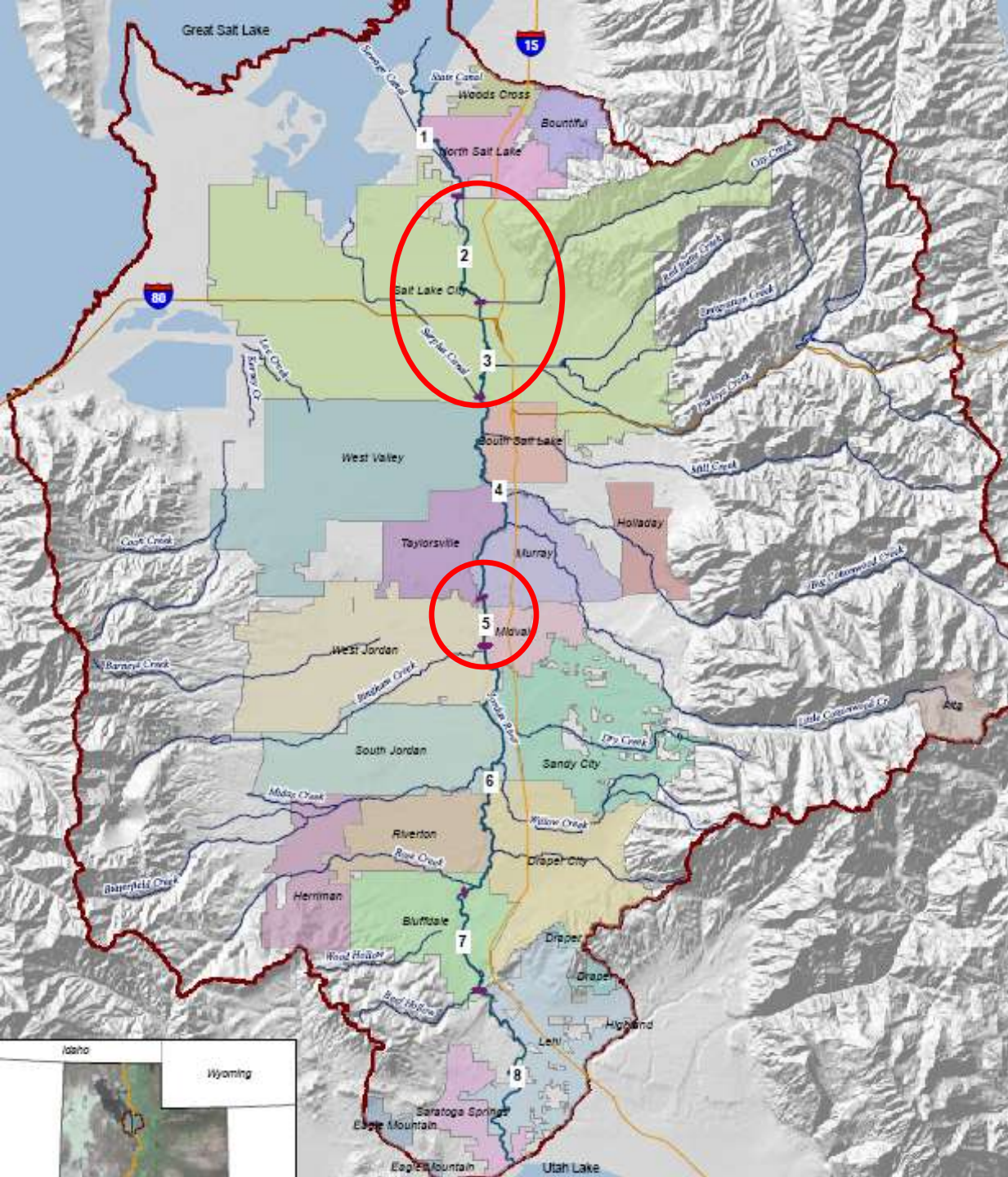
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Impaired Segments



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Impaired Segments



Parameters of Concern	Impaired Segments
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Stream Load Calculations

$$\text{Load (mass/time)} = \text{Flow (cfs)} \times \text{Concentration (mg/l)} \times \text{conversion factor}$$

- Monthly loads calculated where possible to allow definition of seasonal loading patterns.
- Annual loads defined as sum of monthly loads and incorporates seasonal variation.
- USGS continuous flow records were paired with DWQ monitoring at “data rich” sites.

Pollutant Source Calculations

- Utah Lake
- Tributary Streams
 - Some streams not considered due to limited flow, diversions to irrigation systems
- Permitted discharge
 - Central Valley WRF, South Valley WRF, South Davis WWTP.

Pollutant Load Calculations

■ Stormwater

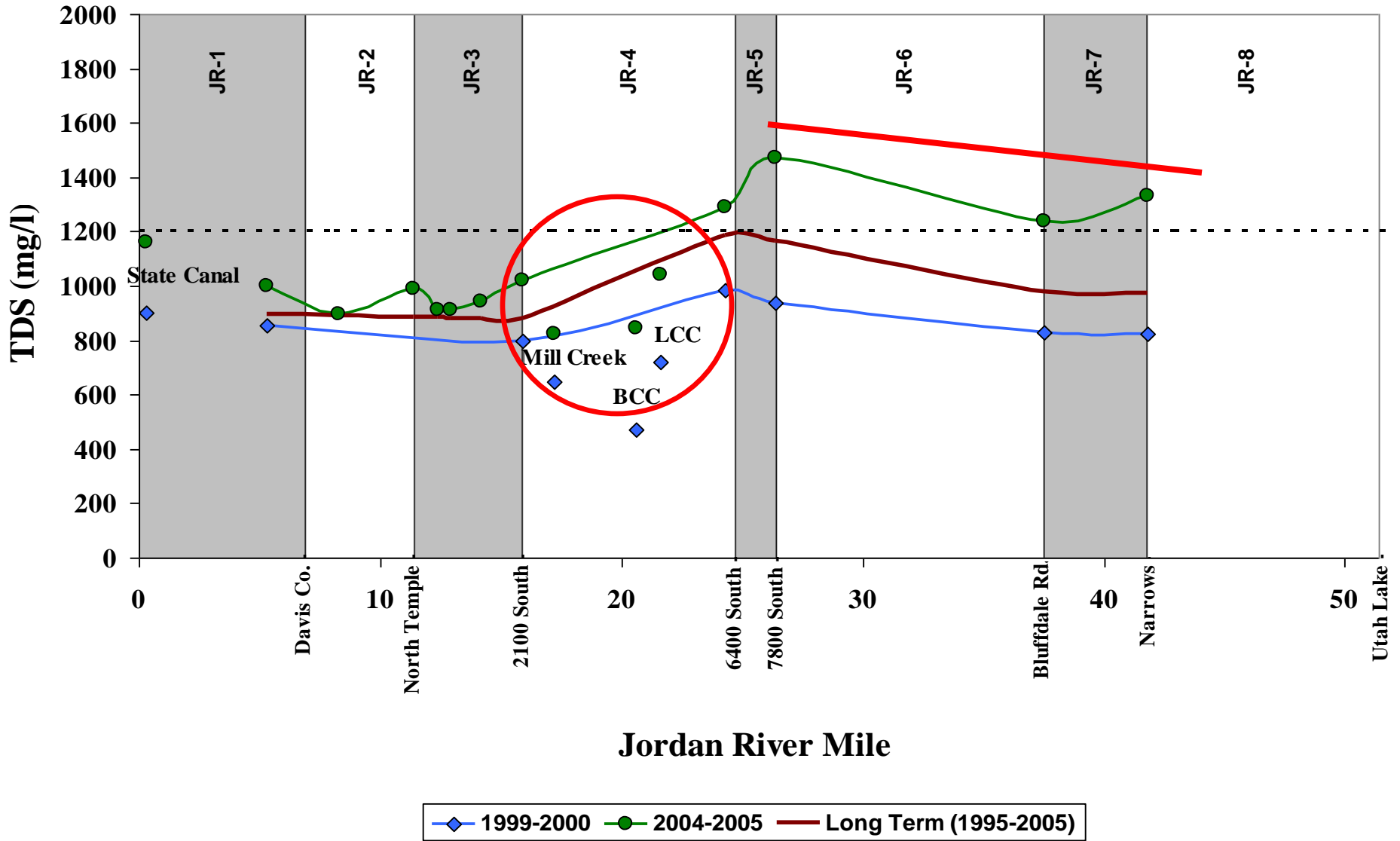
- Stormwater catchments- Salt Lake and Utah counties, none in Davis County.

■ Direct surface runoff

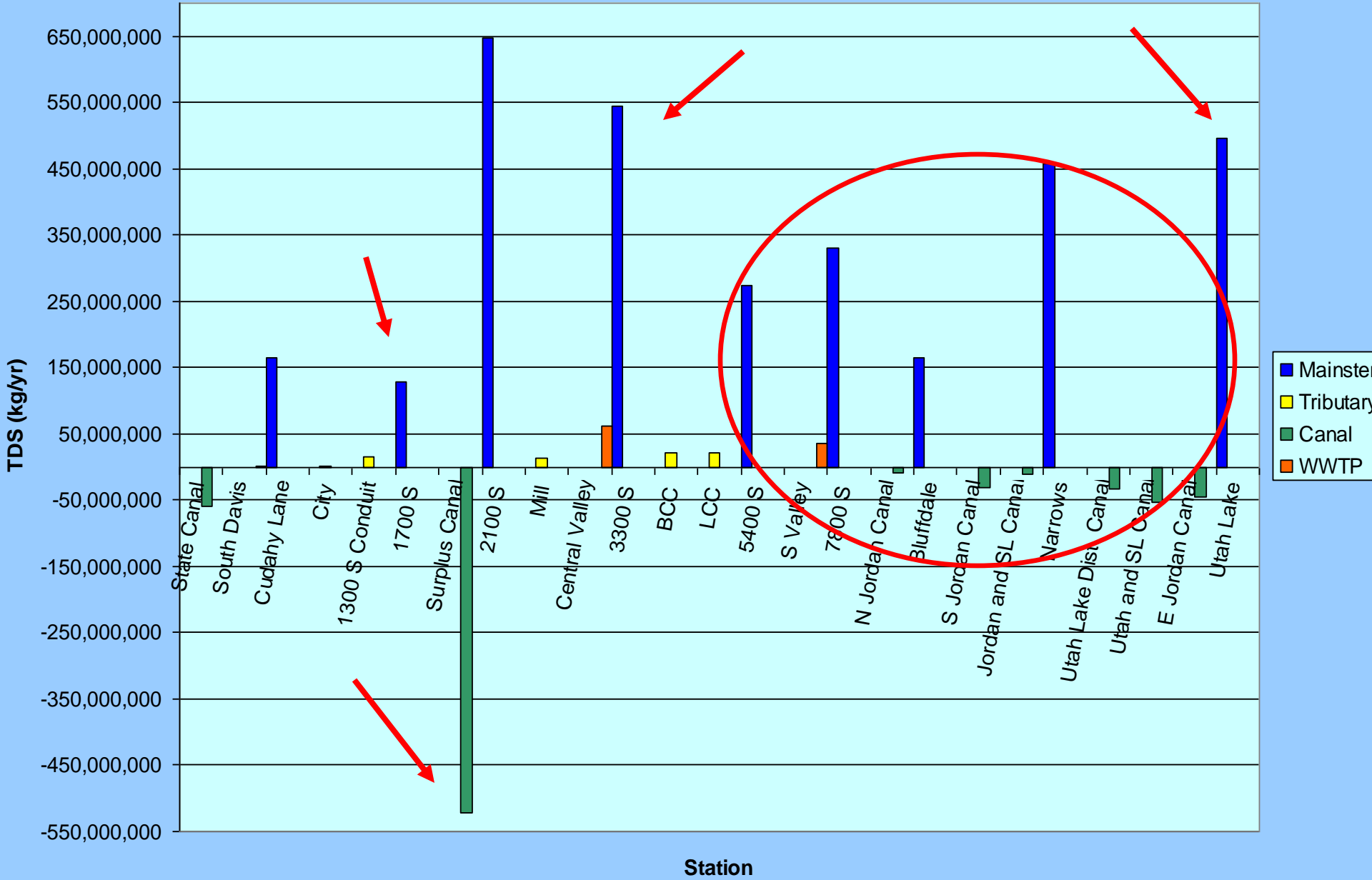
- Areas outside of stormwater catchment that drain to Jordan River.

■ Groundwater

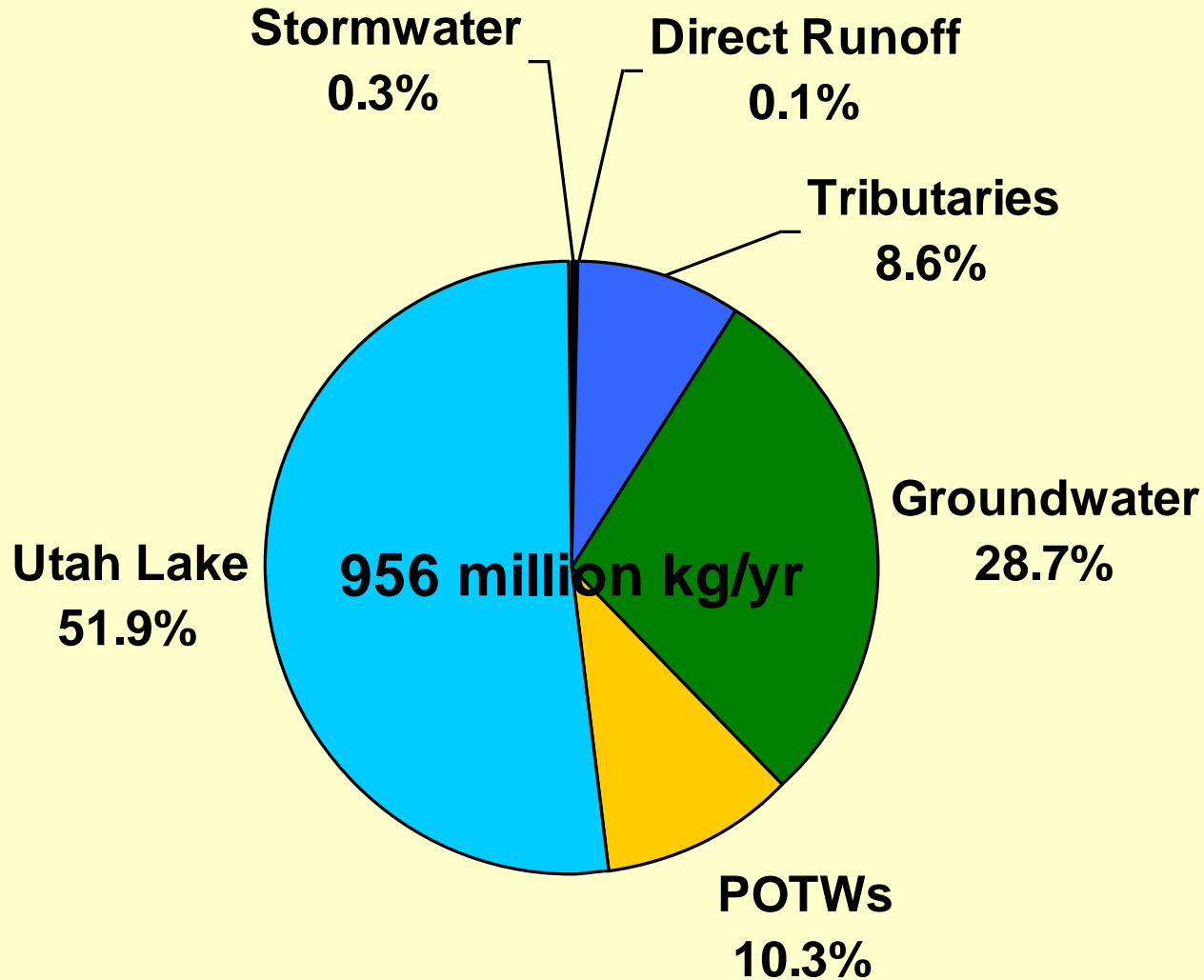
- Flow based on USGS Salt Lake Valley model (Lambert 1995)
- WQ data from all wells within 2 miles of Jordan River.

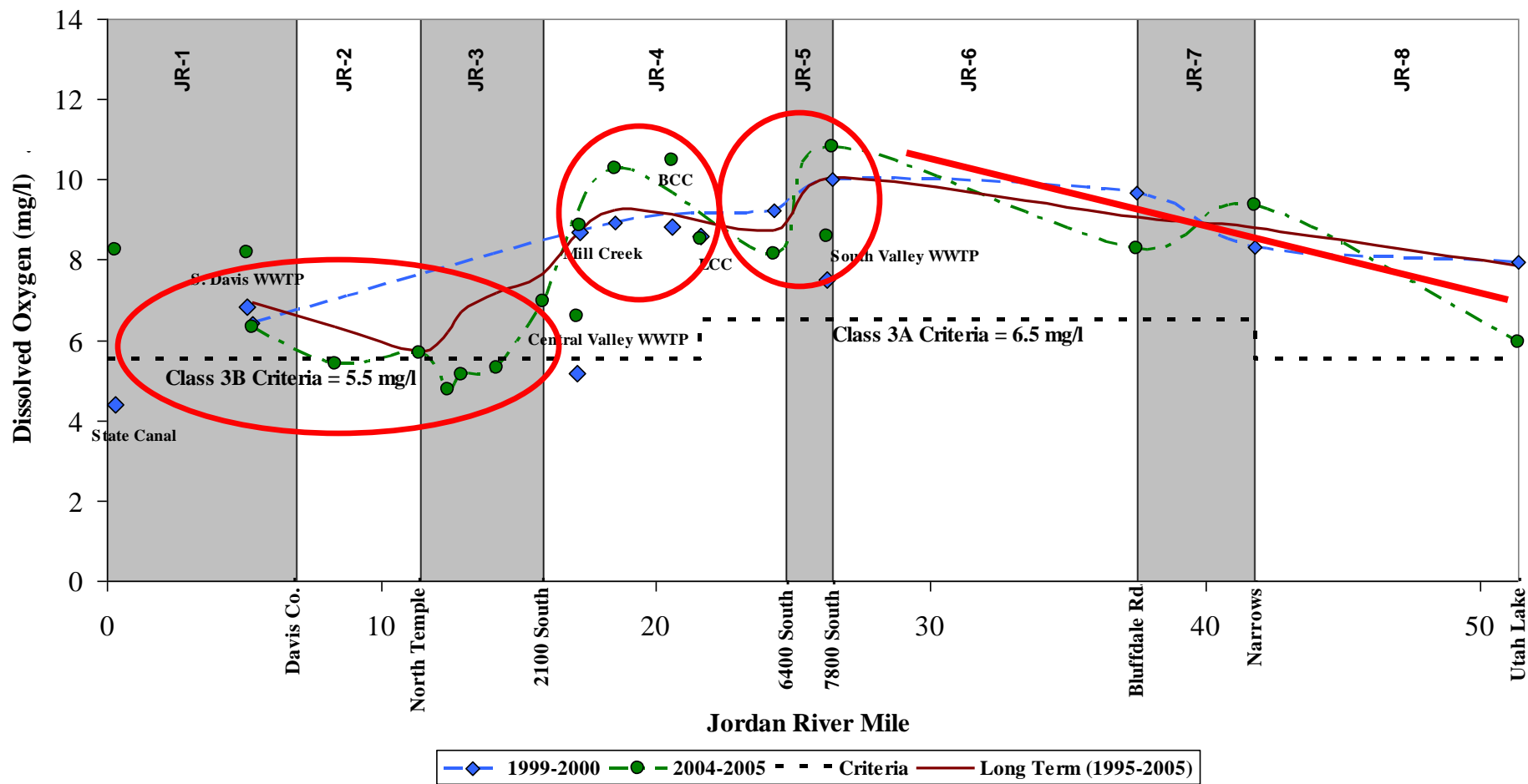


Jordan River TDS Loads



Jordan River annual TDS loading (1995-2005)



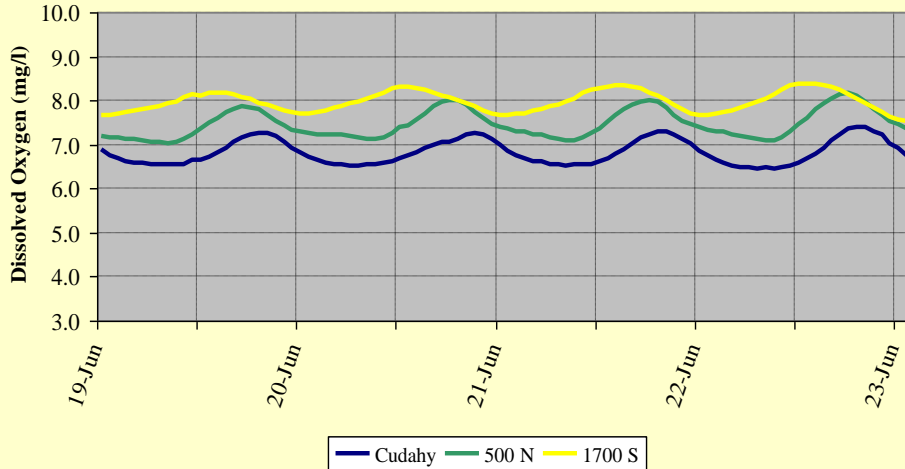


Jordan River Dissolved Oxygen

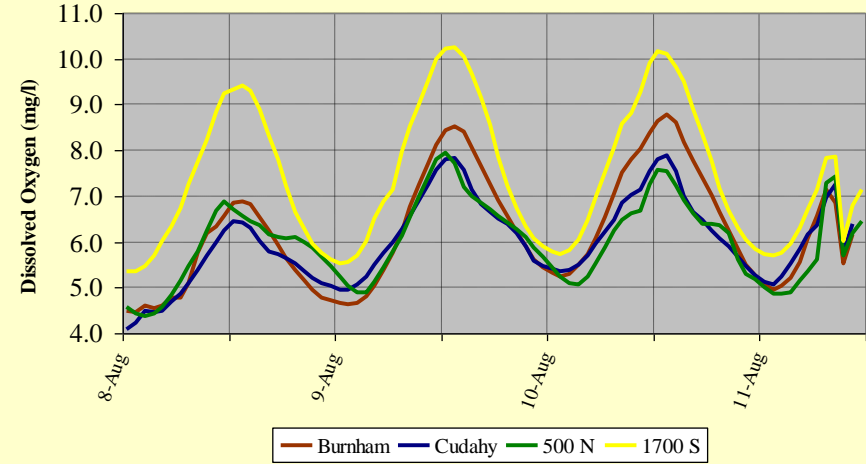
	Criteria	1999-2000			2004-2005			Long Term (1995-2005)		
		Mean	n	% Exceed	Mean	n	% Exceed	Mean	n	% Exceed
Cudahy Lane	5.5	6.4	18	27.8	6.3	28	39.3	6.9	99	19.2
Redwood Road	5.5	na	na	na	5.4	15	33.3	na	0	na
North Temple	5.5	na	na	na	5.7	21	61.9	5.7	24	54.2

Jordan River Diurnal DO below 2100 South (segments 1-3)

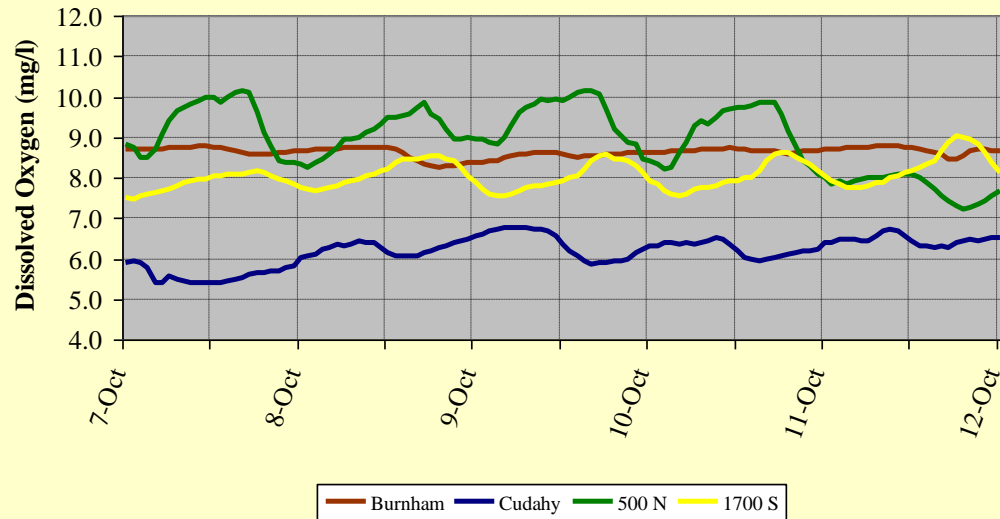
**Jordan River Diurnal Dissolved Oxygen
June 2006**



**Jordan River Diurnal Dissolved Oxygen
August 2006**



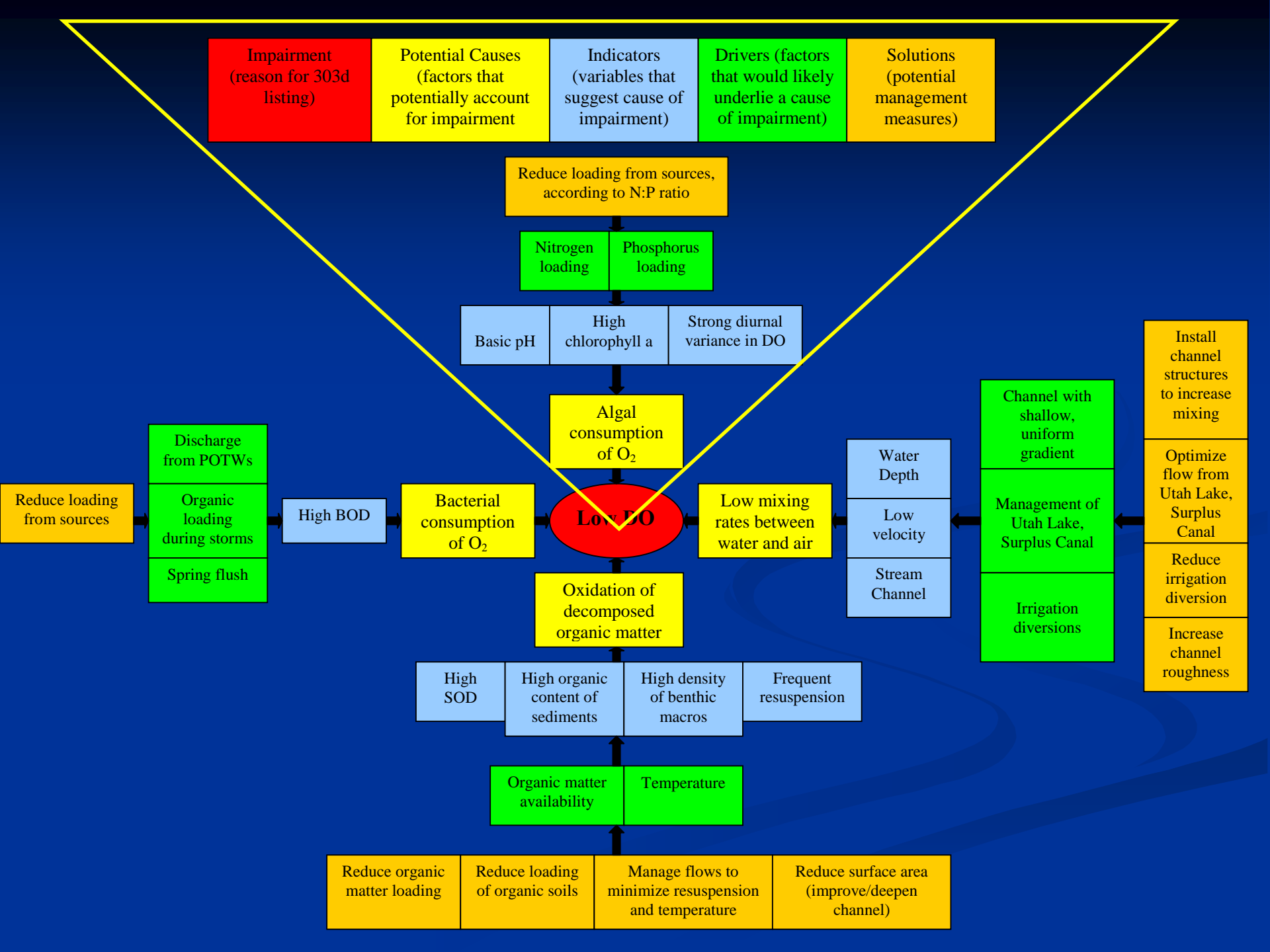
**Jordan River Diurnal Dissolved Oxygen
October 2006**

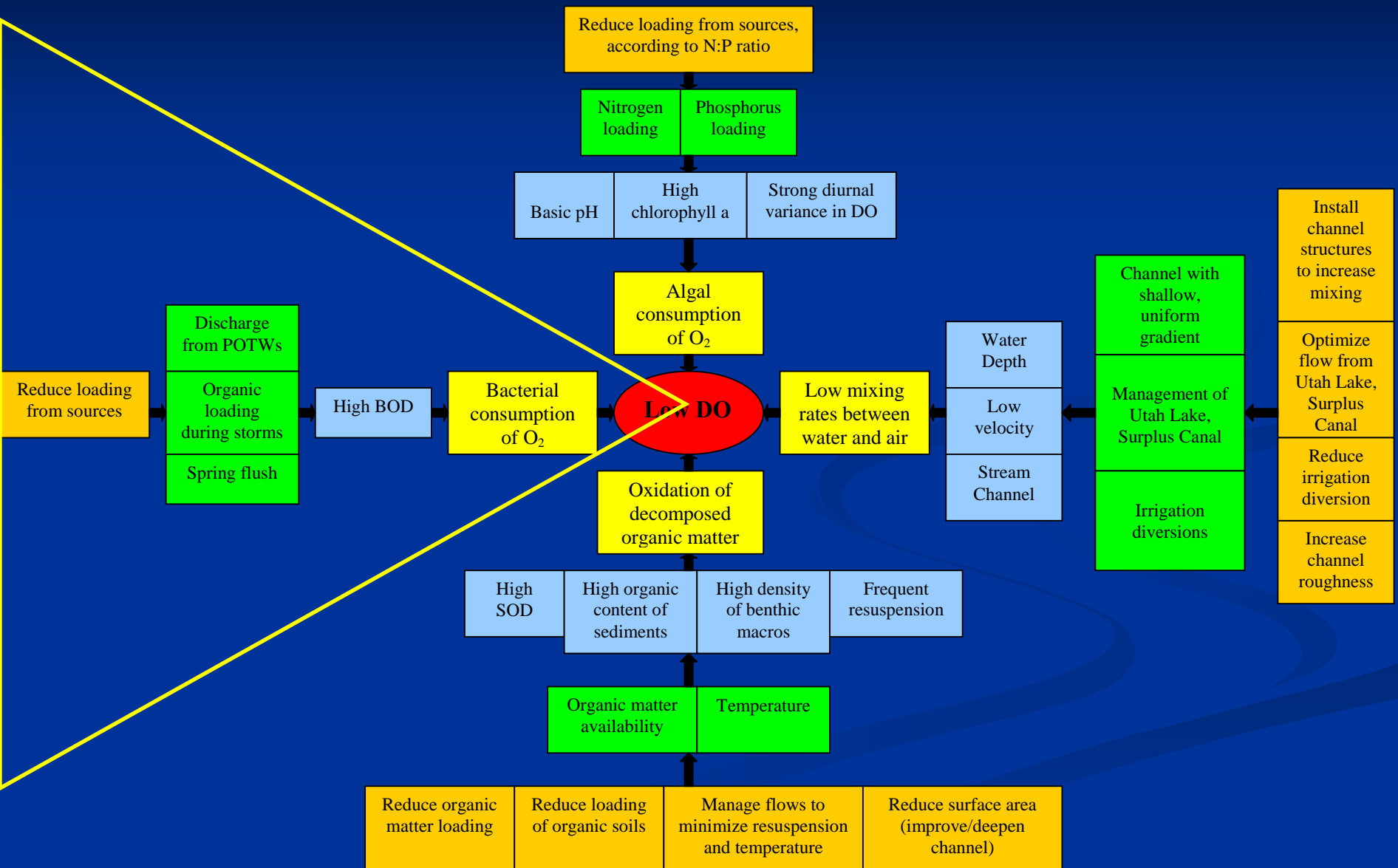
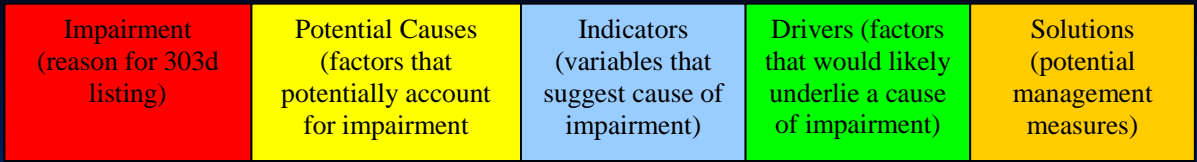


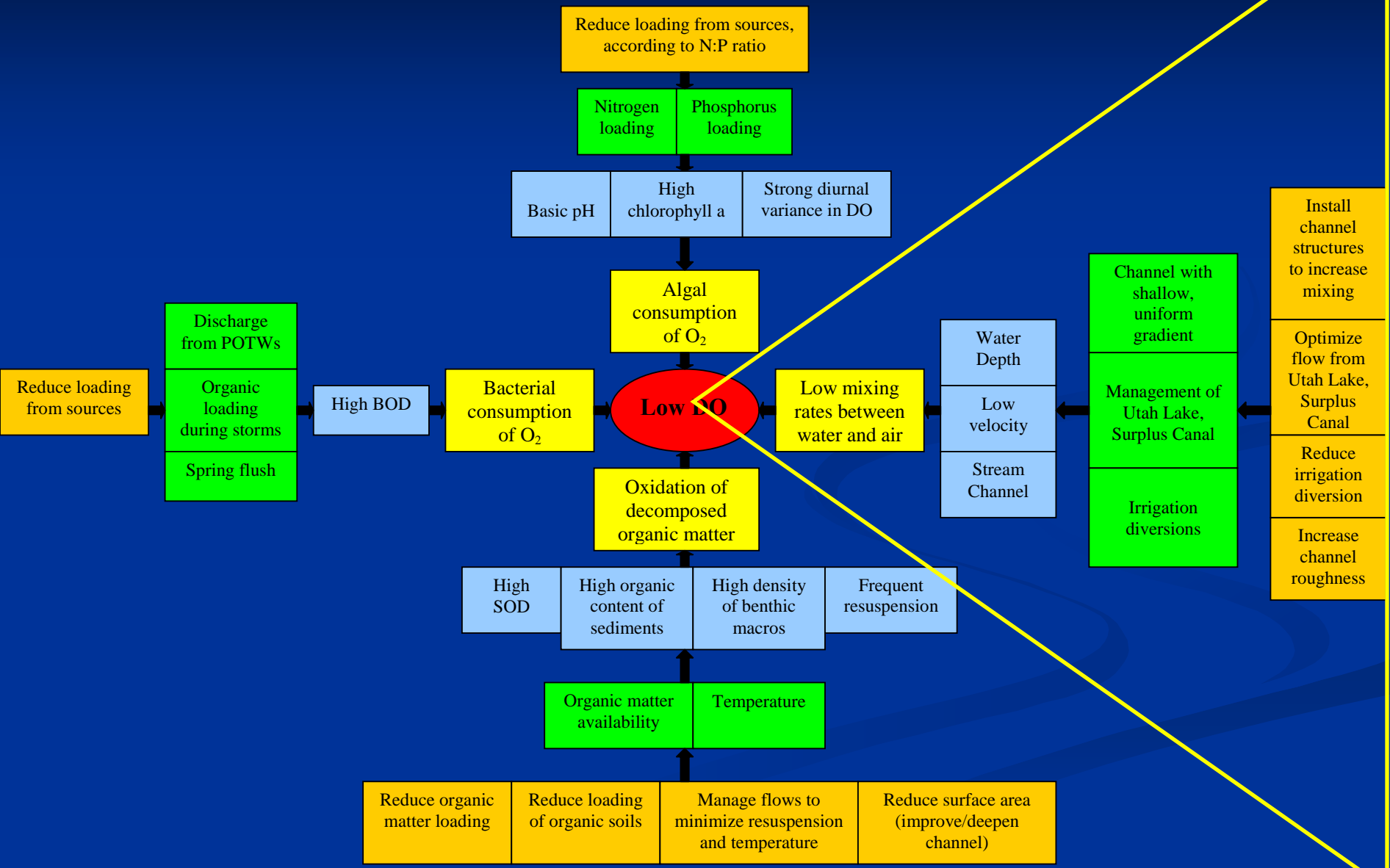
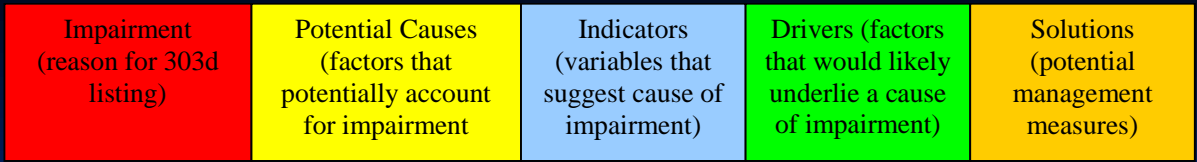
What is Causing Low DO?

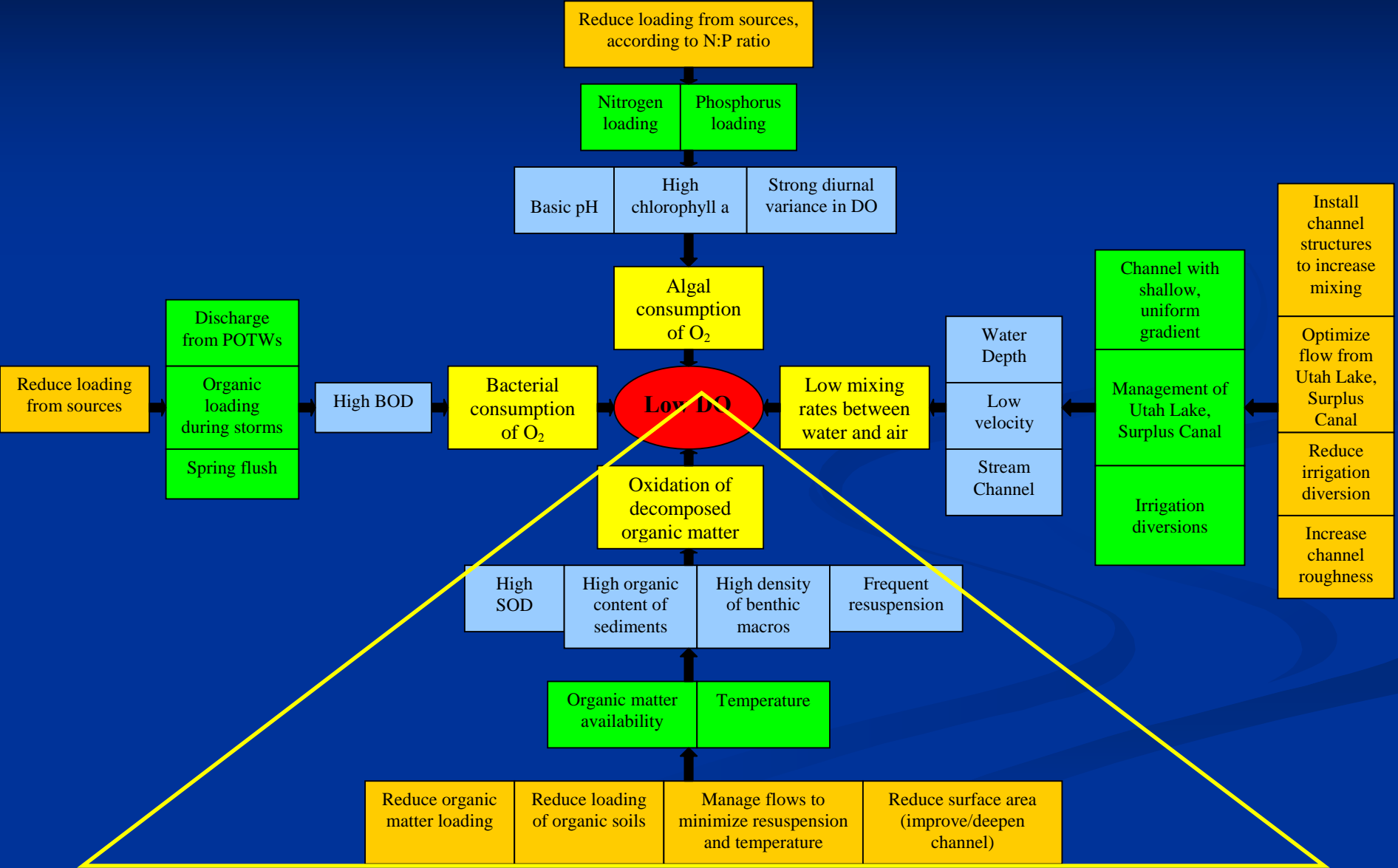
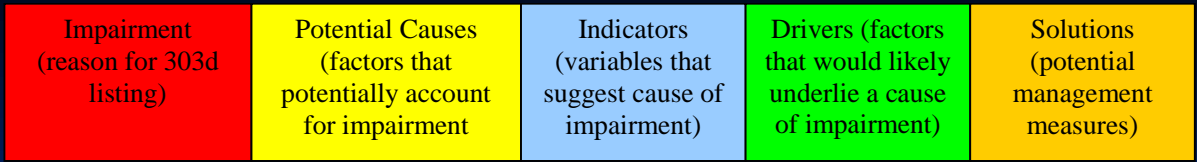
Linkage Analysis

- Algae / Eutrophication
- Biological Oxygen Demand
- Sediment Oxygen Demand
- Physical Characteristics
- Water Management









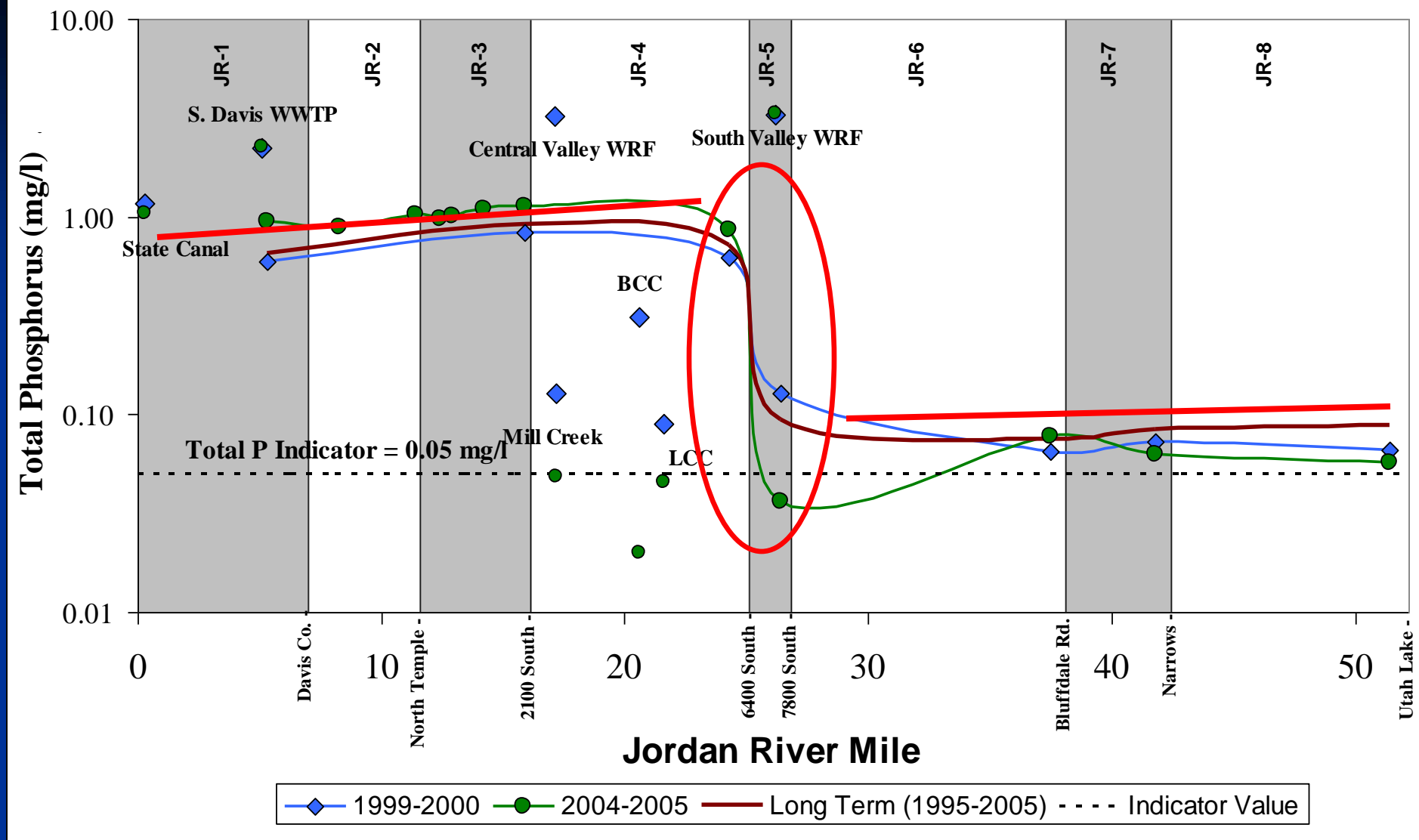
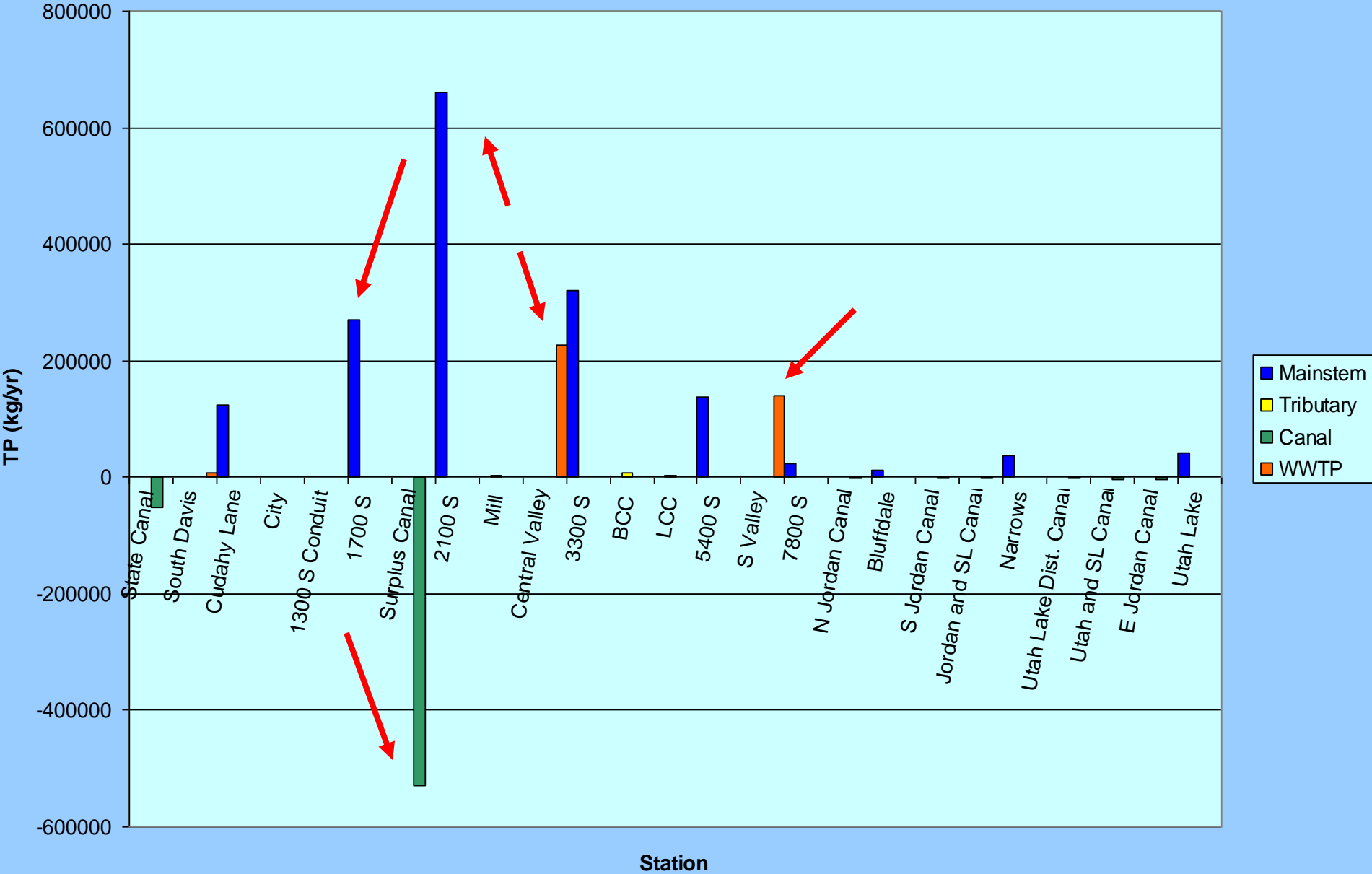


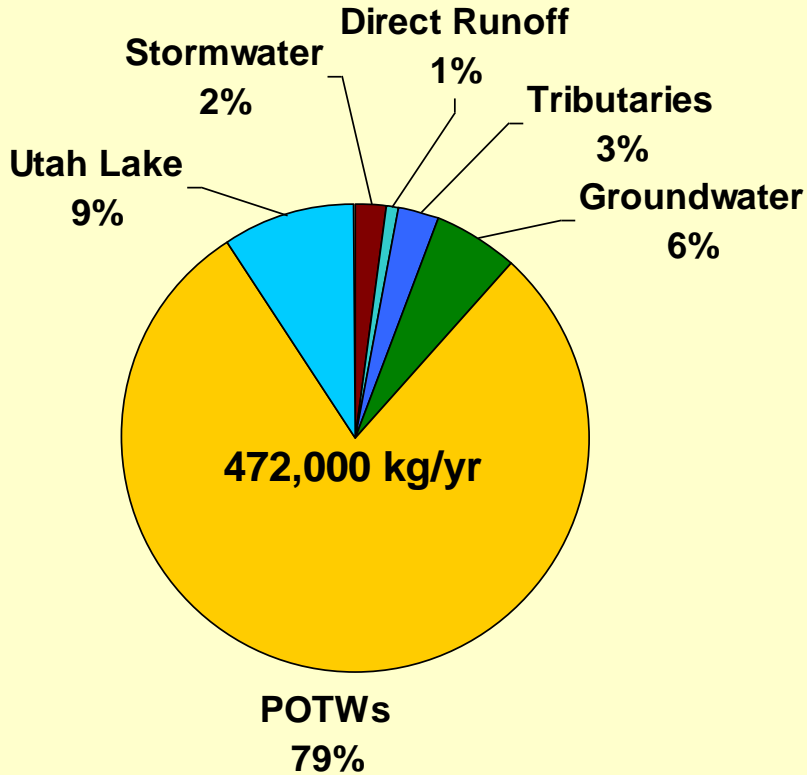
Figure 16. Mean concentrations of Total P measured at intensive monitoring locations on the Jordan River. The plot background indicates relative positions of Jordan River segments 1 (JR-1) through 8 (JR-8) with respect to monitoring locations.

Jordan River TP Loads

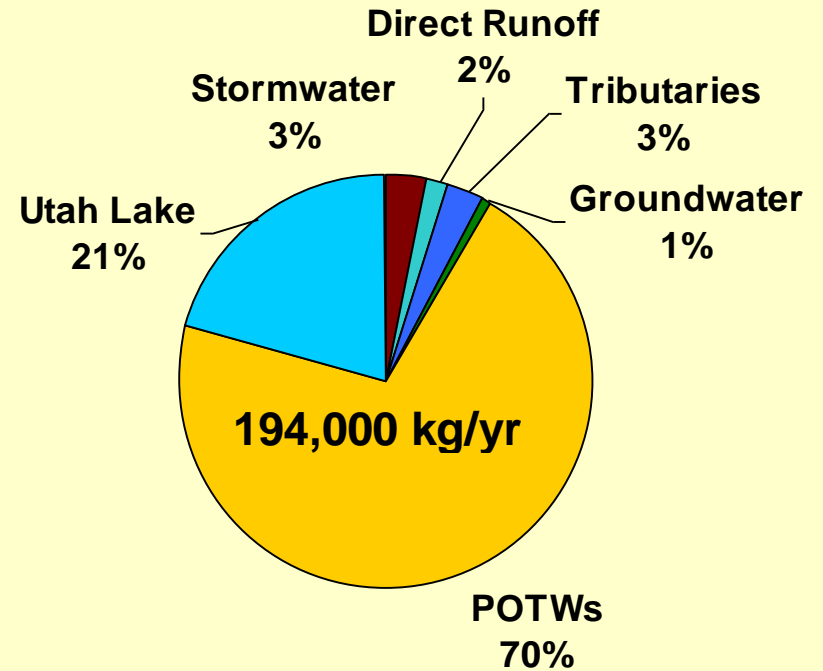


Annual Pollutant Loads (kg/yr) to Jordan River

**Jordan River
mean Total P loading (1995-2005)**



**Jordan River
mean Total Ammonia loading (1995-2005)**



TMDL Status

- Data Evaluation Report
- Source Identification
- Revised Deadline – April 2010
- Continued Data Collection
- QUAL2K Model Development

Model Development

- Why a model?
- Tool for TMDL Development
 - Integrating Data
 - Complex Interactions
- Tool for Management
 - Scenarios
 - WLAs

QUAL2K

- One dimensional. The channel is well-mixed vertically and laterally.
- Steady state hydraulics. Steady flow is simulated.
- Diurnal heat budget and diurnal water-quality kinetics.
- Heat and mass inputs. Point and non-point loads and abstractions are simulated.

QUAL2K

- Utilizes Previous Flood Control Models
- Quarterly Seasonal Data Collection
- Calibration and Validation

Model Inputs

- Seasonal Synoptic Data
 - Nutrients
 - Sediment
 - Biological Oxygen Demand
- Continuous Collection of DO, pH, Temp

Additional Model Needs

- Sediment Oxygen Demand
- Benthic Periphyton
- Travel Time
- Re-aeration Rates
- Stream Shading

Additional Information

- Limiting Factor to Algae Production
 - Light / Habitat
 - Nitrogen
 - Phosphorus
- E. coli / Microbial Source Tracking

What's Next?

■ Special Studies

- Collaboration with POTW's
- SRF Funding
- Dr. Ramesh Goel, U of U

■ Cost of POTW upgrades

- 40 facilities (Wasatch Front and Back)
- 3 Treatment Levels (1.0, 0.5 and 0.1 mg/l TP)

Questions?

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