UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY
WATER QUALITY

Utah Water Quality

Western States Water Council
September 29, 2016
Erica Brown Gaddis, Ph.D.

DWQ Priorities and Challenges

Spill response

Nutrient pollution and harmful algal blooms

Great Salt Lake

Utah's Integrated Report

Perennial Rivers / Streams

15,583 **miles**

Lakes / Reservoirs / Ponds

376,676 **acres**

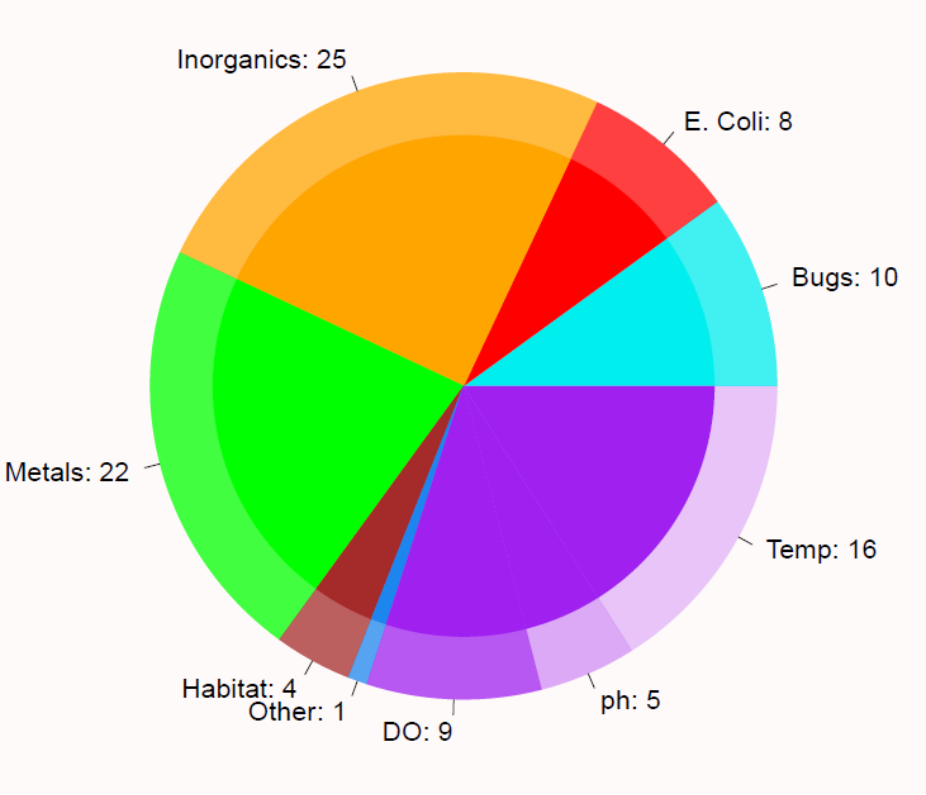
Freshwater Wetlands

510, 359 **acres**

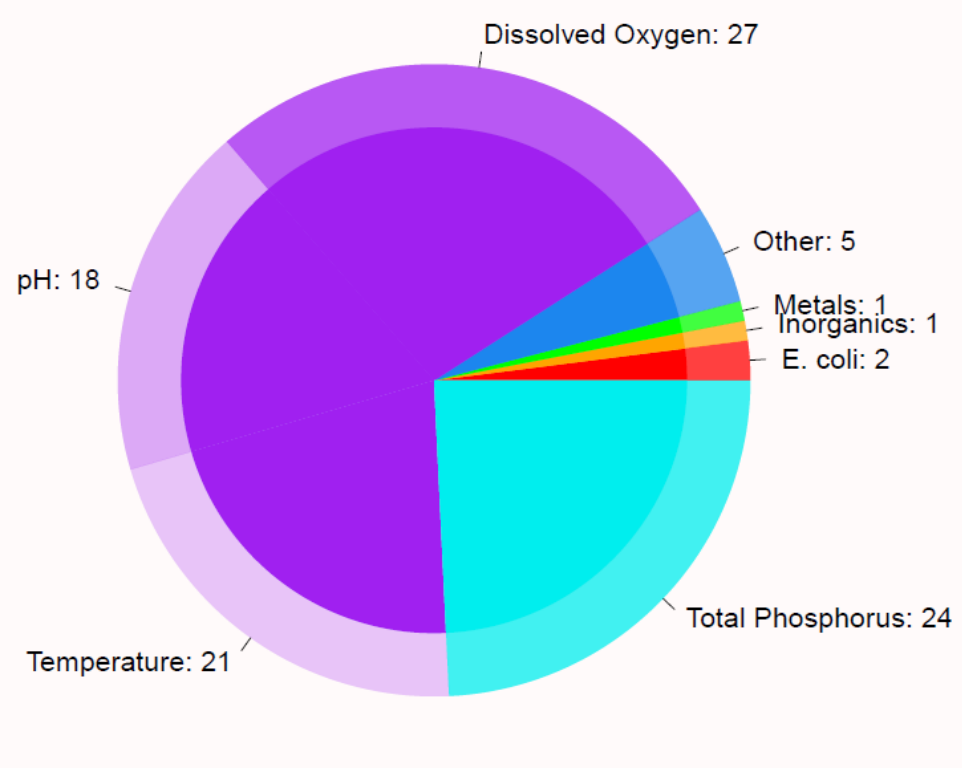
- Integrates 303(d) and 305(b) requirements of the Clean Water Act every two years
- 2016 Draft Integrated Report
  - 36% of lake acres impaired (51 lakes and reservoirs)
  - 43% of stream miles impaired (240 stream segments)

Causes of Impairment

Streams



Lakes



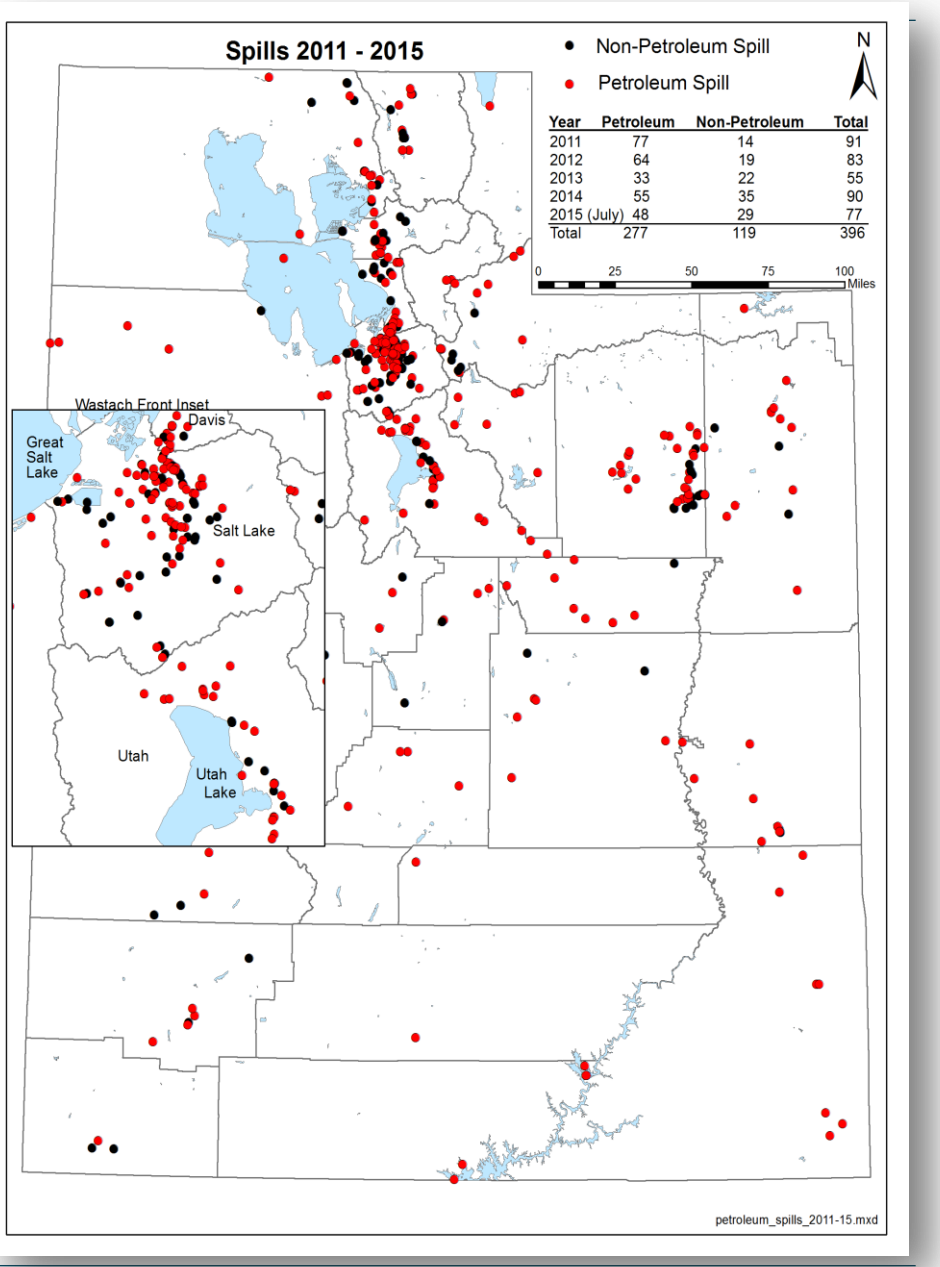
Spill Response

Spill Response

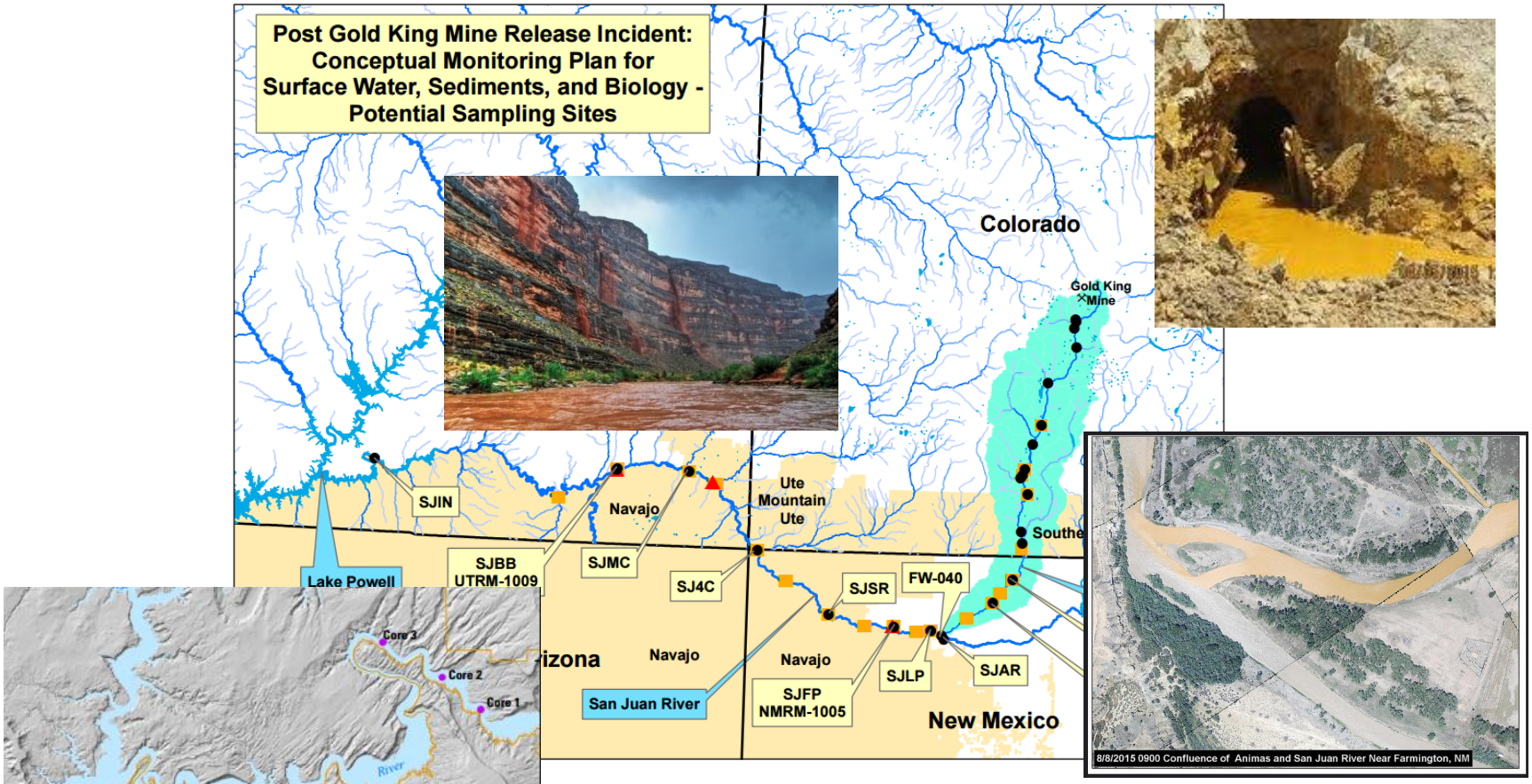
50 – 115 spills per year

Over half are petroleum spills

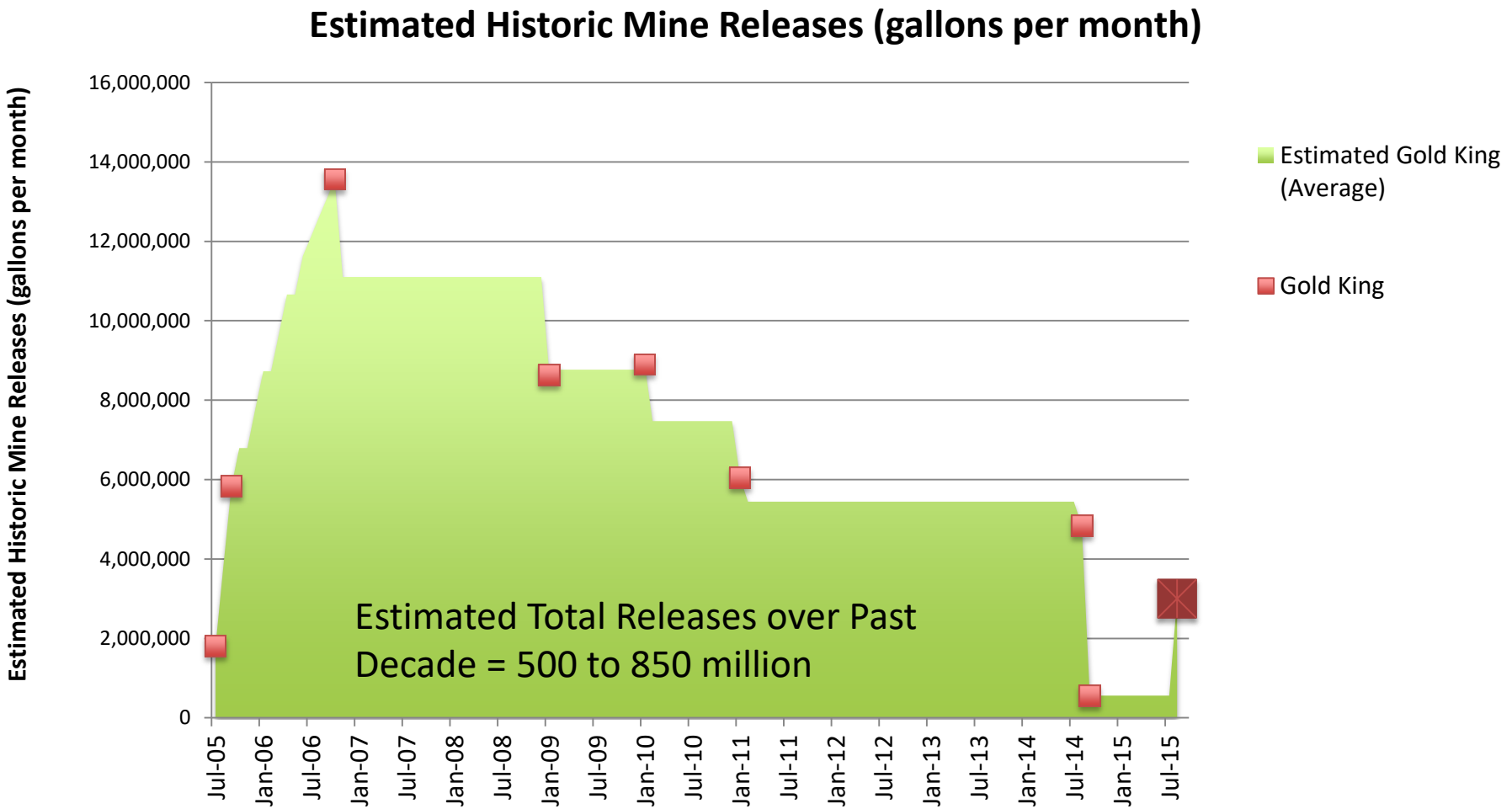
Large and complex spills



Gold King Mine Release



GKM Cumulative Releases Over a Decade



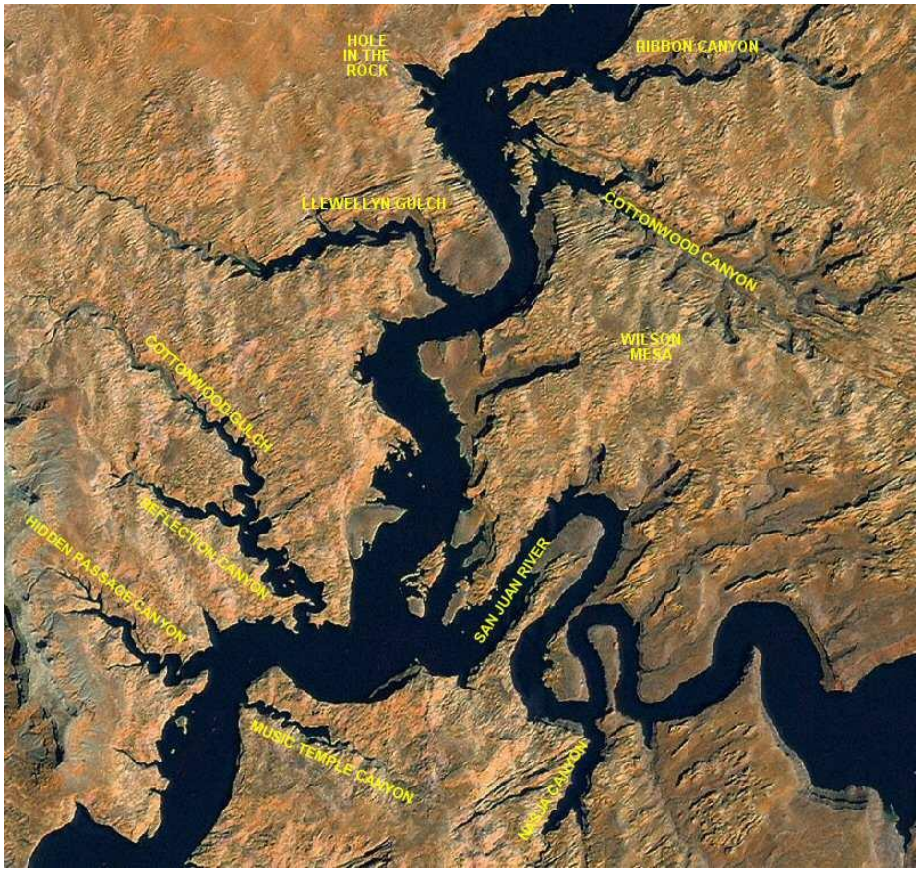
Long-term effects on Lake Powell

San Juan Arm, Lake Powell

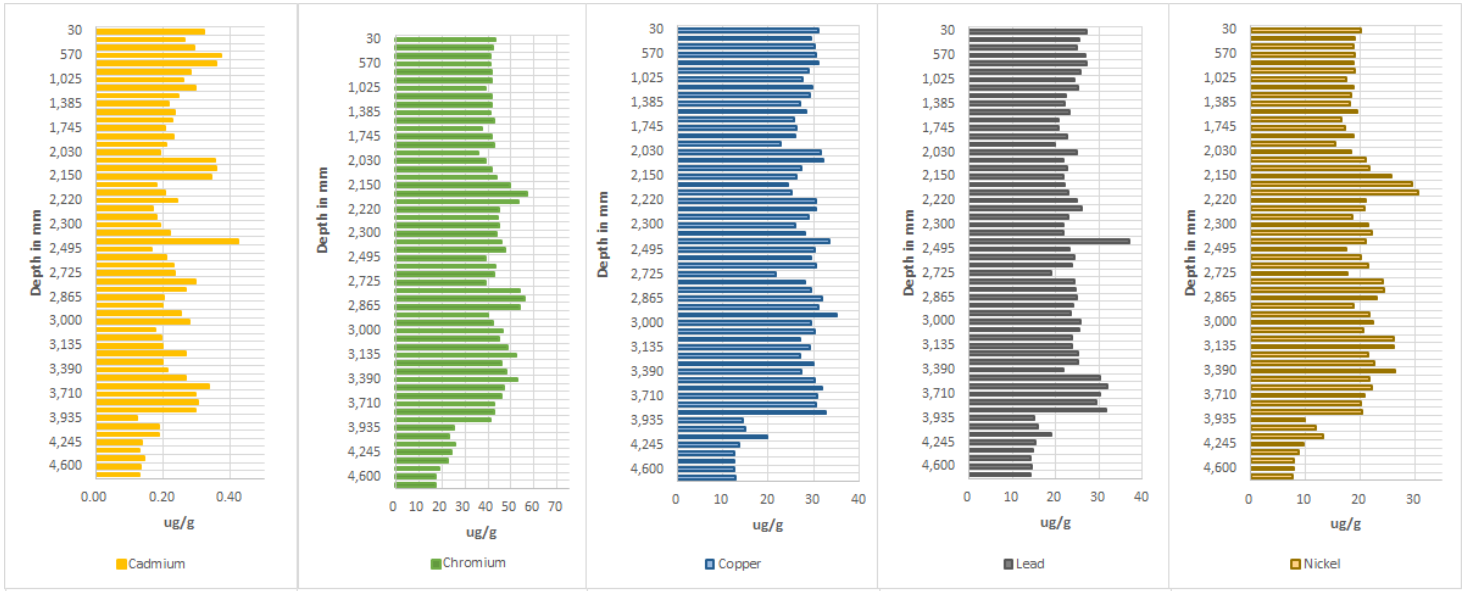
- Depositional area for historic and current mine releases in San Juan system

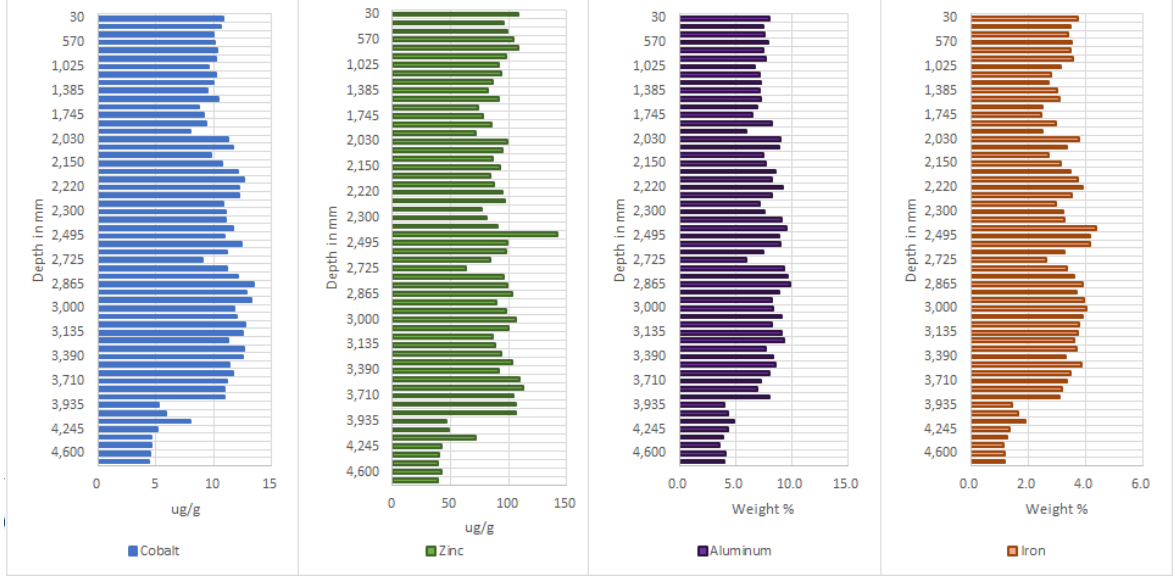
Historic releases:

- Estimated release of 8.6 million tons of tailings discharged to river system over life of the mines
- EPA estimates 5.5 million gallons per day of releases
- 1974 – 116,000 tons
- 1978 - 500 million gallon release



Lake Powell - San River Arm Core 3





From USGS 2014 - 1096

Tibble Fork Sediment Release

Sediment Contamination – A Regulatory Gap?

American Fork Sediment Contamination: Aquatic Life Screening Values

No Exceedence | Above Screening Level

Monitoring Location	Site Description	Collection Date	Collection Time	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Vanadium	Zinc	Molybdenum
EPA Aquatic Life Screening Values						9.8			1.0	43.4	50.0	31.6	20,000.0	35.8	460.0	0.2	22.7	2.0	1.0		121.0	
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
5912840	N FK American FK CK AB Tibble Fork Res	8/23/2016	2:25:00 PM	6,840	ND	13	60	ND	2	20	5	ND	17,300	40	466	0.1	21	ND	ND	26	213	ND
		8/27/2016	8:55:00 AM	11,000	ND	17	54	ND	2	22	9	ND	18,900	70	563	ND	24	ND	ND	24	207	ND
		8/28/2016	8:40:00 AM	10,300	ND	13	38	ND	2	26	7	ND	29,600	43	471	0.1	21	ND	ND	27	265	ND
5912810	N FK American FK R BL Tibble Fork Res	8/23/2016	2:45:00 PM	7,760	ND	16	181	ND	2	22	6	ND	12,100	109	406	0.2	ND	ND	ND	35	280	ND
		8/27/2016	9:27:00 AM	7,540	5	19	178	ND	2	17	6	23	23,900	114	442	0.2	ND	ND	ND	22	306	ND
		8/28/2016	9:00:00 AM	7,950	ND	18	137	ND	2	16	6	20	25,000	105	391	0.2	ND	ND	ND	21	262	ND
4994990	N FK American FK R AB confl S FK	8/23/2016	3:00:00 PM	11,700	9	34	162	ND	5	26	9	56	15,700	347	560	0.4	ND	ND	ND	42	601	ND
		8/27/2016	9:45:00 AM	8,800	ND	20	158	ND	2	18	6	25	26,800	128	471	0.2	ND	ND	ND	22	342	ND
		8/28/2016	9:20:00 AM	10,000	ND	21	181	ND	3	19	7	25	28,300	154	491	0.2	ND	ND	ND	23	370	ND
4994984 - b	American Fork River BL Cave Camp Springs - Blw Water Line	9/1/2016	12:18:00 PM	NS	10	39	NS	0	6	23	NS	66	NS	415	NS	0.5	30	0	0	NS	650	NS
4994984 - a	American Fork River BL Cave Camp Springs - Abv Water Line		12:18:00 PM	NS	0	22	NS	0	3	21	NS	33	NS	163	NS	0.2	0	0	0	NS	339	NS
4994984	American Fork River BL Cave Camp Springs	8/27/2016	10:05:00 AM	7,660	4	19	139	ND	2	15	6	20	24,300	128	483	0.2	ND	ND	ND	19	321	ND
		8/28/2016	9:35:00 AM	9,360	ND	15	107	ND	2	18	5	20	21,300	93	357	0.1	ND	ND	ND	24	235	ND
4994980	American Fork River at mouth of Canyon	8/23/2016	12:25:00 PM	12,900	7	31	155	ND	4	26	9	43	18,400	267	576	0.3	26	ND	ND	38	509	ND
		8/27/2016	10:20:00 AM	16,600	12	49	180	ND	8	30	13	92	41,000	522	616	0.6	36	ND	3	38	916	ND
		8/28/2016	10:00:00 AM	9,560	ND	22	116	ND	3	18	7	31	23,100	170	440	0.3	ND	ND	ND	22	351	ND

Abandoned Mine Drainage in American Fork Canyon

BOR Evaluation following Gold King Mine Release

RECLAMATION
Managing Water in the West

Technical Evaluation of the Gold King Mine Incident

San Juan County, Colorado

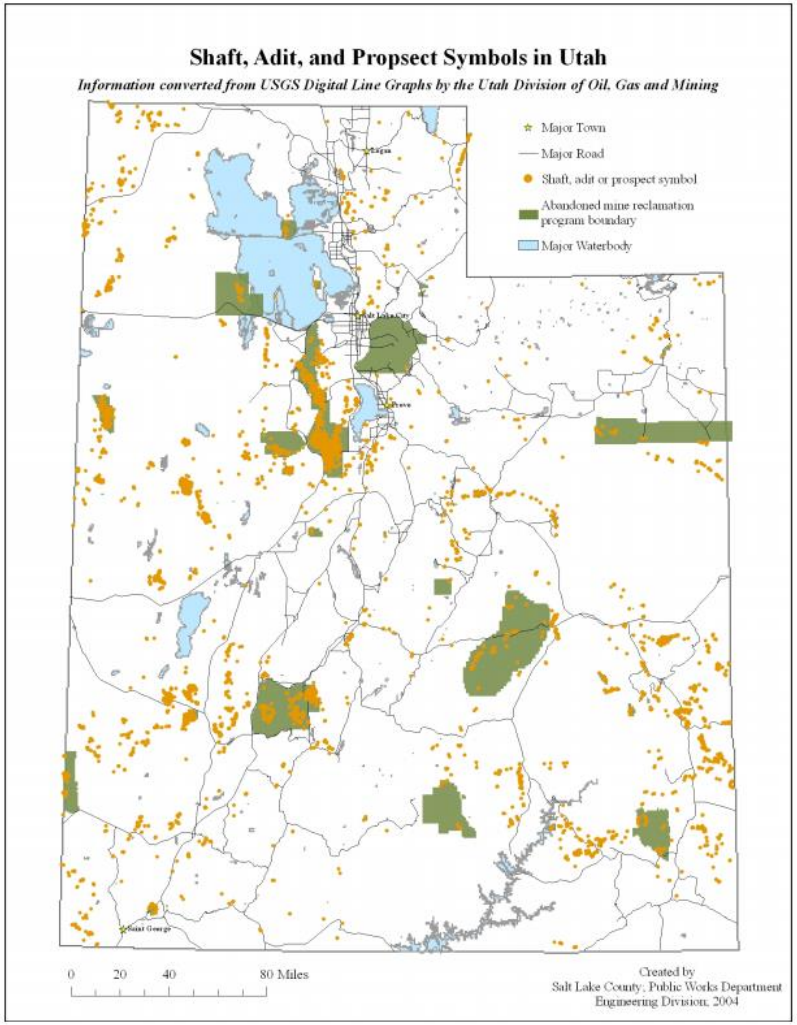
U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

October 2015

- Actions leading to blowout are not unique or isolated
  - Inconsistent standards of practice among agencies
  - Guidance includes little attention to engineering complexity of abandoned mines
- Regulations that govern similar situations (SMCRA; dam safety) do not apply to abandoned hardrock mines
- Nearly 100,000 abandoned hardrock mines in Western US

Abandoned Mine Management in Utah

- Multiagency management
  - Federal: USFS, BLM, EPA (CERCLA)
  - State: Division of Oil, Gas, and Mining; Division of Water Quality
- Implement BMPs for safety and to reduce discharge to streams
  - Treatment of contaminants
  - Removal of mine waste
  - Isolation from water
  - Diversion
- Identify streams impacted by abandoned mines through assessment
- Inventory of discharging abandoned mines
- UPDES permitting?



Utah's Nutrient Reduction Program

Nutrient Pollution Threatens Utah Waters

Aquatic life

Aesthetics

Livestock

Recreation

Drinking Water

- Direct toxicity
  - High levels of nitrate cause blue baby syndrome.
  - Ammonia is directly toxic to aquatic life.
  - Cyanotoxins (Harmful Algal Blooms)
- Indirect effects
  - In excess, robs waters of dissolved oxygen
  - Results in nuisance conditions
  - Affects taste and odor of drinking water

UDEQ/UDOH Guidelines for HABs

Toxin Producing Blue-green algae Cell Density (cells/mL)	Health Risks	Action Recommended	Relative Probability of Acute Health Risk
<20,000	Negligible	None	Very Low
20,000-100,000	Short-term effects e.g. skin irritation, gastrointestinal illness	Issue caution advisory; Post **CAUTION** sign; Weekly sampling recommended	Low to Moderate
100,000 – 10,000,00 or reports of animal illnesses or death	As above for low risk, and potential for long-term illness	Issue warning advisory; Post **WARNING** sign; Weekly sampling recommended	Moderate to High
>10,000,000 or large scum mat layer or reports of human illness;	As above for moderate risk, and potential for acute poisoning	Issue Danger Advisory; Post **DANGER** sign; Weekly sampling recommended Consider **Closure**	Very High

2016 Utah Lake Algal Bloom

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

Brad T Johnson
Deputy Director

Utah County
HEART of UTAH
Health Department

UTAH DEPARTMENT OF HEALTH

UTAH DNR STATE PARKS

NEWS RELEASE
July15, 2016

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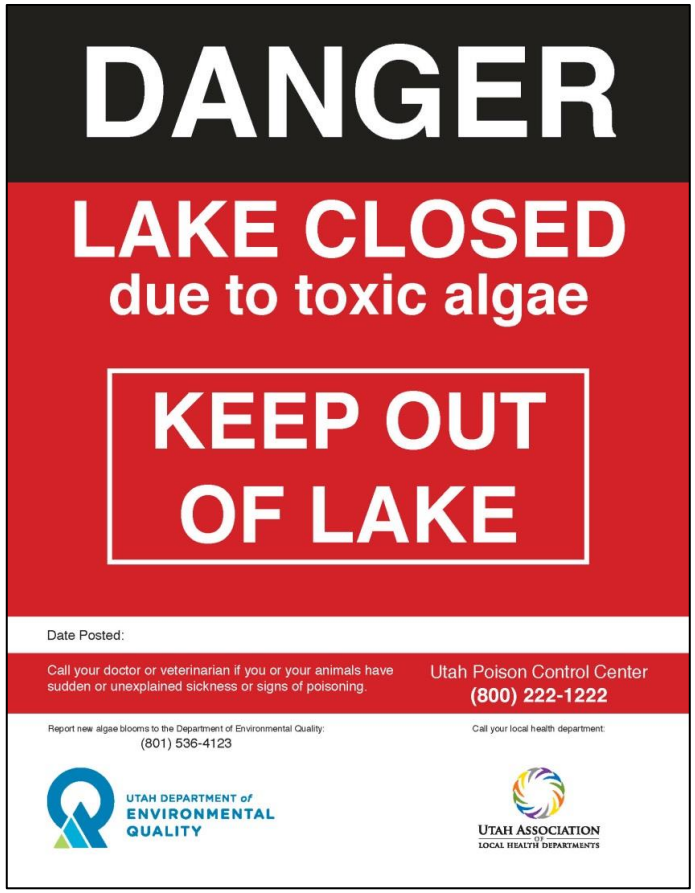
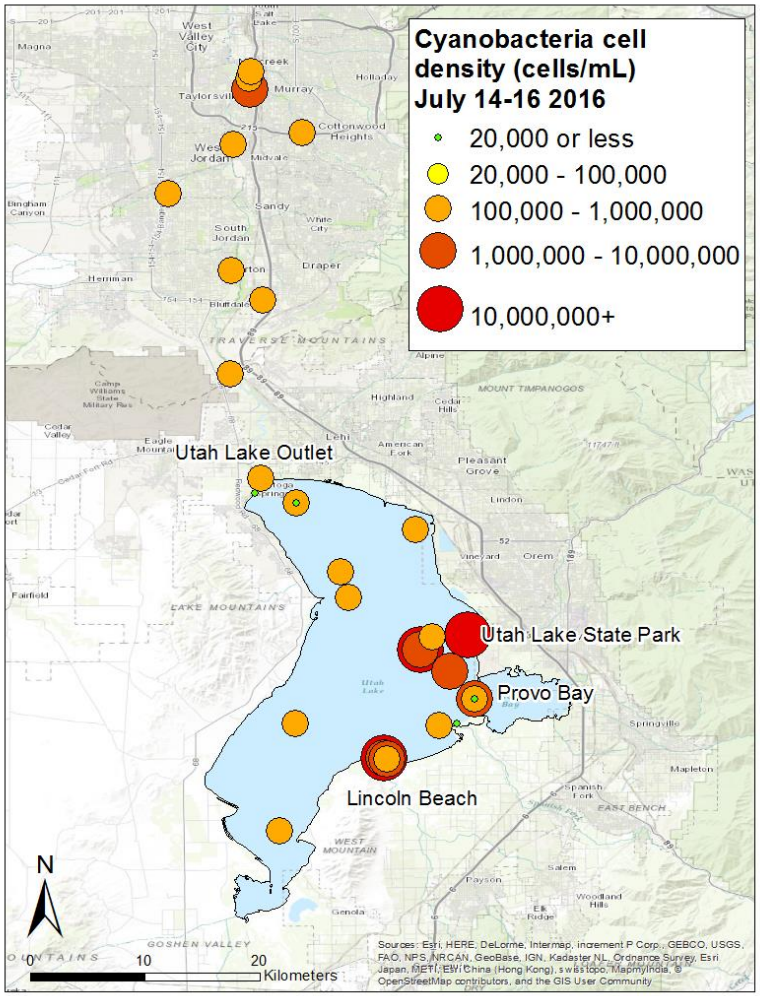
Potential Health Risks Force Closure of Utah Lake from Harmful Algal Bloom
Lab tests confirms a high probability of health risks

SALT LAKE CITY - Public health officials have decided to close Utah Lake, effective immediately, due to a large, harmful algal bloom that may pose a serious health risk to the public and animals. The Utah Department of Health (UDOH) and Utah County Health Department (UCHD) say lab results for samples collected by the Utah Department of Environmental Quality (DEQ) show the concentration of algal cells in the water are three times the threshold for closing a body of water.



Utah Lake and Jordan River Harmful Algae



Utah Lake – Jordan River – Great Salt Lake

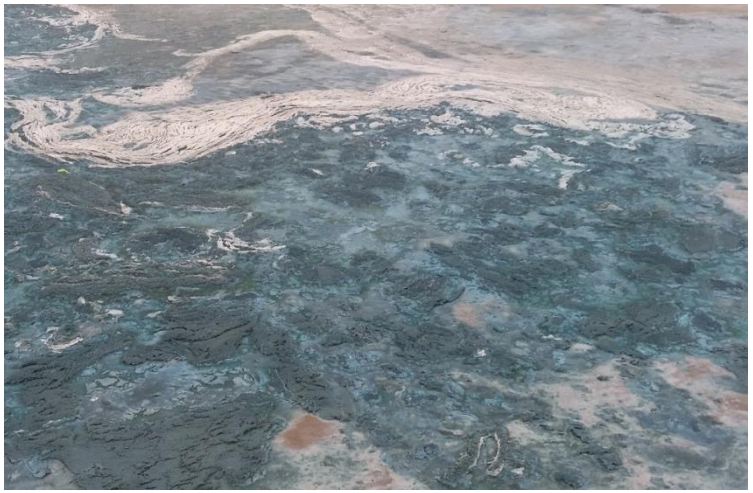
Farmington Bay

Impounded Wetlands

Wetlands and Ponds

Utah Lake

Utah Poison Control Center



636 Reported Calls (As of August 1)		
Human Exposure (504)	81%	Recreated in or exposed to Utah Lake Water
Animal Exposure (27)	4%	14 dogs (8 UT Co., 5 SL Co., 1 WY)
Information only (86)	14%	

31% of cases are symptomatic

Symptoms Reported:

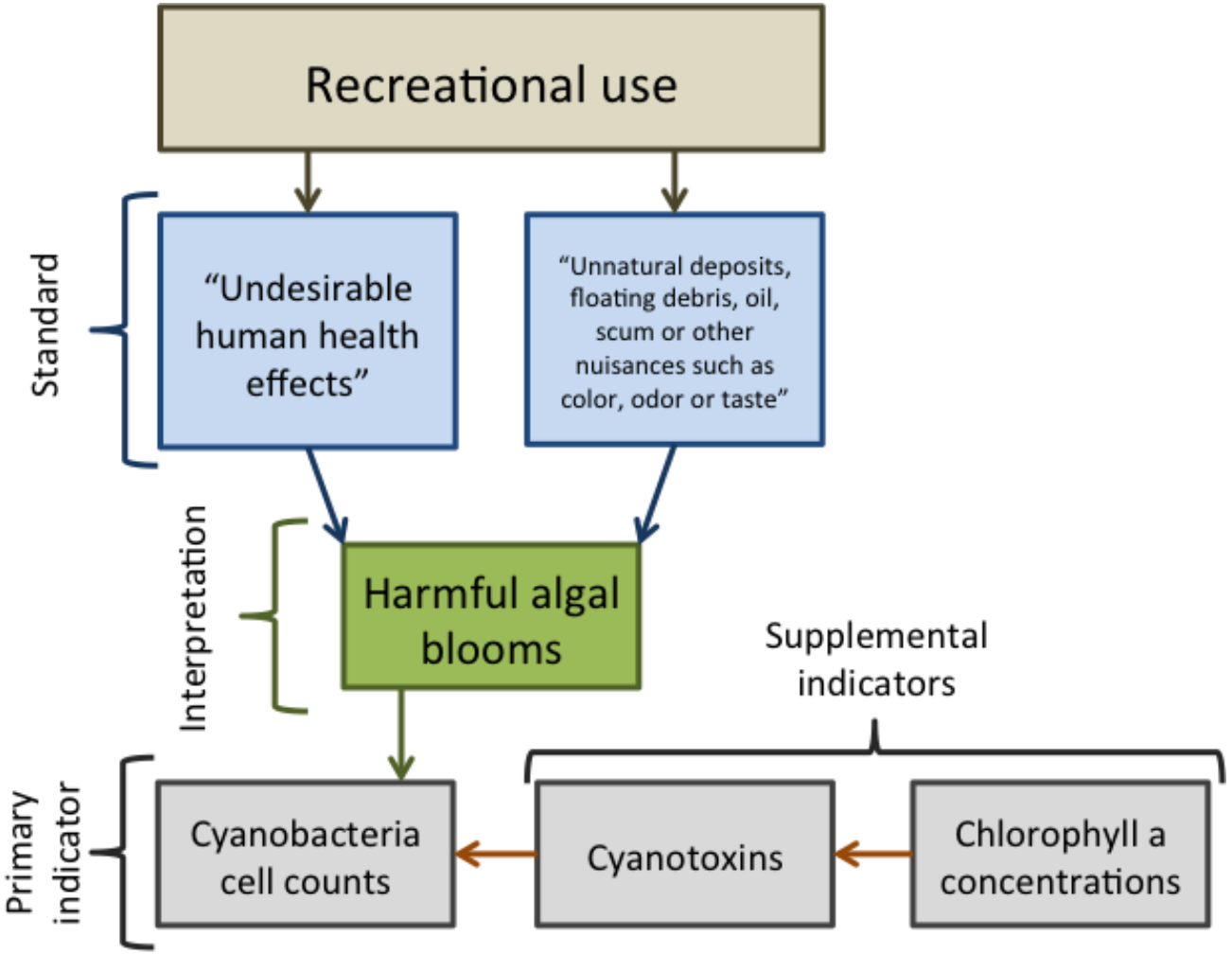
GI: diarrhea, nausea, vomiting, and abdominal pain

Skin: rash and irritation

Neuro: headache, dizziness, drowsiness

Ocular: irritation

Harmful Algal Bloom Assessment Method



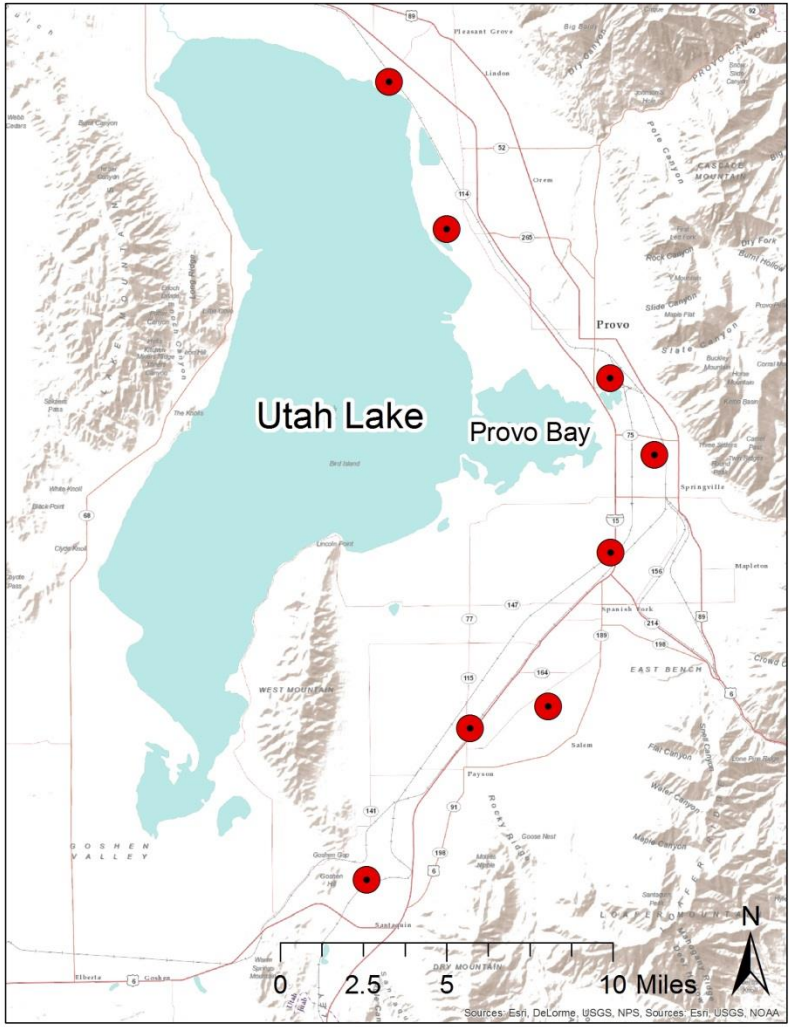
Scientific Consensus on HABs

- Increased nutrient pollution promotes development and persistence of harmful algal blooms
- Large HABs require external sources of nutrients to be sustained
- Reduction of nutrient inputs from watershed sources can significantly reduce HAB frequency and magnitude
- Important to distinguish green algae from harmful algal bloom
- Conditions for blooms: Nutrients, warm temperatures, clear water, stagnant conditions
- Need better monitoring, prediction, an analytical tools

Satellite Imagery: July 12 2016

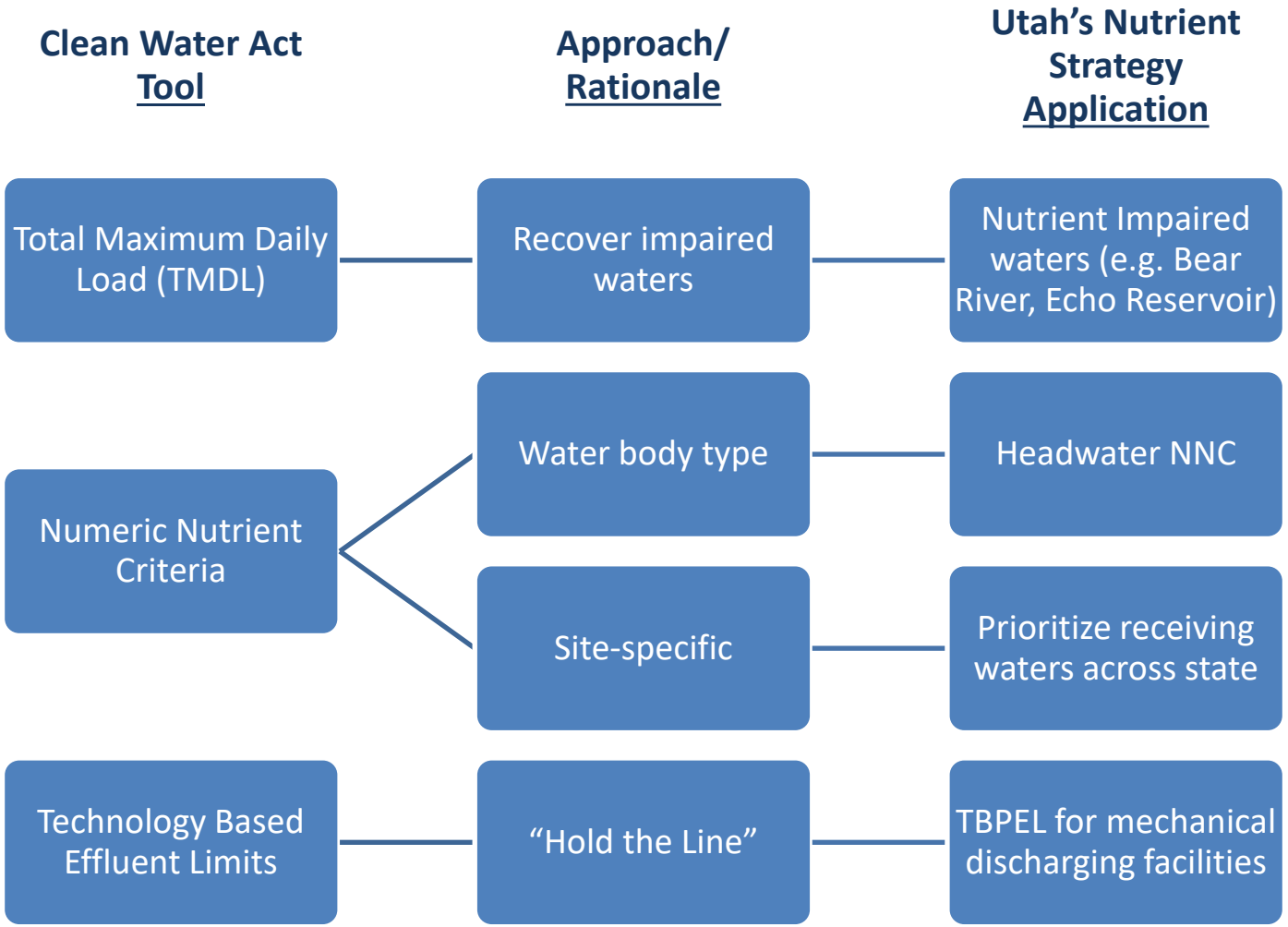
Heisler et al., 2008. *Eutrophication and harmful algal blooms: A scientific consensus*

Nutrient Loading – Point Sources



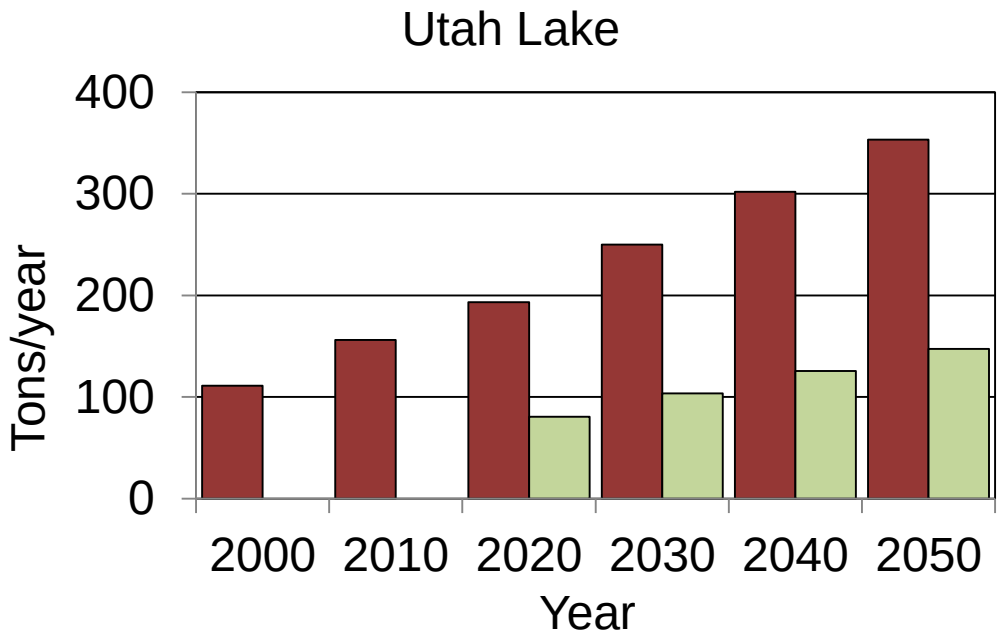
POTW Phosphorus Loads (75% of total)
2004 (TMDL): 227 tons/year
2016 (DWQ): 162 tons/year
2016 (Merritt): 215 tons/year

Utah's Adaptive Nutrient Reduction Strategy



Utah's Proposed Technology-based Phosphorus Effluent Limit Rule

- Require mechanical wastewater plants to meet 1 mg/L
- Establish a maximum ceiling of lagoon systems
- Variance options to accommodate unique facility circumstances
- Monitoring requirements
- $24 million capital cost



Evolution of Utah's Wastewater Treatment

Sewage Farm – early 1900s

First Treatment Systems – 1950s and 1960s

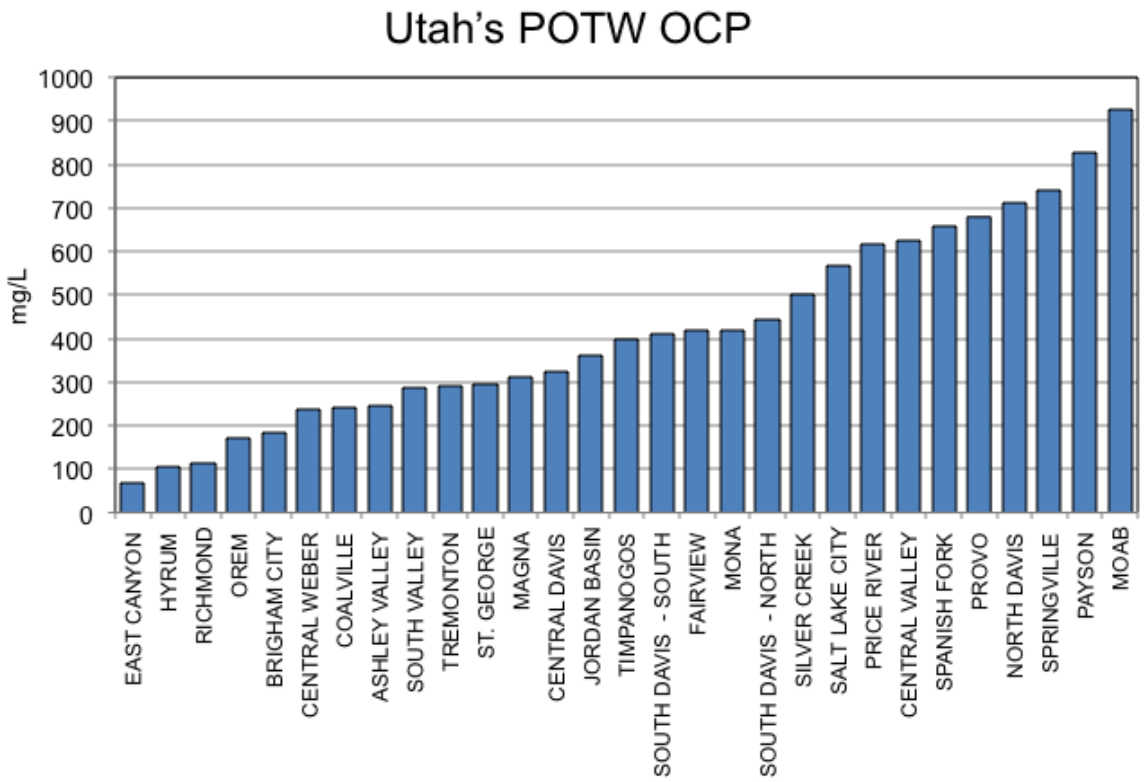
Regionalization and Secondary Treatment – 1970s

Advanced Treatment – 2000s

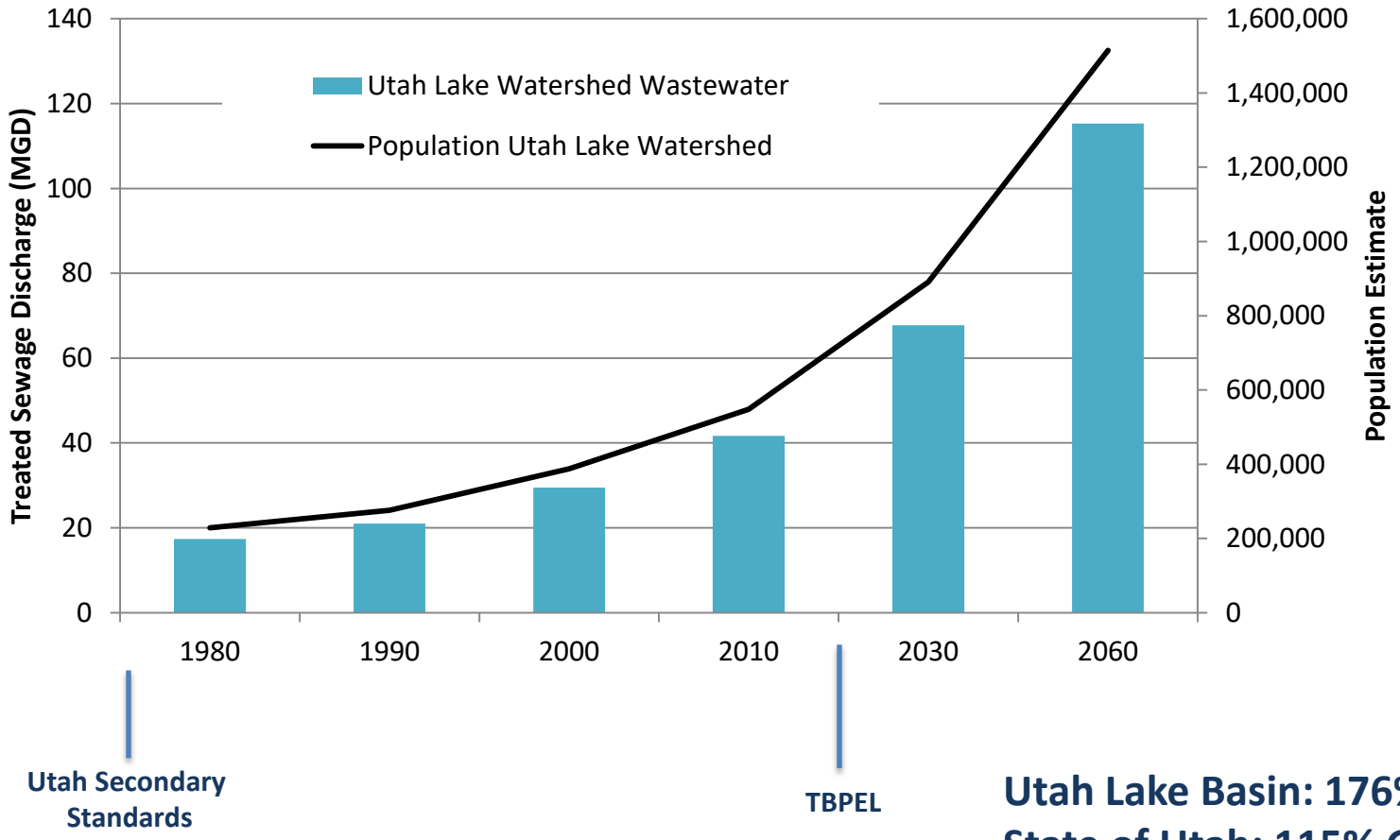
Wastewater Treatment Infrastructure

Wastewater Effluent Parameters

- Pathogens
- Biological Oxygen Demand (BOD)
- Total Suspended Solids
- Ammonia
- Nitrate
- Total Phosphorus



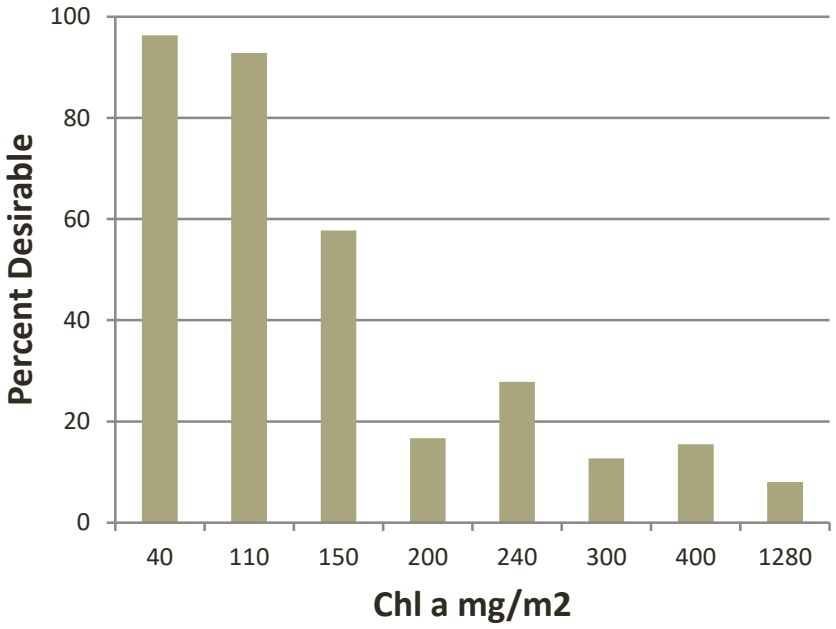
Population Growth

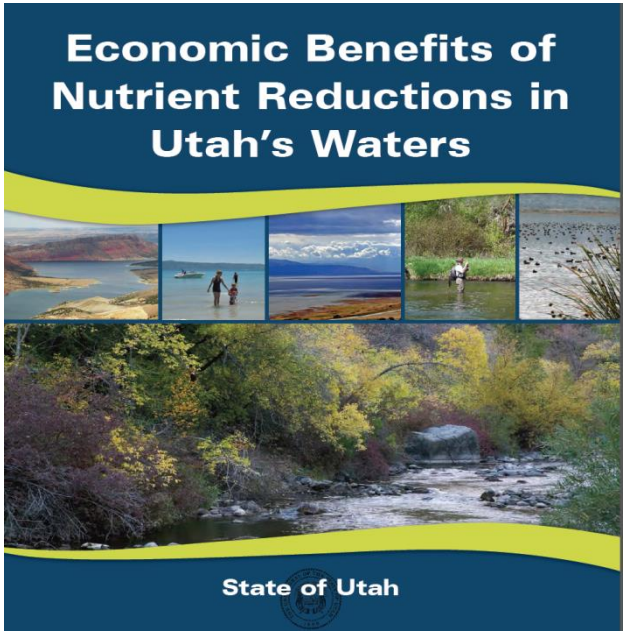


Utah Lake Basin: 176% Growth
State of Utah: 115% Growth

Public Interest in Nutrient Reduction (2013)

- 97% of Utah households surveyed agree that it is important to maintain water quality for future generations
- Utahns are willing to spend $8 to $32/month to protect and improve waters that are threatened by increasing levels of nutrients
- Utahns spend about $1.4 to $2.4 billion a year on water-based recreation activities

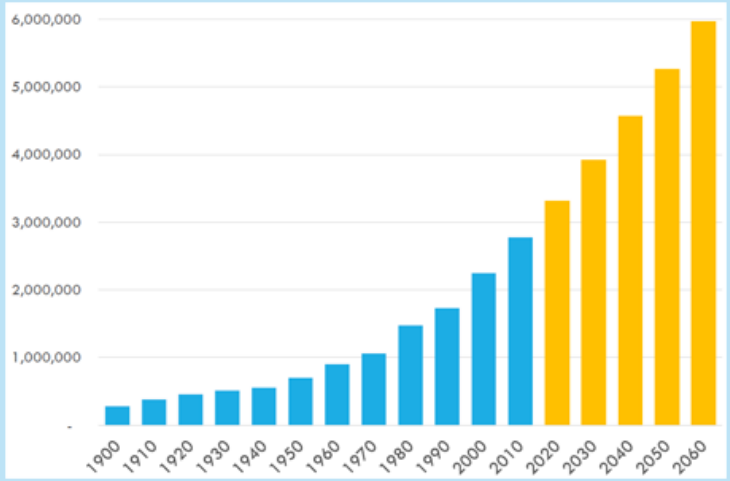




Need for Investment to accommodate growth and preserve Utah's Quality of Life

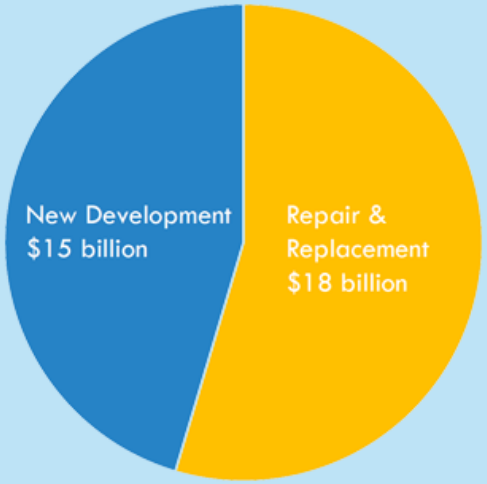
STATEWIDE WATER INFRASTRUCTURE PLAN

TO SUPPORT OUR GROWING POPULATION



*Utah's population is expected to double by the year 2060

WE NEED $33 BILLION THROUGH 2060



*These costs assume that Utah's population will meet statewide conservation goals

This effort is considering only municipal and industrial water needs for Utah. It includes estimated infrastructure needs projections for all levels of agencies, including those of cities, counties, districts, and the state. Other water-related needs such as storm and waste water infrastructure and agricultural demands are not quantified in this analysis.

Urban Water Cycle

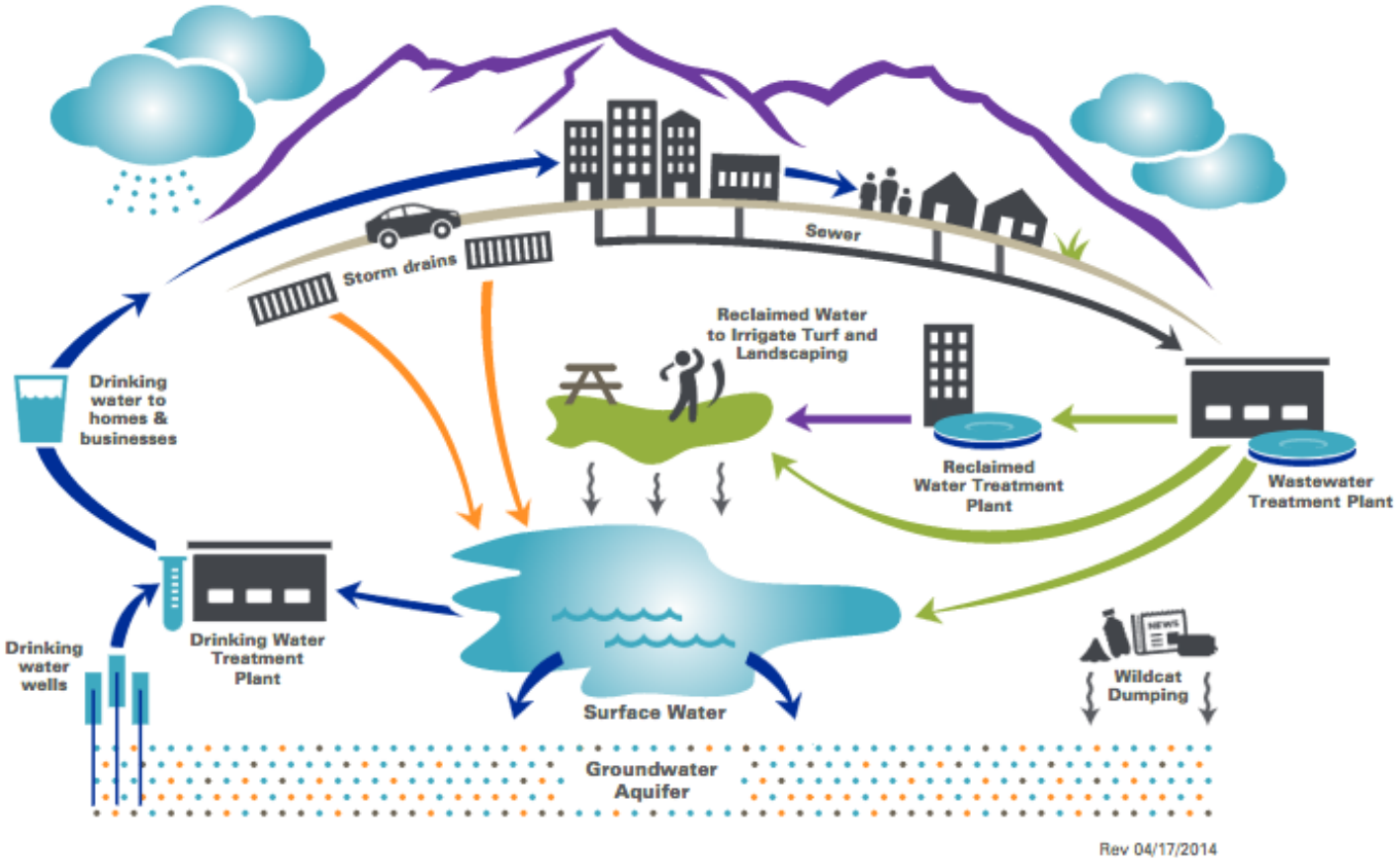
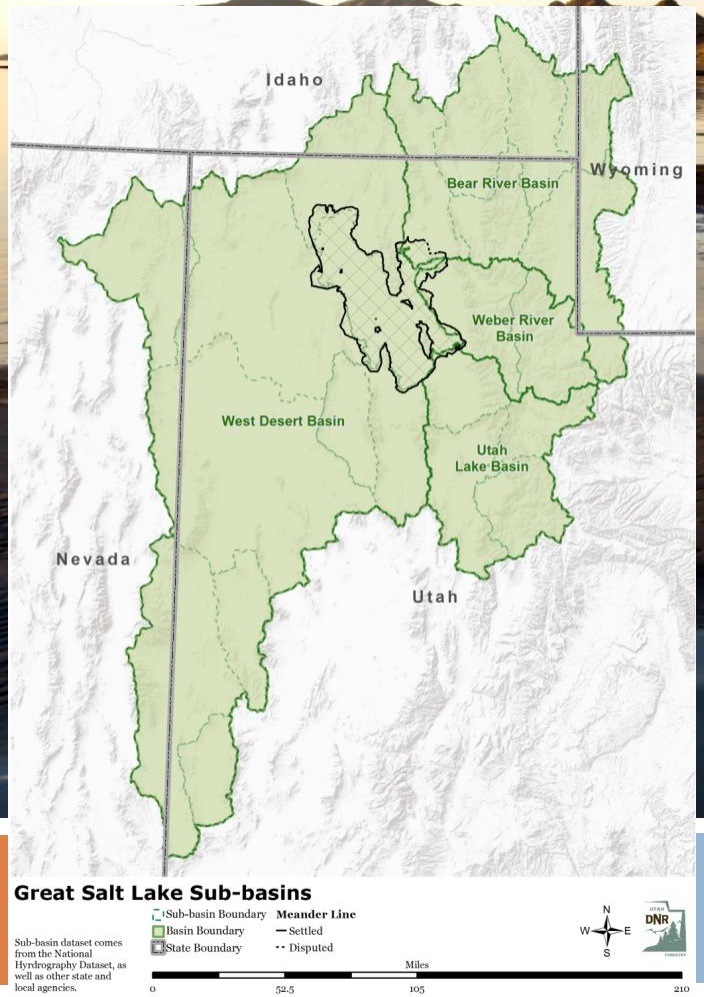


Figure credit: Tucson Water, tucsonaz.gov/water

Questions

Great Salt Lake continues to provide recreational, ecological and economic benefits for current and future generations



Fourth largest terminal lake in the world

Ultimately receives 78% of Utah's wastewater

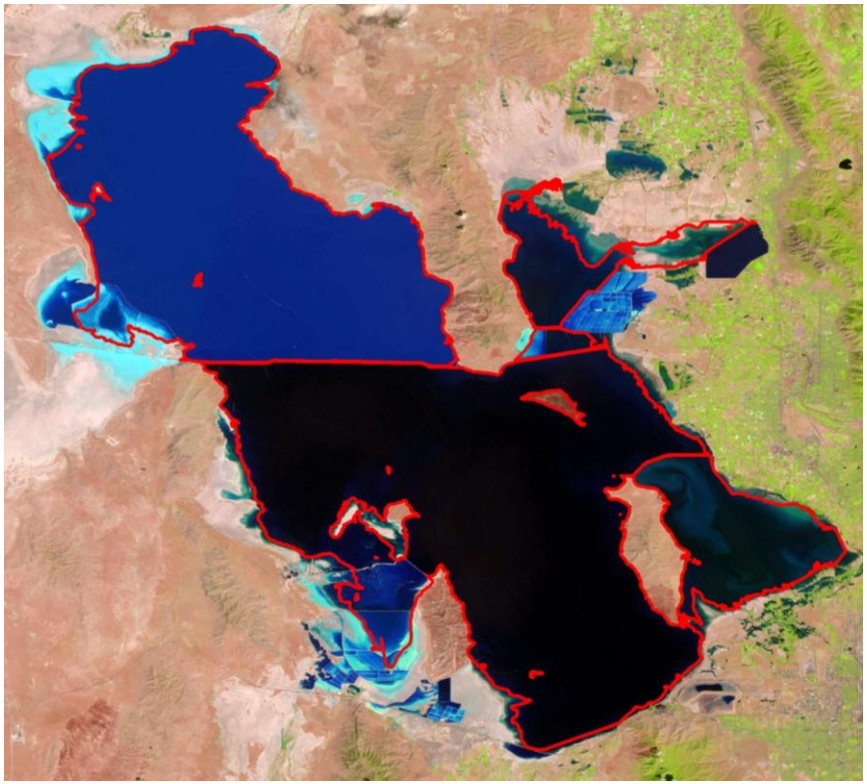
Contributes $1.3 billion to Utah's economy

Migratory bird habitat of hemispheric importance

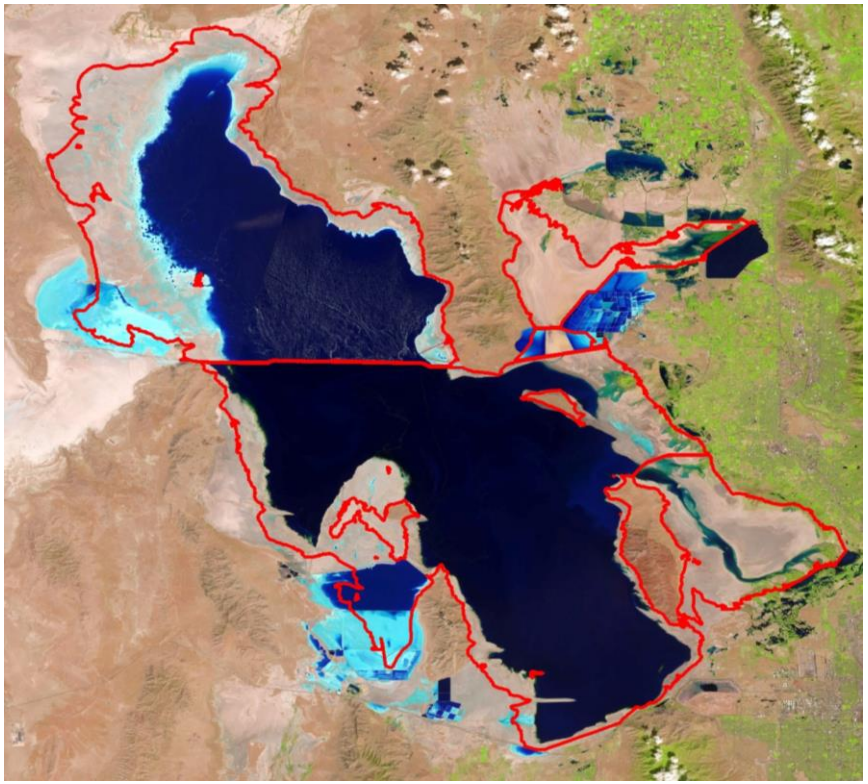
Photo courtesy of Charles Uibel, greatsaltlakephotos.com

Water Level Impacts on Water Quality

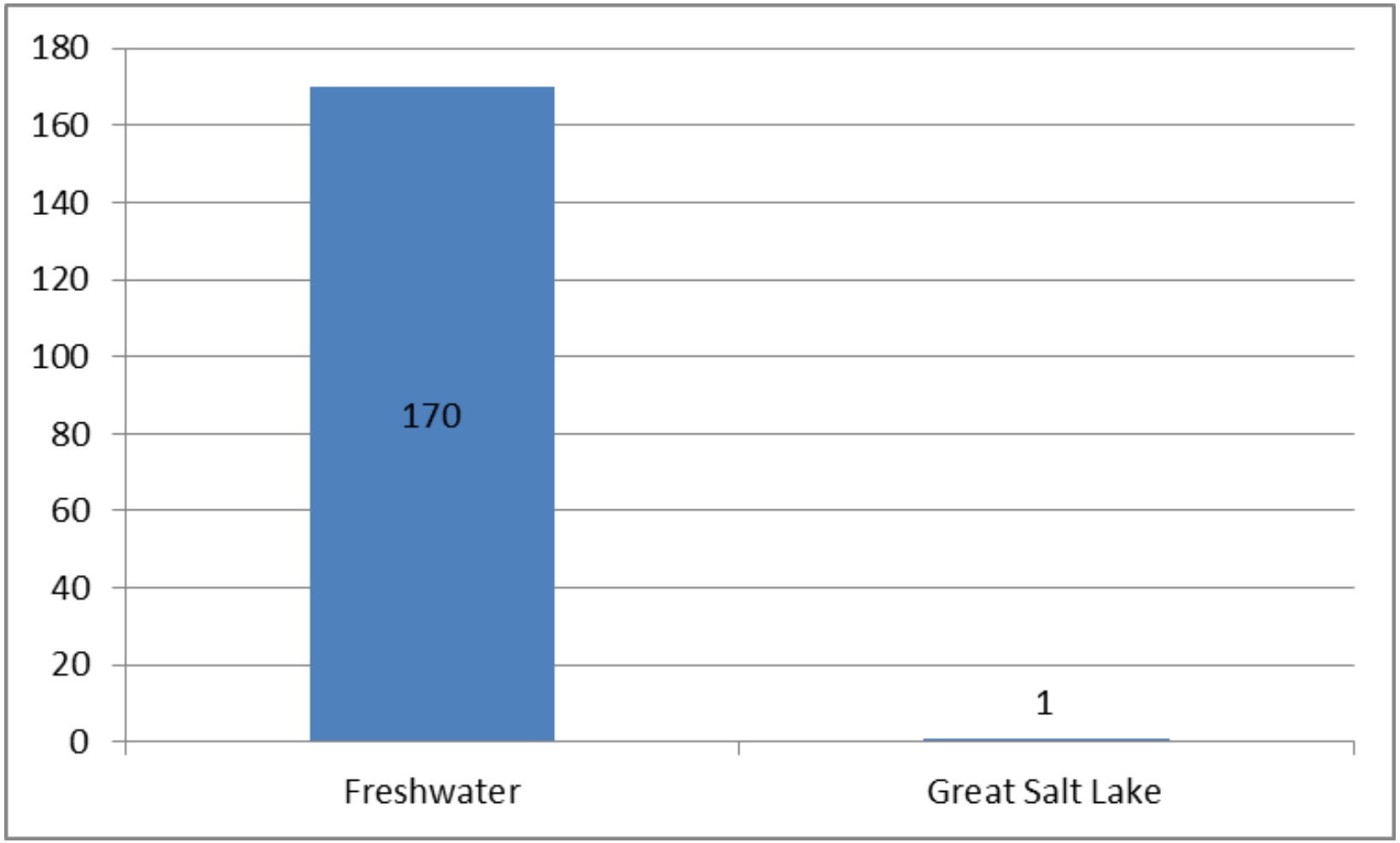
September 2000
Lake Elevation 4201 ft



September 2016
Lake Elevation 4192 ft

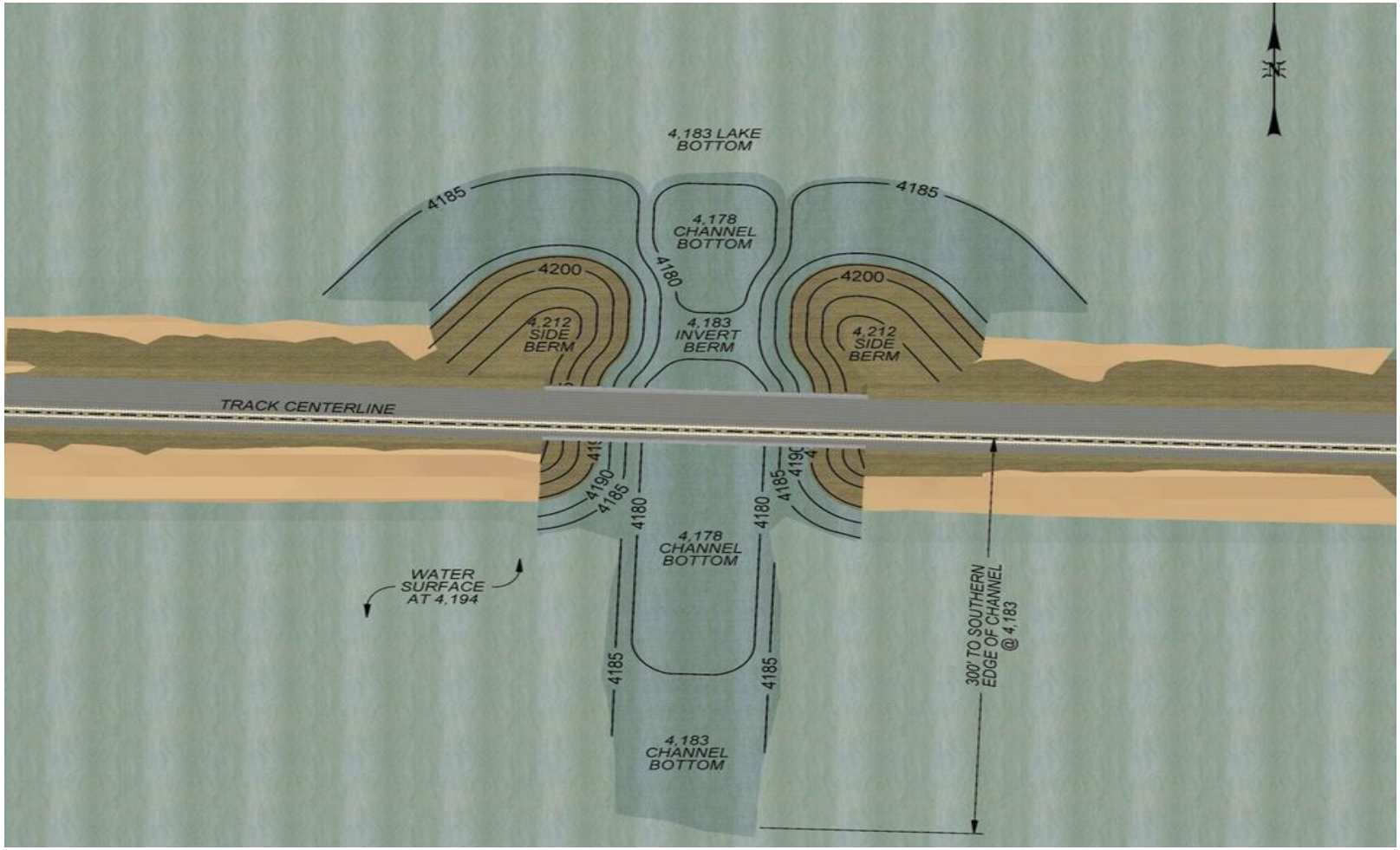


Number of Pollutants with numeric criteria



Great Salt Lake Water Quality Strategy

Great Salt Lake Causeway



Farmington Bay Harmful Algae