

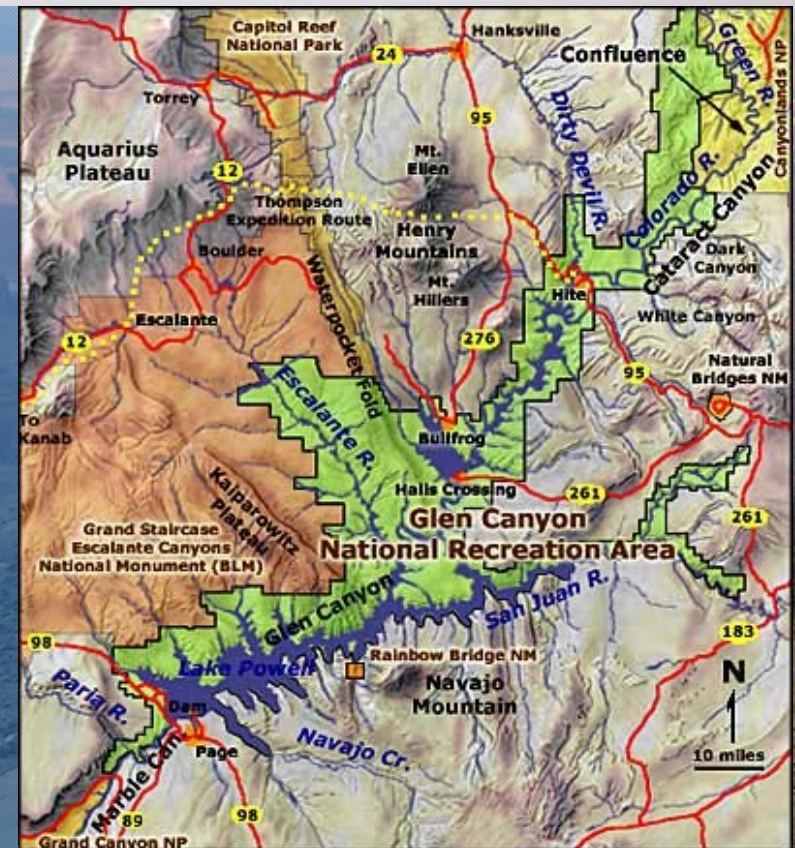
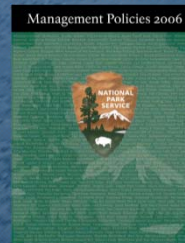
Ecosystem Monitoring in Glen Canyon National Recreation Area



Mark Anderson
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National Park Service

Glen Canyon National Recreation Area (GLCA)

- GLCA is larger than Grand Canyon NP
(Grand Canyon = 1.22 million acres / Glen Canyon = 1.25 million acres)
- GLCA extends north as far as Canyonlands NP
- Longest average stay of any NPS unit (4.5 days)
- “Recreation Areas” follow the same management as any NPS unit
- Lake Powell = 90% of visitors, 13% of GLCA



What is the **largest** man-made reservoir in the United States?

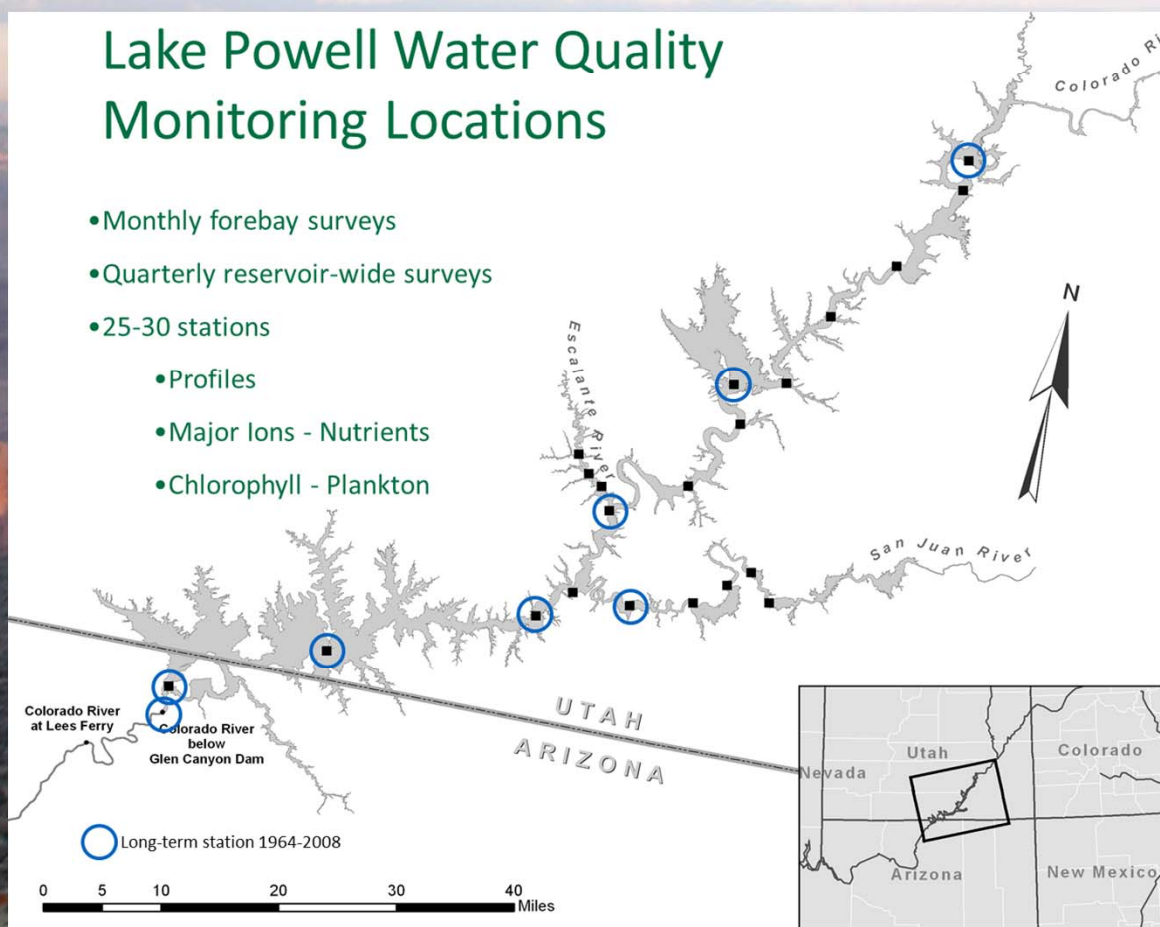


Measure	Mead	Powell
Surface Area (acres when full)	158,000	163,000
Main Stem Length (miles)	110	186
Shoreline Length (miles)	550	2000

Limnological Monitoring

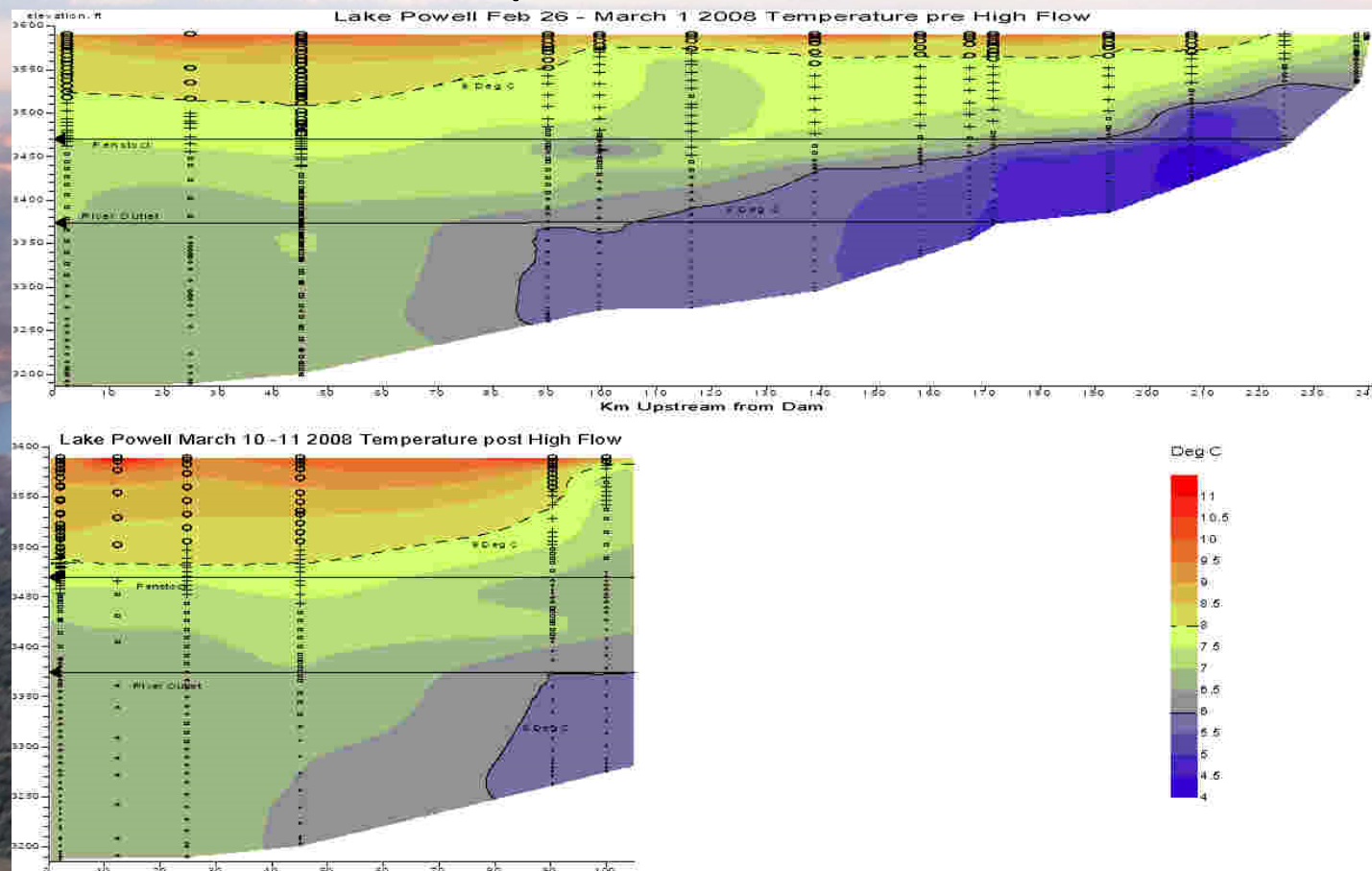
Lake Powell Water Quality Monitoring Locations

- Monthly forebay surveys
- Quarterly reservoir-wide surveys
- 25-30 stations
 - Profiles
 - Major Ions - Nutrients
 - Chlorophyll - Plankton

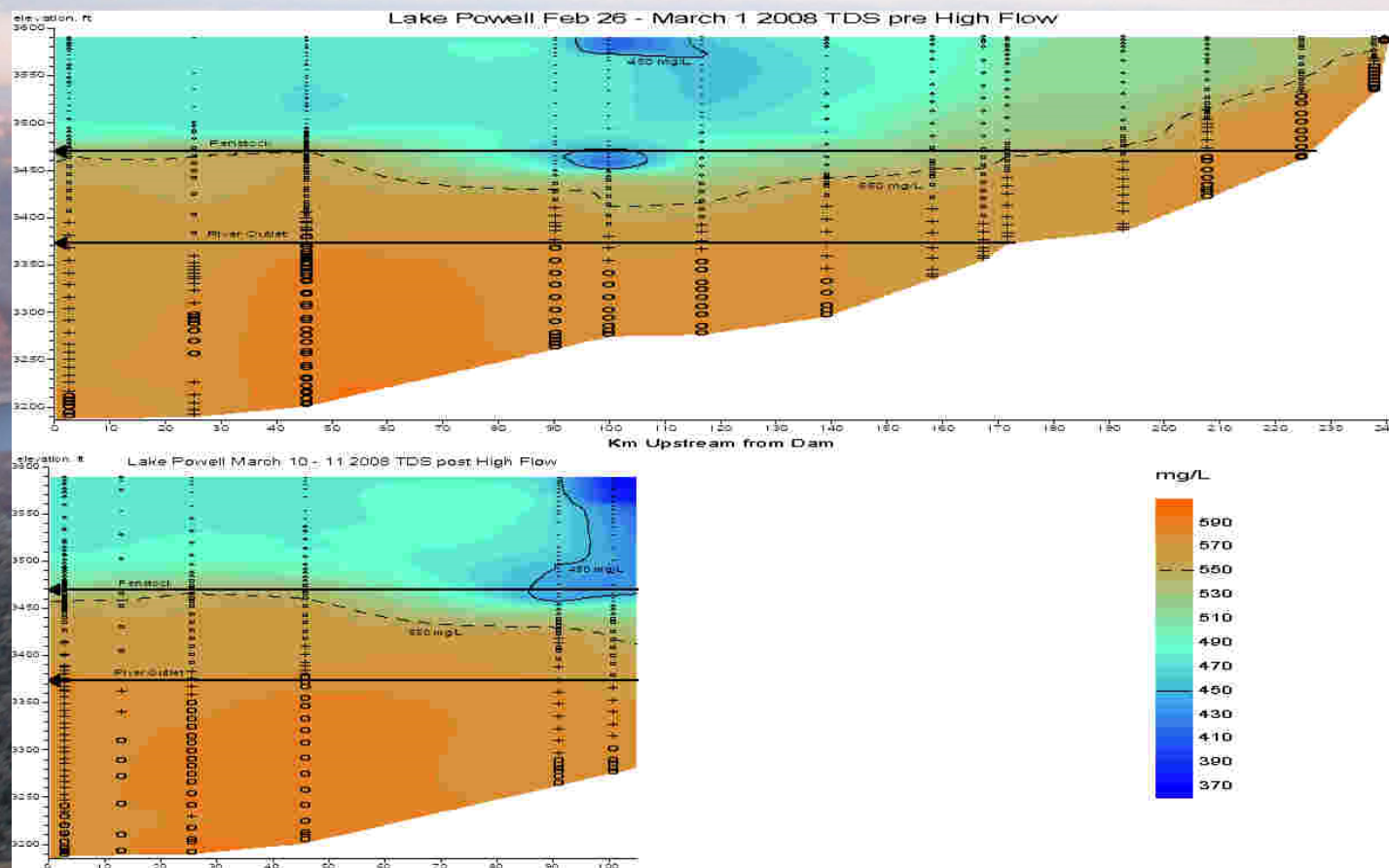


	Phase 1 1964-1971	Phase 2 1972-1981	Phase 3 1982-1990	Phase 4 1990-Present
Frequency: forebay reservoir	monthly quarterly	monthly monthly	variable variable	monthly quarterly
Number of stations	7	7-8	8-10	23-30
Physicochemical parameters	Temperature DO (Winkler)	Temperature DO (electro.)	Multi-parameter profiling (T, SC, DO, pH, ORP)	Multi-parameter profiling (T, SC, DO, pH, ORP, turb.)
Chemical Sampling	Major Ions	Major Ions	Major Ions	Major Ions Nutrients
Sampling interval	50 ft	50 ft	50 ft	Variable
Inflow monitoring	None	None	Colorado River	Colorado River San Juan River Escalante River
Tailwater monitoring	None	None	Below Dam T, SC (<1985)	Below Dam Lees Ferry T, SC, DO, pH

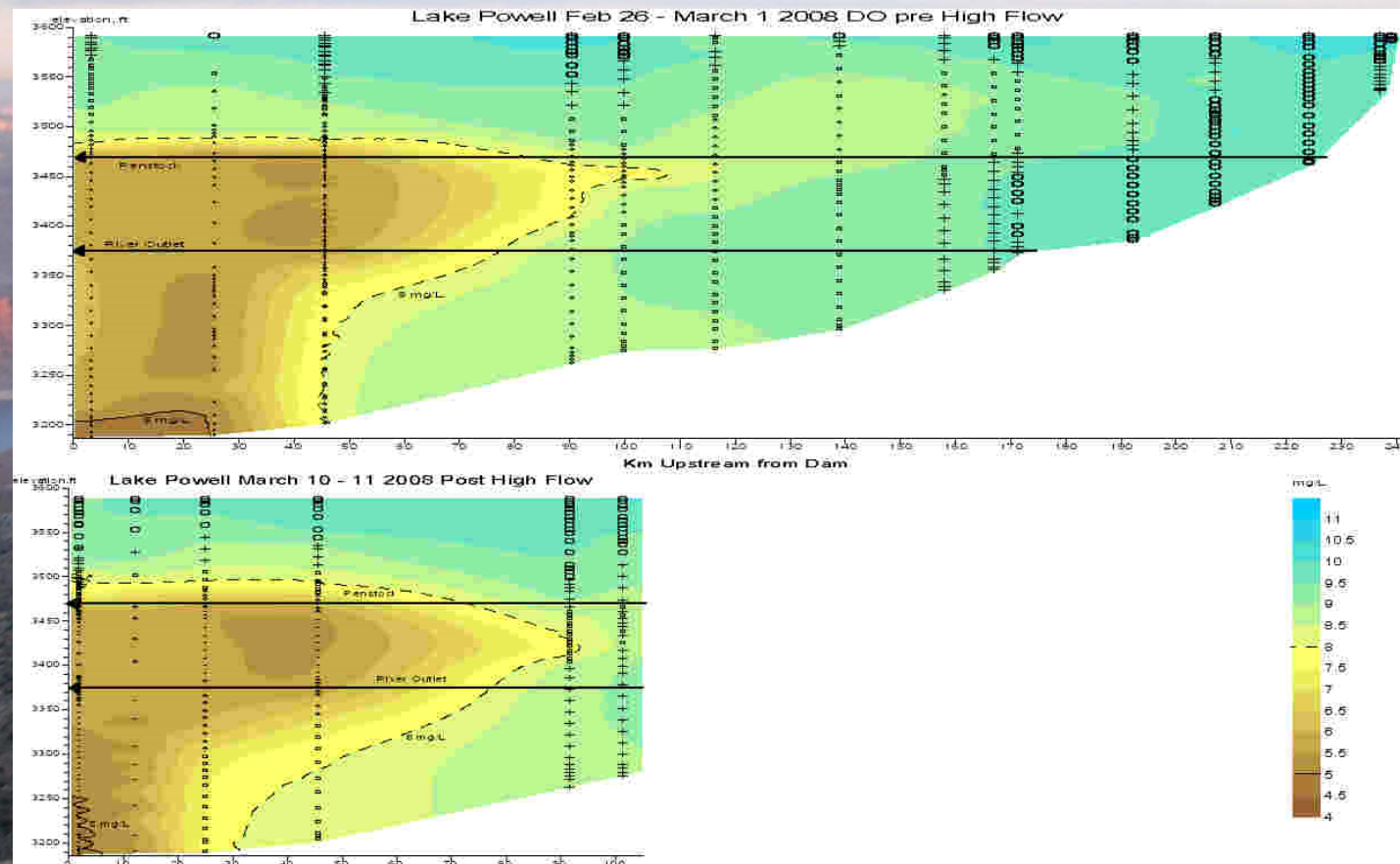
Lake Powell Temperature



Lake Powell Specific Conductance

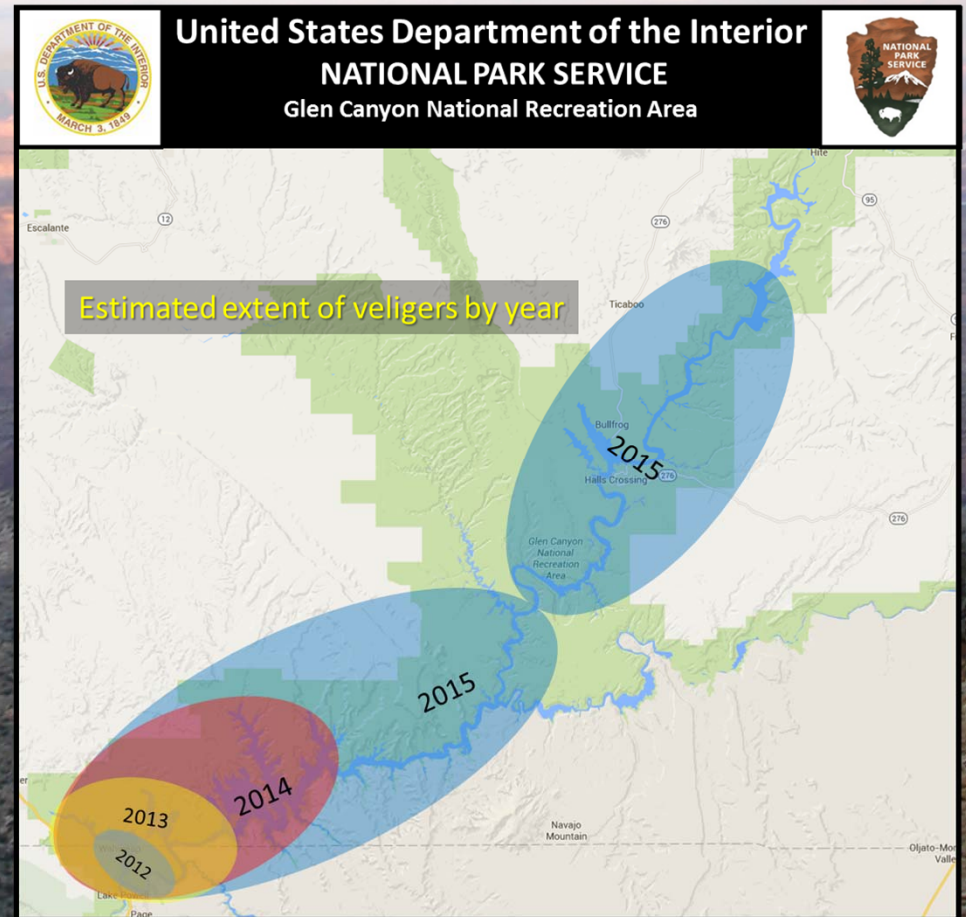


Lake Powell Dissolved Oxygen





Quagga Mussel Monitoring



Quagga Mussel Monitoring

Glen Canyon Dam



Davis Dam Penstock



Lake Havasu RECLAMATION

← Glen Canyon Dam may look like this in 2016

Quagga Mussel Effects Monitoring

- Water Clarity
- Phytoplankton/Zooplankton
- Fishery
- Waterfowl
- Aquatic Vegetation
- Harmful Algal Blooms
- Dissolved Oxygen
- *Dreissena polymorpha*



Hydrocarbon Monitoring

- Estimated 400,000 watercraft per year
 - Many 2-stroke engines
 - Sunlight + Hydrocarbons = PAHs
 - Potential for bioaccumulation and build up in sediments
- Side Canyon Study (2001-2)
- Personal Watercraft EIS, 2003
- Long-term Hydrocarbon Monitoring
 - Monitoring Approach
 - Sentinel Sites
 - Water and Sediment
 - SPMDs and CLAMs



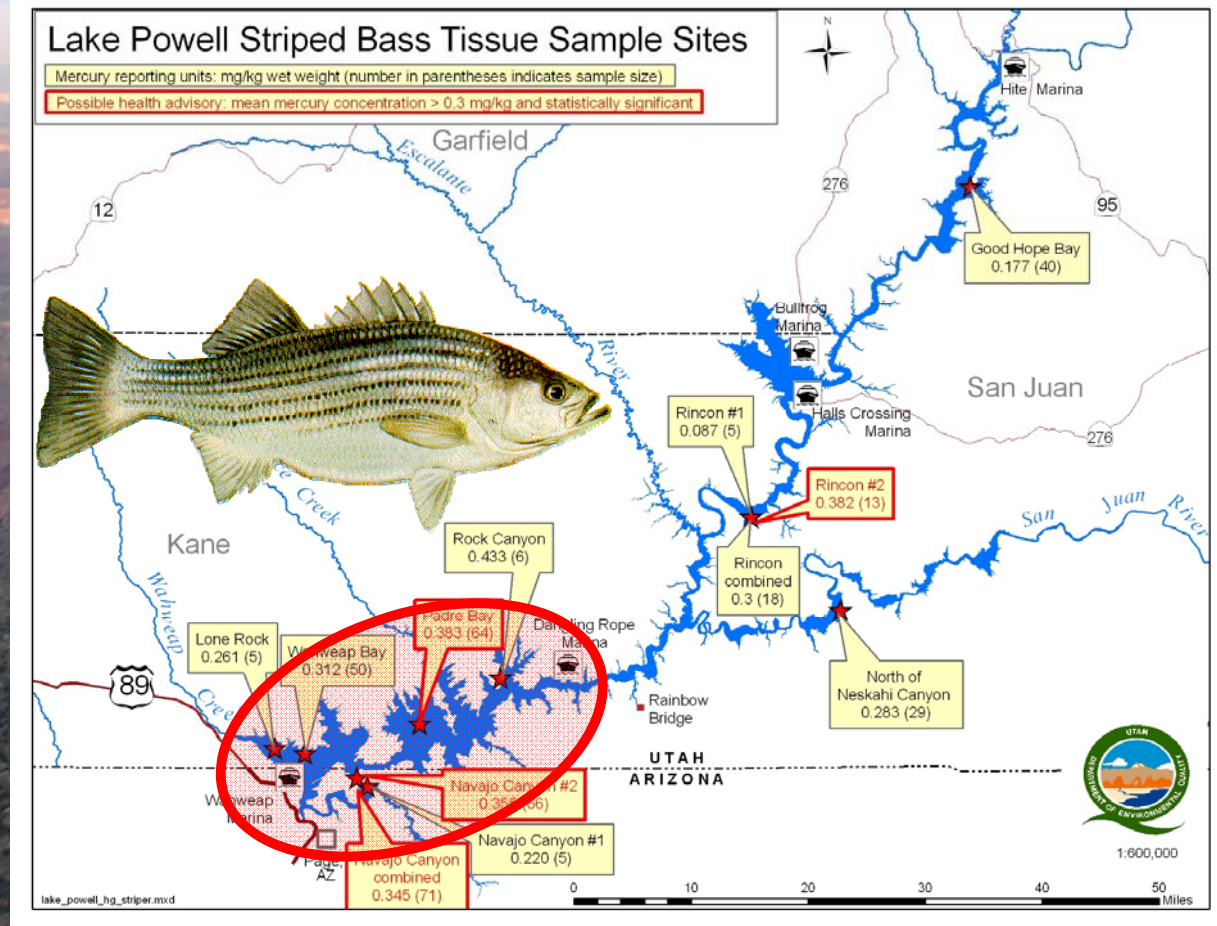
Mercury Investigations

Lake Powell Striped Bass

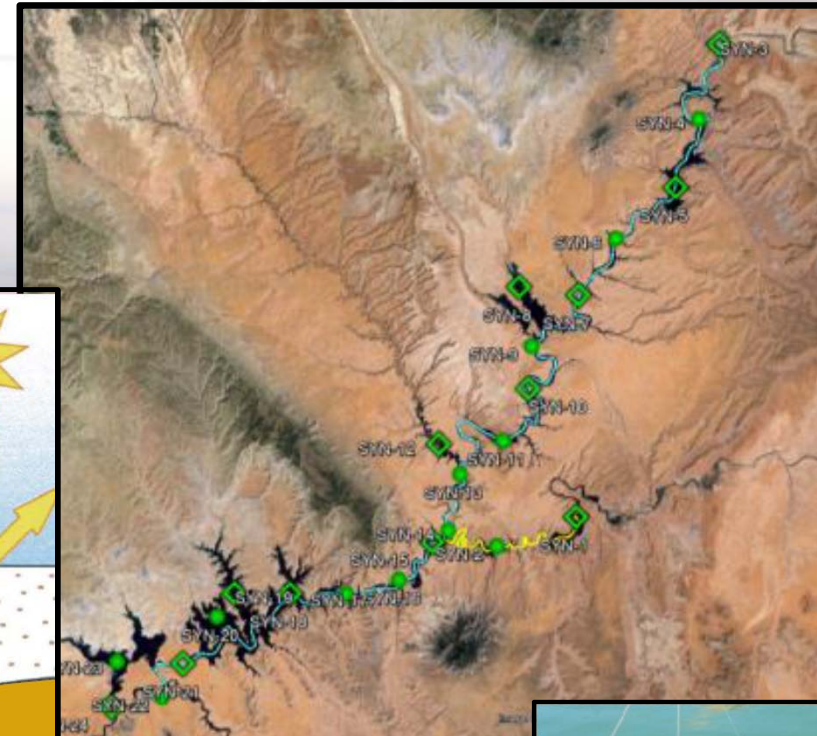
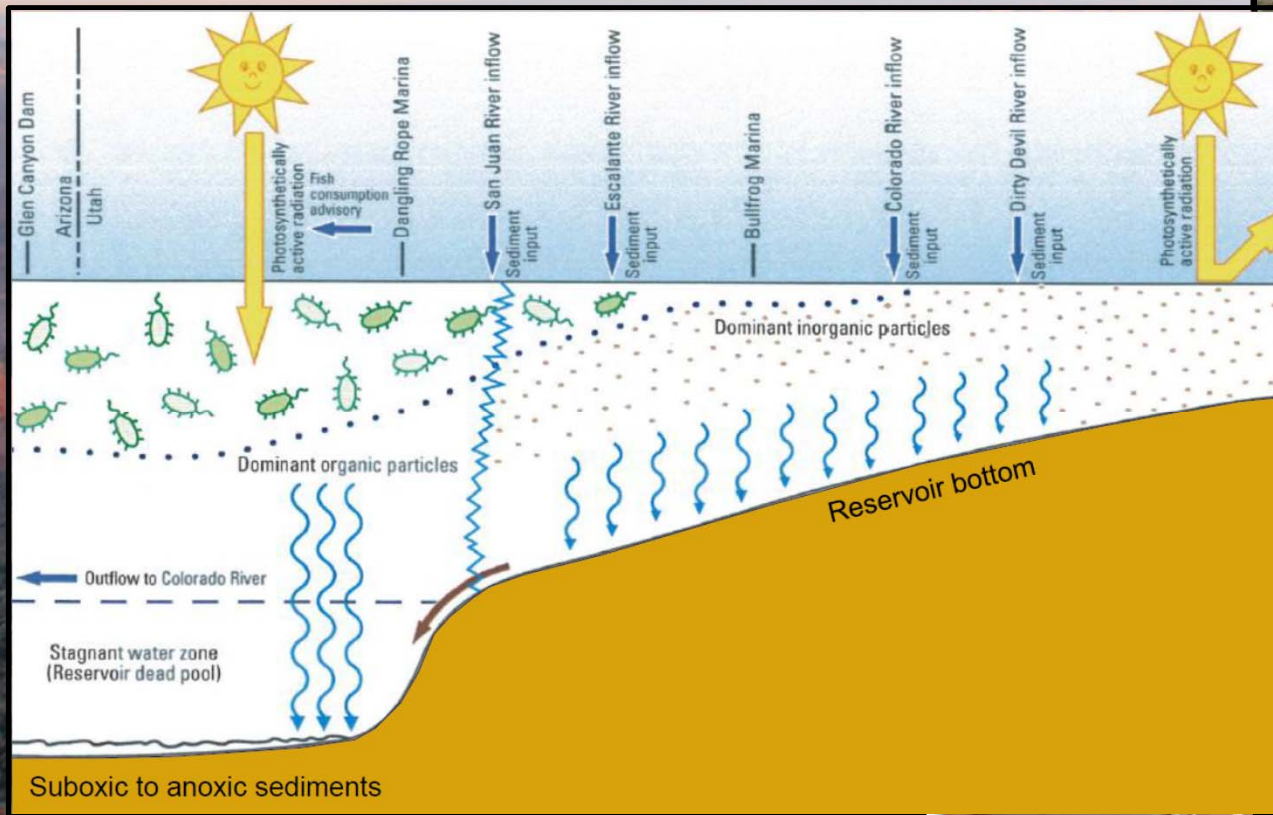
Consumption Advisory (UT and AZ)

(from Dangling Rope Marina south to the dam)

- Children should limit their consumption of Striped Bass to one 4-ounce meal per month.
- Women of childbearing age should limit their consumption of Striped Bass to two 8-ounce meals per month.
- Adult women past childbearing age and men older than 16 should limit their consumption of Striped Bass to eight, 8-ounce meals per month.

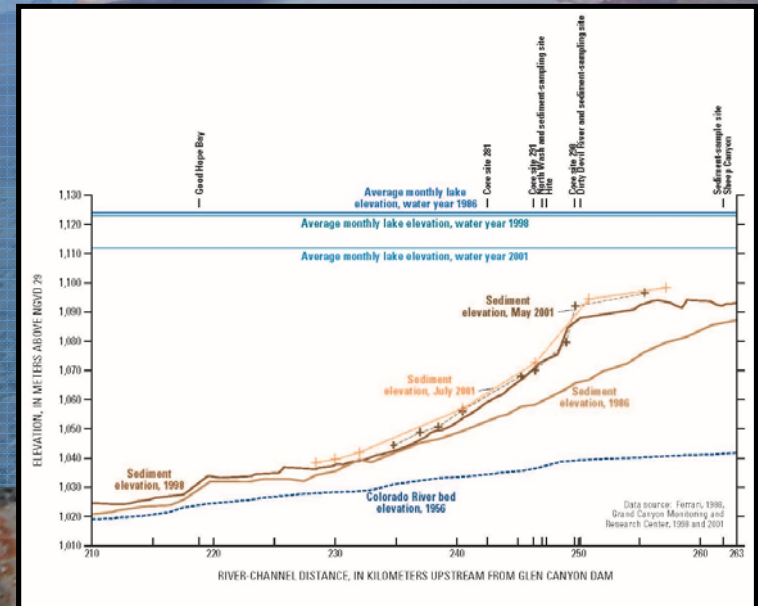
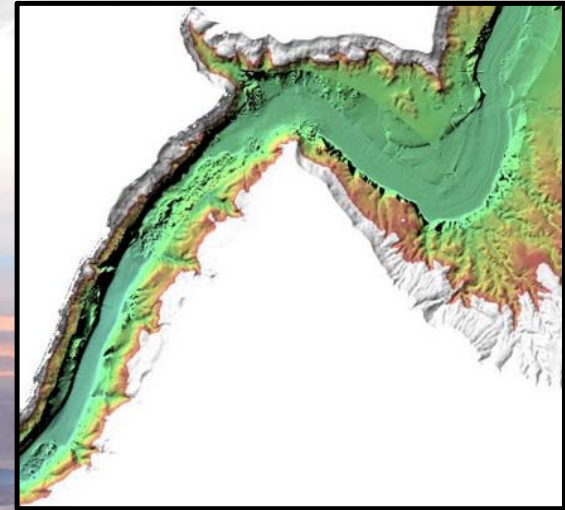


Mercury Investigations



Sedimentation

- Visitor Use Impact
 - Paiute Farm Marina, Hite
 - Waterfalls
- Contaminant Accumulation / Release
 - Bioaccumulation
- Oxygen Demand



Tip of the Iceberg

- Fisheries Partners
 - RIPs, UDWR, ERWP, AGFD, GCMRC, etc.
- Springs
 - Grazing Impacts
 - Hanging Gardens
 - Climate Change
- Visitor Impacts – emerging contaminants
- River Terrace Monitoring
- Public Health Beach Monitoring
- Integrated Pest Management
- Compliance

