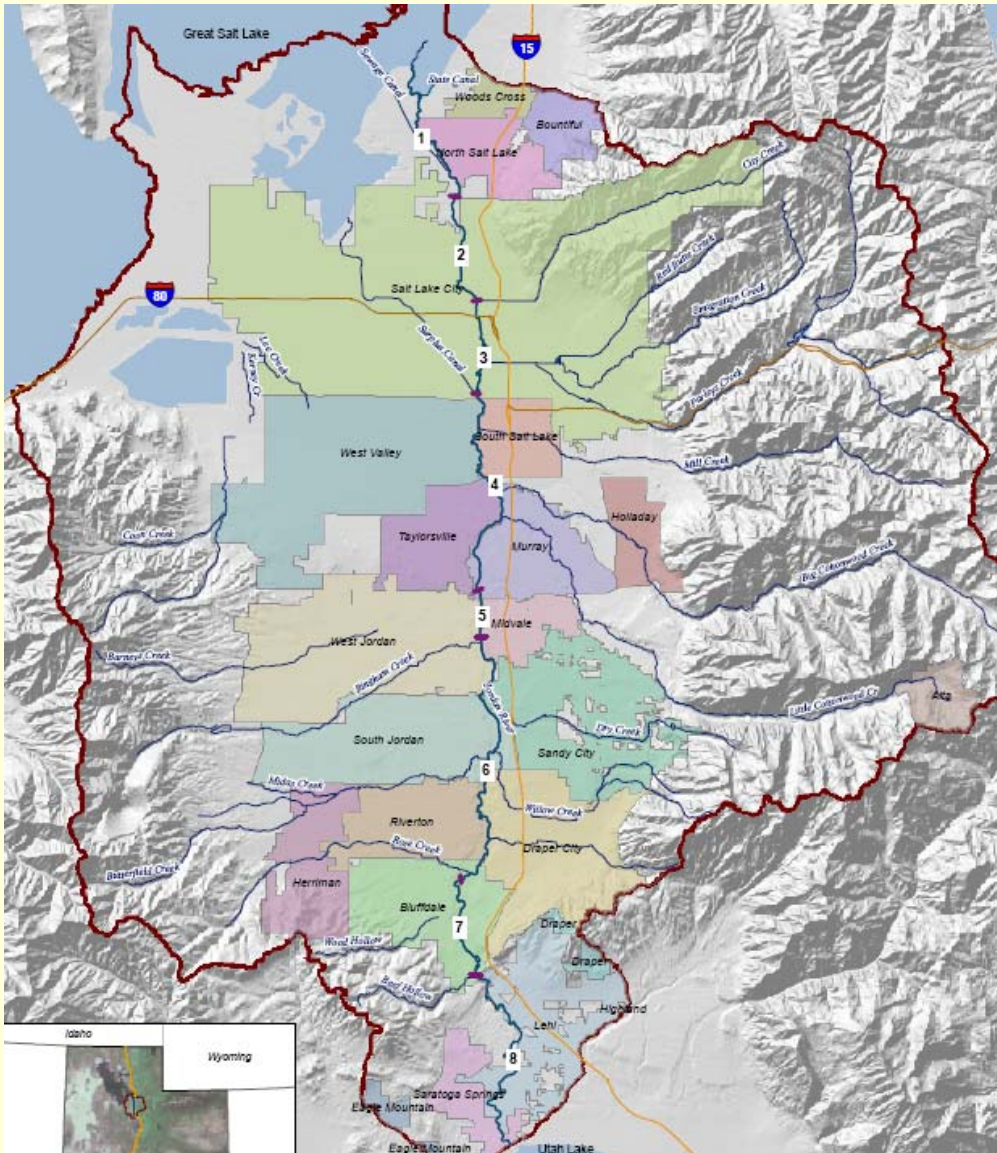


# Jordan River TMDL - Work Element 1



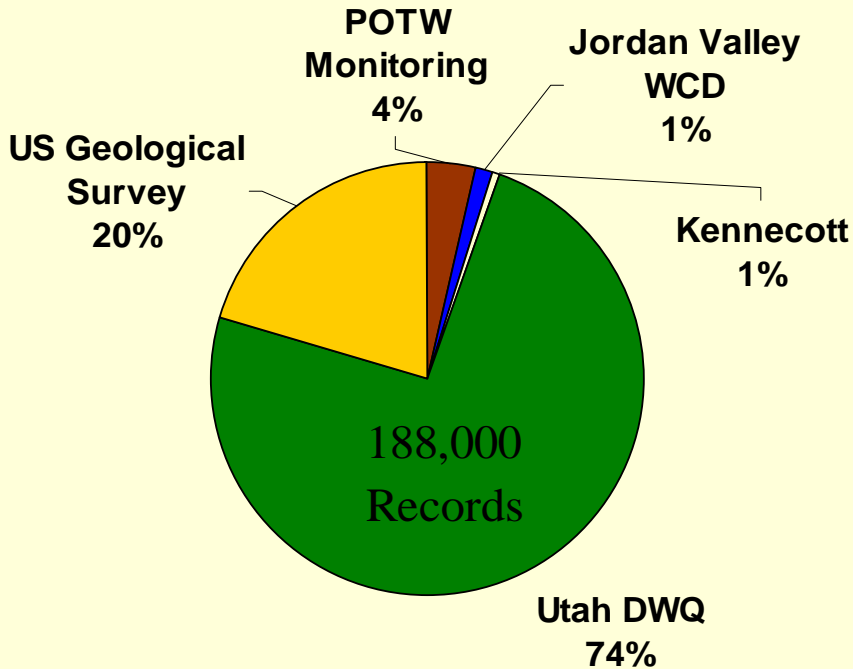
December 14, 2006

# Jordan River Segments



| Pollutants of Concern  | Impaired Segments |
|------------------------|-------------------|
| Dissolved Oxygen       | 1, 2              |
| Temperature            | 5, 6, 7           |
| Total Dissolved Solids | 1, 5, 6, 7, 8     |
| E. coli                | 2, 3, 5           |

## Water Quality Data

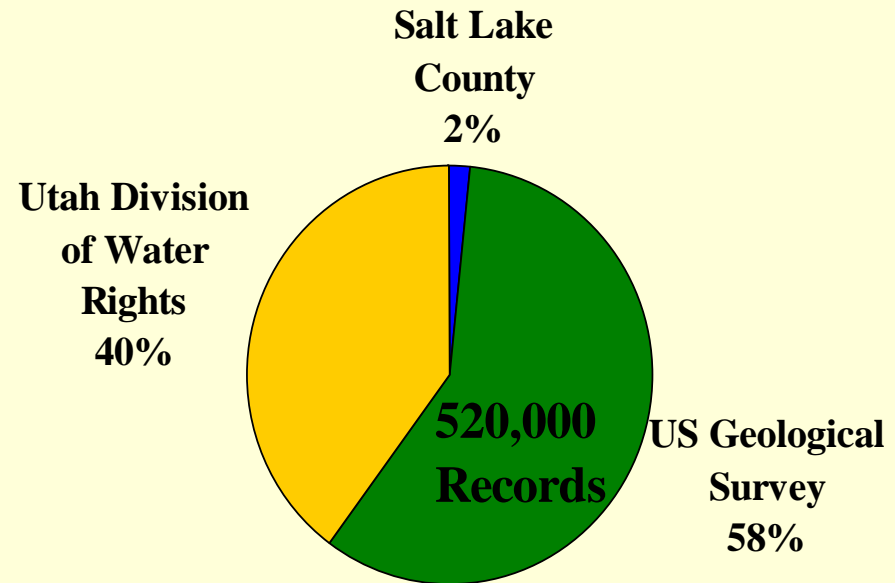


- All WQ and flow data organized in MS-Access database and assessed with MapWindow analysis tools (EPA-BASINS software).
- Biological data obtained from literature review, Utah DWQ, and NAWQA including fish, macroinvertebrate and periphyton measurements.
- Original GIS data sets obtained from archives (EPA, USGS, AGRC), Salt Lake County, and DWQ.

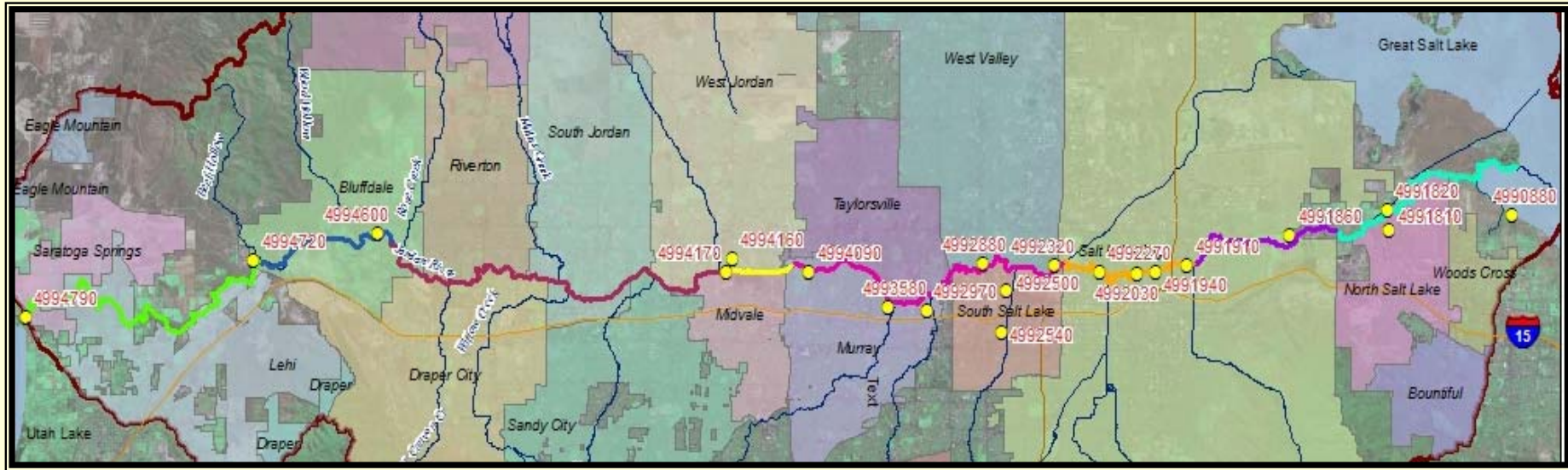
# Data Sources

Water Quality, Flow, Biology, GIS

## Flow Data



# DWQ Intensive Monitoring Sites 1999-2000 and 2004-2005



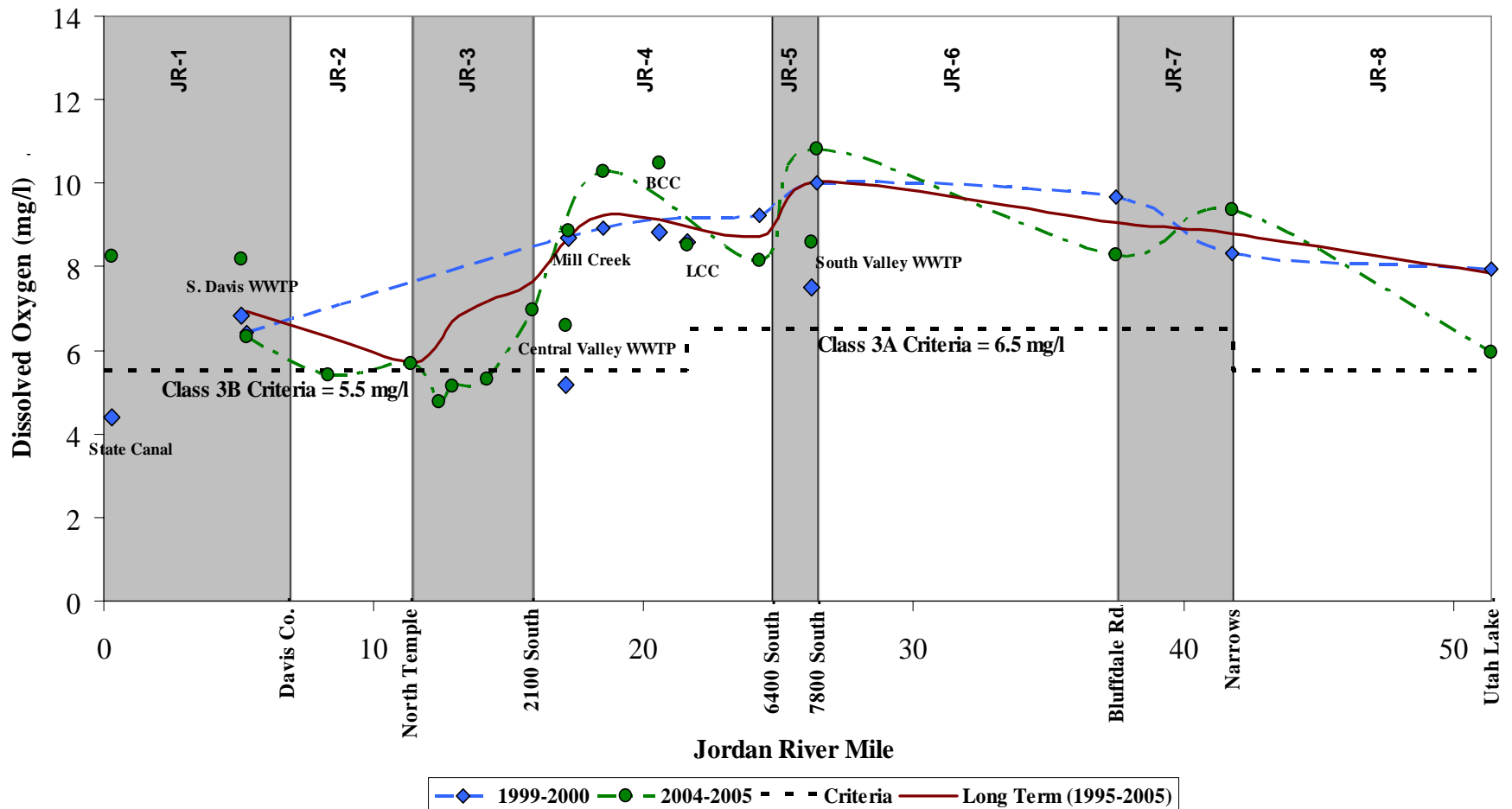
| Station ID | Name             | Segment |
|------------|------------------|---------|
| 4994160    | South Valley     | 5       |
| 4994170    | 7800 South       | 5       |
| 4994600    | Bluffdale Road   | 7       |
| 4994720    | Narrows          | 8       |
| 4994790    | Utah Lake Outlet | 8       |

| Station ID | Name           | Segment |
|------------|----------------|---------|
| 4992320    | 2100 South     | 4       |
| 4992500    | Central Valley | 4       |
| 4992540    | Mill Creek     | 4       |
| 4992880    | 3300 South     | 4       |
| 4992970    | BCC            | 4       |
| 4993580    | LCC            | 4       |
| 4994090    | 5400 South     | 4       |

| Station ID | Name                | Segment |
|------------|---------------------|---------|
| 4990880    | State Canal         | NA      |
| 4991810    | South Davis         | 1       |
| 4991820    | Cudahy Lane         | 1       |
| 4991860    | <i>Redwood Road</i> | 2       |
| 4991910    | <i>North Temple</i> | 3       |
| 4991940    | <i>400 South</i>    | 3       |
| 4992030    | <i>700 South</i>    | 3       |
| 4992270    | <i>1300 South</i>   | 3       |

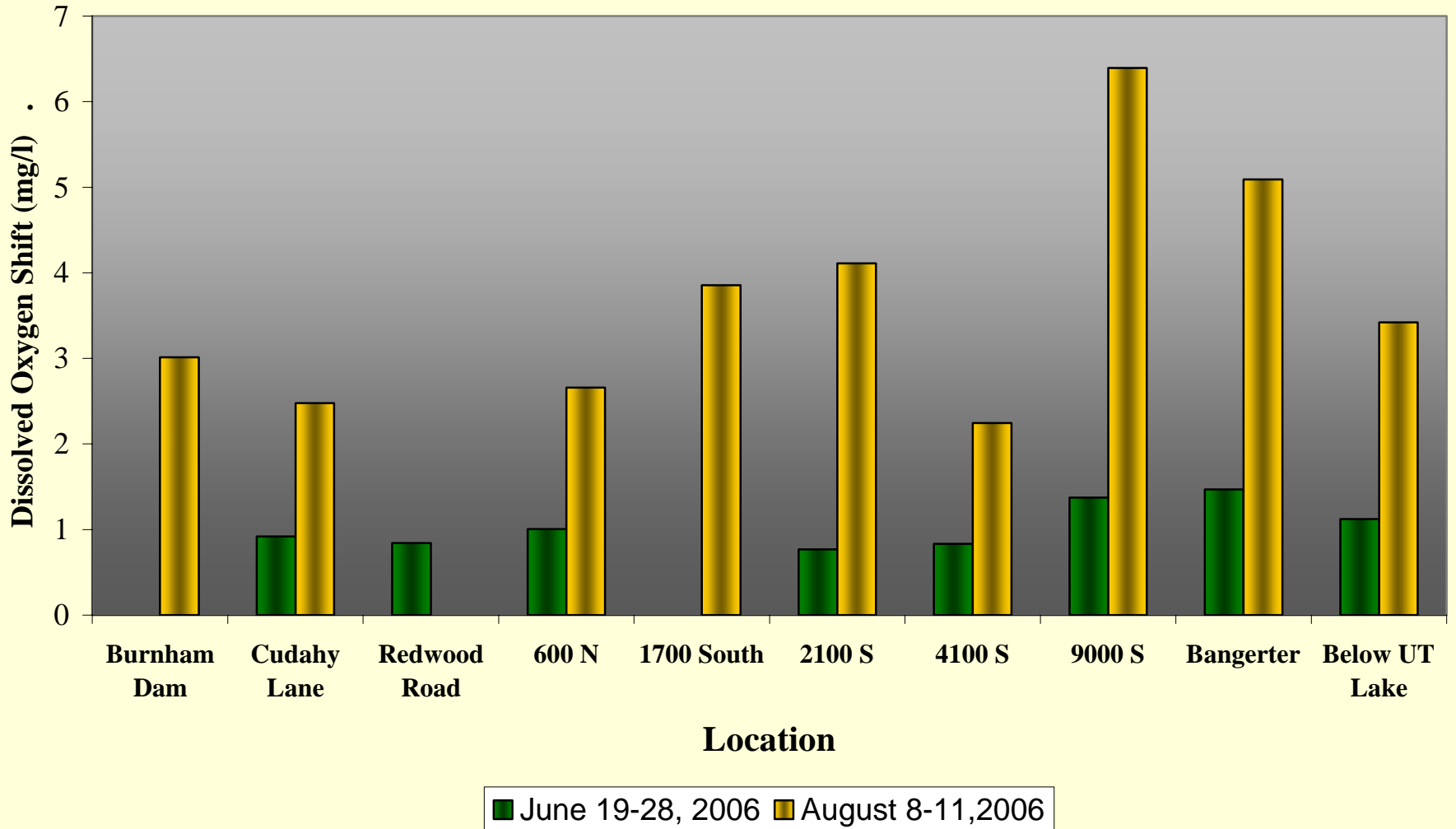
*Italics* = Sampled in 2004-2005 only

# Dissolved Oxygen



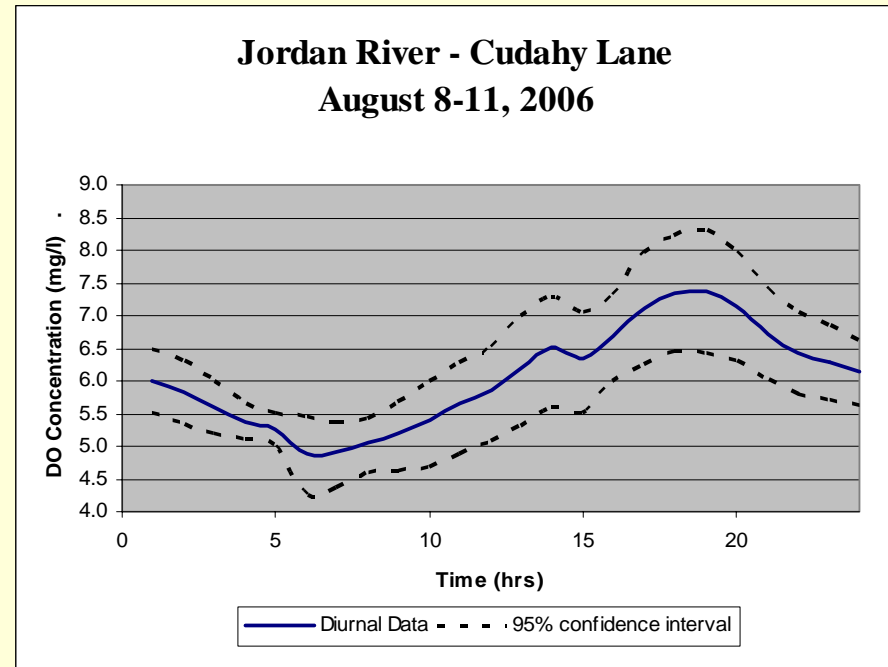
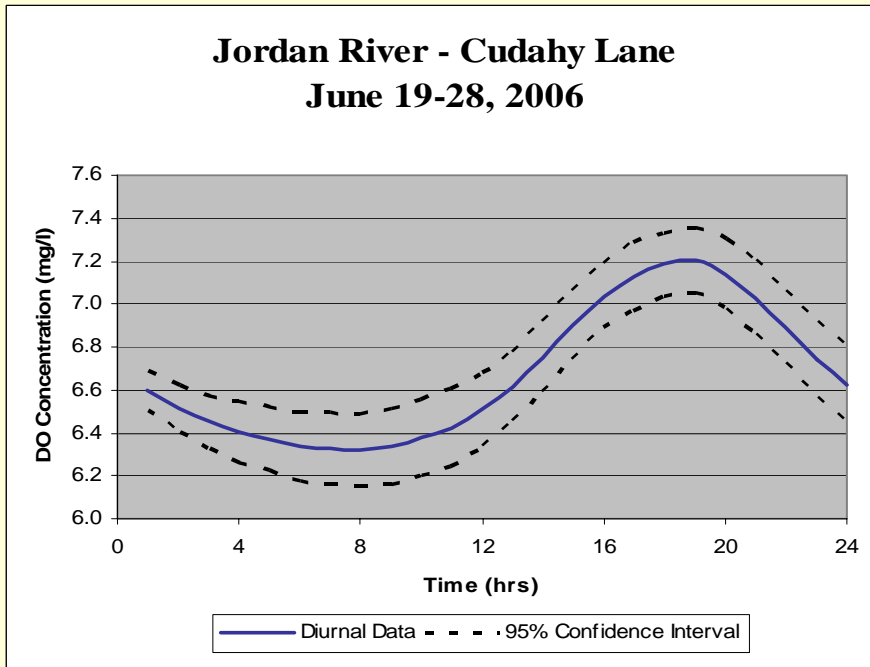
| Jordan River Dissolved Oxygen |          |           |    |          |           |    |          |                       |    |          |
|-------------------------------|----------|-----------|----|----------|-----------|----|----------|-----------------------|----|----------|
|                               |          | 1999-2000 |    |          | 2004-2005 |    |          | Long Term (1995-2005) |    |          |
|                               | Criteria | 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 Shift Summer/Fall 2006



# Jordan TMDL

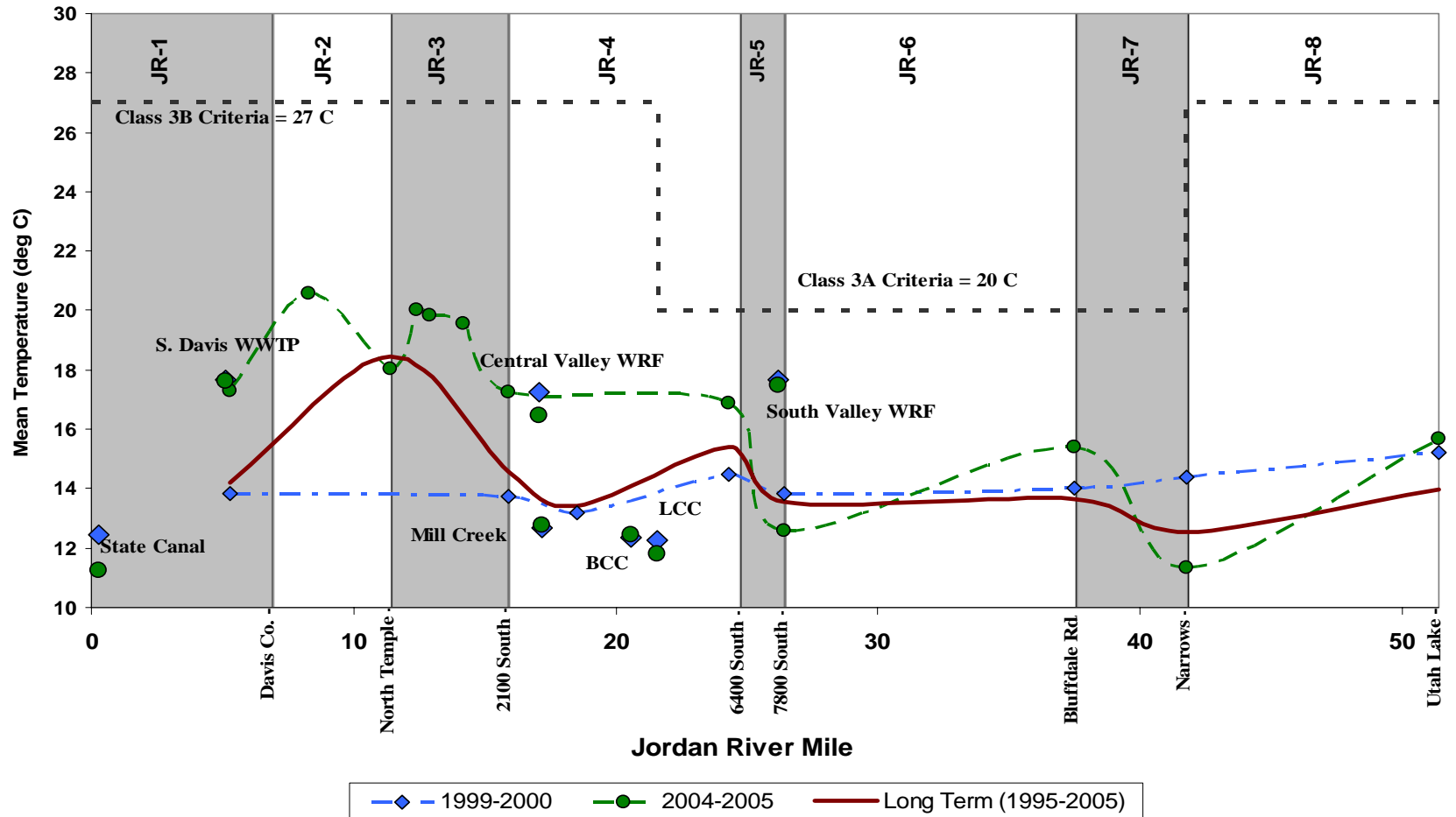
## Diurnal DO – Cudahy Lane



Jordan River Average Diurnal DO Characteristics

|                           | June 20-28, 2006 |              |       | August 8-11, 2006 |             |       |
|---------------------------|------------------|--------------|-------|-------------------|-------------|-------|
| Segment                   | 1                | 2            | 2     | 1                 | 1           | 2     |
| Station                   | Cudahy Lane      | Redwood Road | 600 N | Burnham Dam       | Cudahy Lane | 500 N |
| Min. Concentration (mg/l) | 6.22             | 7.16         | 6.85  | 4.82              | 4.87        | 4.80  |
| Max Concentration (mg/l)  | 7.13             | 8.00         | 7.86  | 7.83              | 7.35        | 7.46  |
| Hours < 5.5 mg/l          | 0                | 0            | 0     | 7.5               | 6.8         | 7.0   |

# Temperature



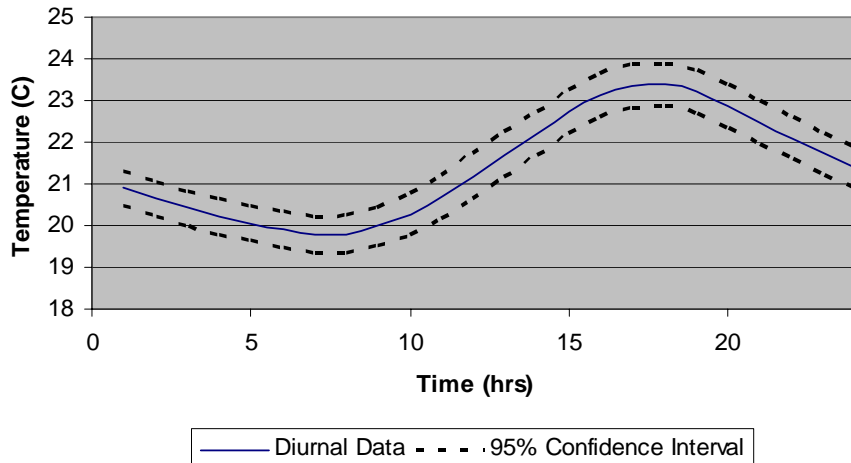
| Jordan River Temperature |          |           |    |          |           |    |          |                       |    |          |
|--------------------------|----------|-----------|----|----------|-----------|----|----------|-----------------------|----|----------|
| Station                  | Criteria | 1999-2000 |    |          | 2004-2005 |    |          | Long Term (1995-2005) |    |          |
|                          |          | Mean      | n  | % Exceed | Mean      | n  | % Exceed | Mean                  | n  | % Exceed |
| 7800 S                   | 20       | 13.84     | 15 | 0        | 12.60     | 9  | 0        | 13.57                 | 55 | 10.9     |
| Bluffdale Road           | 20       | 14.03     | 17 | 0        | 15.40     | 26 | 0        | 13.67                 | 97 | 16.5     |
| Narrows                  | 27       | 14.37     | 10 | 0        | 11.35     | 7  | 0        | 12.55                 | 27 | 18.5     |
| Utah Lake                | 27       | 15.23     | 15 | 0        | 15.68     | 11 | 0        | 13.97                 | 50 | 0        |



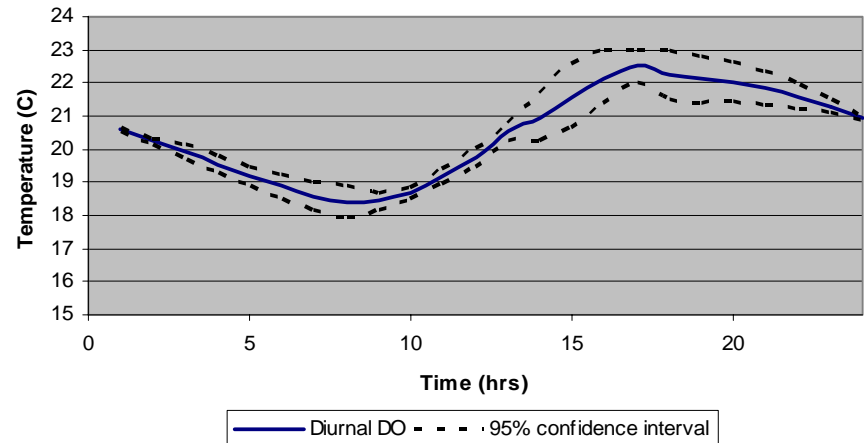
# Diurnal Temperature Curve

## Jordan River at 9000 South (segment 6)

Jordan River - 9000 South  
June 19-28, 2006



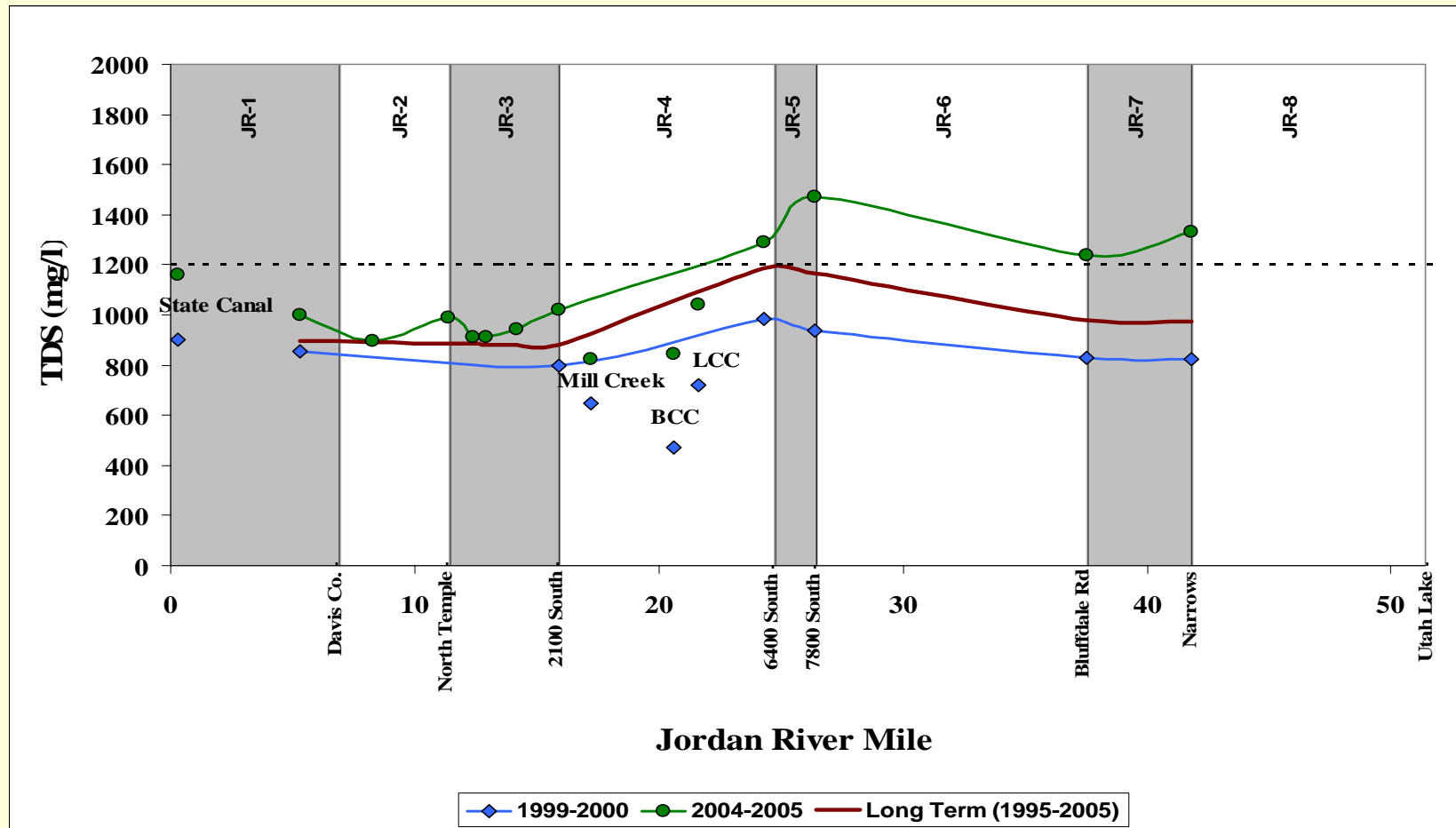
Jordan River - 9000 South  
August 8-11, 2006



Jordan River Average Diurnal Water Temperature Characteristics

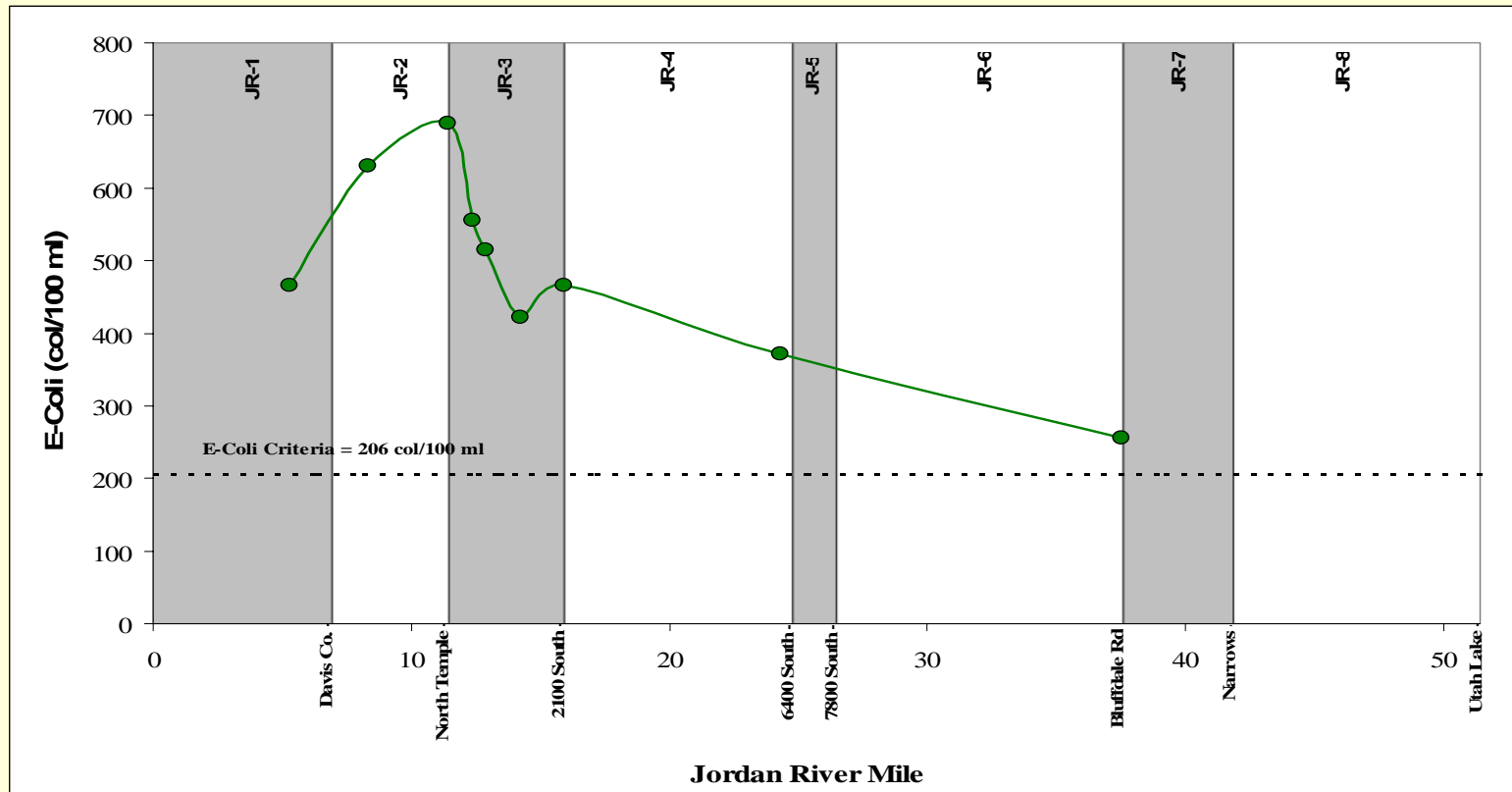
|                       | June 20-28, 2006 |                |                  | August 8-11, 2006 |                |                  |
|-----------------------|------------------|----------------|------------------|-------------------|----------------|------------------|
| Segment               | 6                | 6              | 8                | 6                 | 6              | 8                |
| Station               | 9000 South       | Bangerter Road | Utah Lake outlet | 9000 South        | Bangerter Road | Utah Lake outlet |
| Min. Temperature (°C) | 19.8             | 20.6           | 20.4             | 18.4              | 18.3           | 20.4             |
| Max Temperature (°C)  | 23.4             | 22.8           | 22.5             | 22.5              | 25.8           | 24.7             |
| Hours > Criteria      | 19.1             | 22.7           | 0.0              | 13.7              | 14.0           | 0.0              |

# Total Dissolved Solids



| Jordan River Total Dissolved Solids |             |          |           |    |          |           |    |          |                       |    |          |
|-------------------------------------|-------------|----------|-----------|----|----------|-----------|----|----------|-----------------------|----|----------|
| Station                             | Segment no. | Criteria | 1999-2000 |    |          | 2004-2005 |    |          | Long Term (1995-2005) |    |          |
|                                     |             |          | Mean      | n  | % Exceed | Mean      | n  | % Exceed | Mean                  | n  | % Exceed |
| Cudahy Lane                         | 1           | 1,200    | 857       | 17 | 5.9      | 998       | 18 | 11.1     | 897                   | 88 | 6.8      |
| 7800 S                              | 5           | 1,200    | 939       | 11 | 9.1      | 1,473     | 6  | 100      | 1,167                 | 27 | 48.1     |
| Bluffdale Road                      | 7           | 1,200    | 830       | 16 | 0        | 1,236     | 18 | 72.2     | 979                   | 87 | 21.8     |
| Narrows                             | 8           | 1,200    | 822       | 10 | 0        | 1,334     | 6  | 66.7     | 976                   | 26 | 19.2     |

# E. coli (2004)



| Jordan River E. coli |             |            |            |   |                   |                     |                     |
|----------------------|-------------|------------|------------|---|-------------------|---------------------|---------------------|
| Station              | Segment no. | Criteria 1 | Criteria 2 | n | Average Geo. Mean | % Exceed Criteria 1 | % Exceed Criteria 2 |
| Cudahy Lane          | 1           | 940        | 206        | 9 | 332.7             | 22.2                | 100                 |
| Redwood Road         | 2           | 940        | 206        | 9 | 13.9              | 22.2                | 0                   |
| North Temple         | 3           | 940        | 206        | 9 | 385.2             | 11.1                | 100                 |
| 400 South            | 3           | 940        | 206        | 9 | 231.2             | 11.1                | 60                  |
| 700 South            | 3           | 940        | 206        | 9 | 252.2             | 11.1                | 60                  |
| 1300 South           | 3           | 940        | 206        | 9 | 321.2             | 11.1                | 100                 |
| 2100 South           | 4           | 940        | 206        | 9 | 190.3             | 11.1                | 60                  |
| 5400 South           | 4           | 940        | 206        | 9 | 38.3              | 11.1                | 0                   |
| Bluffdale Rd.        | 7           | 940        | 206        | 9 | 22.2              | 0                   | 0                   |

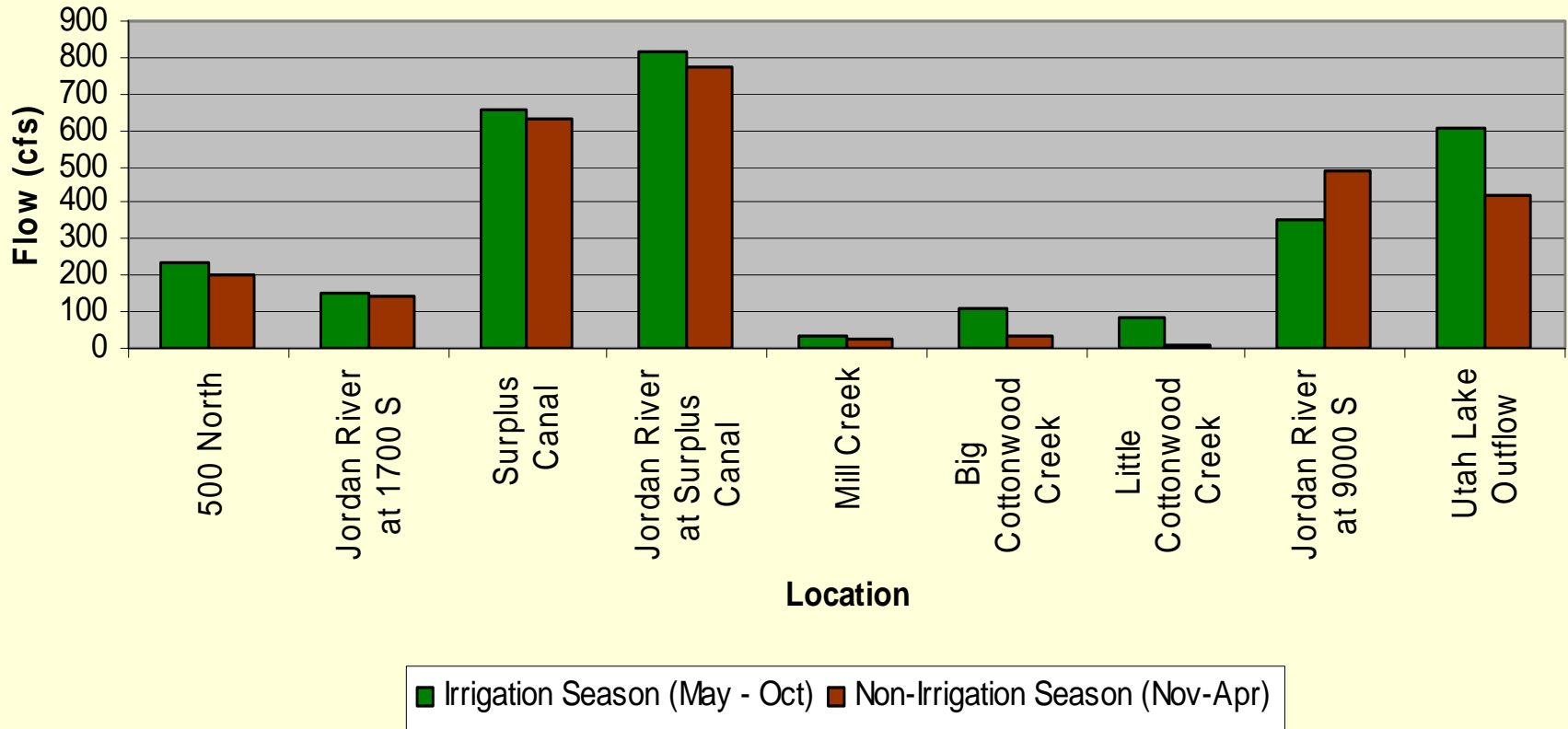
# Jordan River WQ Summary

- Monitoring data consistent with 2006 303(d) listing. Degraded water quality evident during low flow years (2004-2005)
- Sufficient data to complete TMDL for Dissolved Oxygen (DO), Temperature, and Total Dissolved Solids (TDS). Limited E. coli data currently available.
- Dissolved Oxygen
  - Intensive monitoring data indicates moderate-high exceedance of criteria in segments 1-3.
  - August diurnal sampling indicates DO sag < 5.0 mg/l.
- Temperature
  - Mean temperature data indicate good conditions in segments 5-7.
  - However, June and August diurnal sampling indicate > 50% of day exceeds criteria in segment 6.
- Total Dissolved Solids
  - Intensive monitoring data indicate TDS in segment 1 is a concern during low flow conditions (2004-2005), good during other periods.
  - Intensive and long-term monitoring of TDS above segment 4 indicates high exceedance of criteria.
- E. coli
  - High exceedance of criteria 1 and criteria 2 observed during 2004.
  - Concentrations increase downstream of segment 5.

# Jordan River Flow Data

- Flow data identified for all Jordan River inflows and diversions.
  - Canals (9 stations)
  - Stormwater conduits (8 stations)
  - Treated wastewater (3 stations)
  - Streams (7 stations)
- 11 flow sites on the mainstem Jordan River (5 active sites)
  - 500 North
  - 1700 South
  - Above Surplus Canal
  - 9000 South
  - Utah Lake outlet (calculated)
- Reasonably good data on all tributaries, major conduits, and wastewater discharge after 1980.
- Two recent flow studies completed on Jordan River.
  - Borup (1999): Re-evaluated UPDES permits of POTWs in support of long-term TMDL requirements.
  - CH2MHILL (2005): Evaluate effects of future reuse projects on Jordan River flows downstream of Turner Dam.

## Jordan River Seasonal Flow (1980 - Present)



# Biology Data

- Biology data are consistent with water quality data.
- Aquatics:
  - 11 Jordan River surveys reviewed to date (1976 – 1991).
  - Majority of fish identified to date are non-game species.
  - Cold water species observed in segments 6-7 (12000 South – Bluffdale) and below confluence of east side tributaries.
- Macroinvertebrate:
  - Limited data available.
  - Jordan River @ 1700 South (segment 3) and State Canal (near segment 1) indicate poor water quality and substantial organic pollution.
- Periphyton:
  - Limited data available.
  - Jordan River @ 1700 South (one site visit). Data currently being assessed.

# Pollutant Loading (progress to date)

- Annual loads calculated using post-1980 flow values and long-term (1995-2005) water quality concentrations.
  - Loads also calculated for 1999-2000, and 2004-2005 intensive monitoring periods.
- Load duration curves developed for Jordan River sites with continuous flow.
  - Provides a way to assess loads under all flow conditions rather than a single flow event



# Project Schedule

|                | Task                               | Completion Date         |
|----------------|------------------------------------|-------------------------|
| <b>Phase 1</b> | <b>Evaluate Existing Data</b>      | <b>December 2006</b>    |
|                | <b>Load Calculations</b>           | <b>February 2007</b>    |
|                | <b>Assess Beneficial Use</b>       | <b>March 2007</b>       |
| <b>Phase 2</b> | <b>Load Allocations/Reductions</b> | <b>May 2007</b>         |
|                | <b>Public Draft TMDL Report</b>    | <b>November 2007</b>    |
|                | <b>Final TMDL Report</b>           | <b>February 1, 2008</b> |