Utah Water Quality Task Force Meeting
Minutes

October 20th, 2016 9:30-11:30
Utah Division of Water Quality
195 N. 1950 W.
Salt Lake City, Utah

Attendance

Name	Representing
Jim Bowcutt	DEQ/DWQ
Alan Clark	DNR
Carl Adams	DEQ/DWQ
Norm Evenstad	NRCS
Krissy Wilson	UDWR
Gary Kleeman	EPA
Ellen Bailey	USU
Paul Dremann	Trout Unlimited
Jay Olsen	UDAF
Diane Menuz	DNR/UGS
Walt Baker	DEQ/DWQ
Chris Kane	UACD
Kevin Okleberry	DEQ/DWQ
Bracken Davis	UDAF
Jodi Gardberg	DEQ/DWQ
Erica Gaddis	DEQ/DWQ
Bill Zannotti	UFFSL
Rhonda Miller	USU Extension
Ben Holcomb	DEQ/DWQ

Walt Baker (DEQ/DWQ)- Welcome and Introductions

Ben Holcomb (DEQ/DWQ)- Algal Blooms in Utah (see presentation)

- Algal blooms whether they are toxic or not can cause oxygen issues, and the toxins can cascade down the food chain.
- It has been documented that harmful algal blooms can result in social and economic impacts around the U.S. This has been observed as well with the Utah Lake algal bloom.
- One of the best ways to protect the public from algal blooms is to educate them. We can do better on this here in Utah.

- There are different types of algae. They all have different toxins that can vary in severity and longevity in the aquatic system effected by them. Livestock, people, and pets all react to these algae differently.

- Aphorizomenon was the type of algae found most abundantly in Utah lake. Nodularia is they type found in Farmington Bay.

- Depending on the amount of toxic algae found in the system different actions must be taken. More than 20,000 will require signage to be erected, more than 100,000 will require a warning sign, and more than 10,000,000 a closure of that waterbody will be considered.

- Harmful Algal Blooms (HABs) can be reported on the DEQ spill line 801-536-4123.

- Many of the Utah Lake samples came back as nontoxic, but poison control was contacted in various instances with people reporting symptoms similar to those you would see from toxic algal blooms after recreating in Utah Lake.

- There are still a lot of unanswered questions about impacts of algal blooms one of which is the impacts of secondary water use.

- The Scofield bloom resulted in a fish kill, mostly chubs. This was as a result of toxins, not low oxygen levels. Bat and waterfowl deaths were also reported during this time period, though there is no evidence that these deaths were linked to the algal blooms.

- DWQ needs to collaborate better with DWR in bloom sites, especially if there are mortalities in the wildlife using that waterbody.

- DEQ does not have a budget to address HABS, and neither do the health departments. DEQ is currently looking at how they can obtain additional funding to deal with the blooms. This includes the funding needed for additional monitoring and safety equipment.

- Predicting blooms and stopping them from occurring are two different issues.

- USU Water Quality Extension will be helping out with bloom identification next year.

- There is a water quality health advisory panel that will meet in November/December to talk about what happened last summer and what we will be doing moving forward.

Diane Menuz (UGS)-Water Quality Improvement Function Assessment (See presentation)

- UGS has been doing a study looking at wetland conditions and their role in water quality. They have been using the state protocol and using Washington State's protocol mainly.

- They are looking at vegetation, hydrology, soil type, and loading rate.

- A checklist was developed for evaluation (See the attached document). This is a binary checklist and is meant to be more of a rapid assessment.

- Once the data is collected an estimate will be done to show wetlands and identify wetlands that can be improved and possibly mapped.

Kevin Okleberry (DEQ/DWQ)- Tibble fork Dam spill (See presentation)

- There has always been a lot of mining activity in American Fork Canyon since the 1870's. This has been a water quality concern for quite some time now.

- Tibble fork Dam is currently being upgraded to become more seismically stable, and to be able to double the storage capacity of the reservoir. This construction should be completed by mid-December of 2016.

- To make these repairs a drawdown was required, and during this drawdown approximately 8700 cubic yards of sediment was discharged from the reservoir resulting in a fish kill of approximately 5,250 trout.

- Monitoring sites have been established above and below the reservoir to document the impact of the spill. It was monitored very heavily for two weeks after the spill.

- There were a few days that showed an exceedance of metals for recreational use below the dam, but not as many as were expected. However, there were issues with the aquatic life use. This prompted an NOV to the North Utah County Water Conservancy District, but DWQ has not received a response regarding this NOV.

- DWR will work with DEQ to determine the amount of the fine that will be imposed and what should or could be restored.

Jim Bowcutt (DEQ/DWQ)- NPS Programmatic Update

- The National NPS Monitoring Conference was a success. Over 180 people attended, and it got great reviews. Thanks for the funding that was used to help sponsor that meeting.

- The Nonpoint Source MOU has been received from all agencies. DEQ is now waiting for final approval from all participating agencies, and will be going out for signature in the next month or two.

- Jim is currently beginning to work on the 2016 Annual report. He will be contacting each agency for information in the next month or two.

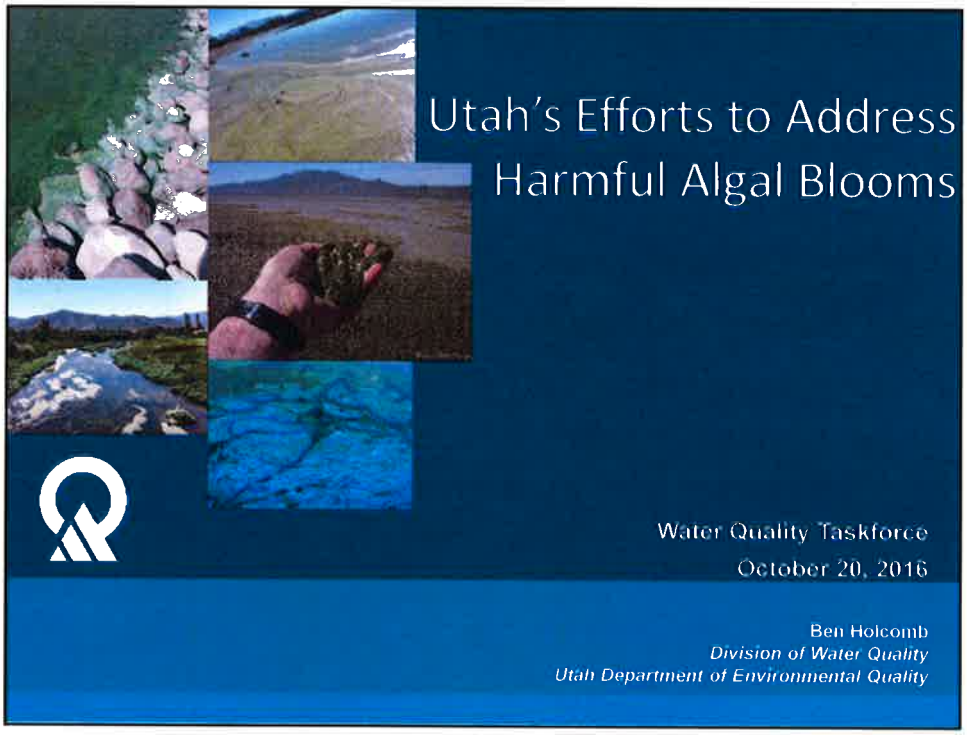
Additional Items of Discussion

- Next Meeting will be held on January 19th at the DWQ office.

- Topics for the next meeting:
    - Summary of WRI program
    - Water Report and anticipated snow pack
    - Snowbird expansion and Gold King Mine Issues
    - Working with abandoned mines

- UACD will be having a District supervisor Training in January for the Local Conservation Districts.
- The Millsite Dam project will start in July and should be completed by April of 2019.

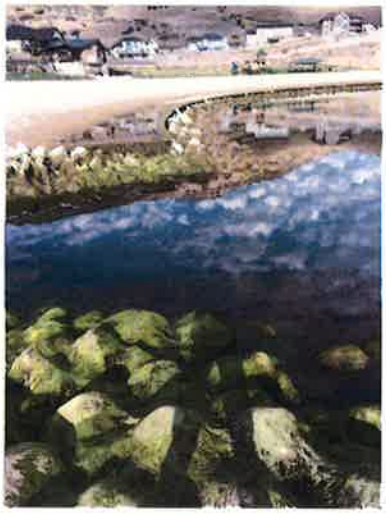
test



What's the Problem?

- Affects drinking water
- Impacts recreation
- Disrupts aquatic life food webs
- Social and Economic despair

Haven't we always seen this stuff?



Visual Assemblage

2016 cHABs in Utah Waters

Ksl.com

- Blackridge Reservoir
- Mantua Reservoir
- Payson Lakes (n=4)
- Scofield Reservoir
- Utah Lake
- Farmington Bay
- Upper Box Cr. Reservoir

Cast of Characters: Cyanobacteria and their toxins (cyanotoxins)

Liver, nerve, or skin toxins
Selectively produced by many genera but not very predictable
Widely distributed but not often at acutely toxic levels
Analyses are available for some *but not all* of these toxins

Dolichospermum (Anabaena)
-Microcystins (liver)
-Anatoxin-a/a(s) (nerve)
-Saxitoxins (nerve)

Microcystis
-Microcystins (liver)
-Toxin is most common and easily measured
-100 congeners

Cylindrospermopsis
-Cylindrospermopsins (liver)
-Saxitoxins (nerve)
-Benthic/epiphytic rather than planktonic

Nodularia
- Nodularins (liver)
- Found in brackish water including bays of Great Salt Lake

Aphanizomenon
-Anatoxins (nerve)
-Cylindrospermopsins (liver)
-Saxitoxins (nerve)

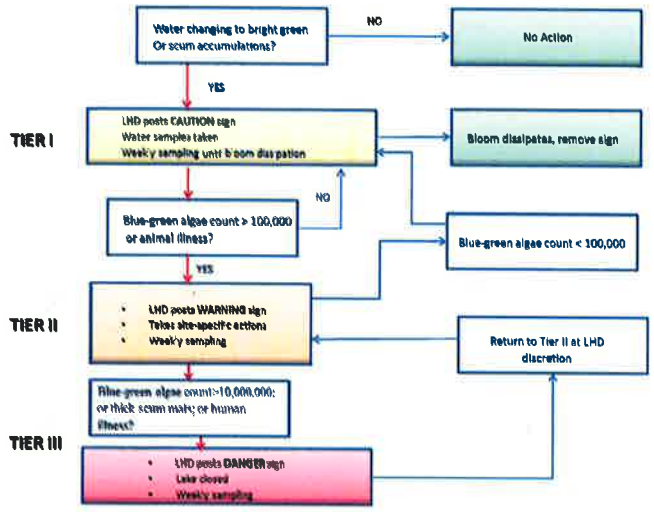
Types of Analysis

- Species Identification and cyanobacteria cell count concentrations – Rushforth Phycology
  - 24 to 48 hour turn around time
- Cyanotoxin pre-screening test strips –
  - Day of sampling
  - Limited to cylindrospermopsins, microcystins and anatoxin-a (not saxitoxins)
  - Limited to various screening levels– recreation values set at >10 ug/L
- Cyanotoxin analysis – GreenWater Lab and EPA R8
  - 48 to 96 hour turn around time at best; 1 week is more likely
  - ELISA and LC/MS/MS results and costs vary
  - Differences in capacity, result ranges, and sample submission
  - Fundamental response that States require from this level of analysis– Is the sample 11 ug/L or 60,000 ug/L microcystin?

UDEQ/UDOH Guidelines for HABs

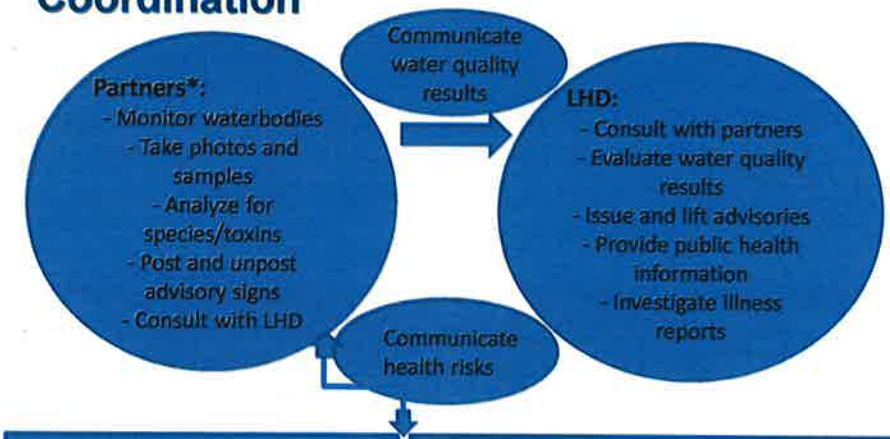
Toxin Producing Blue-green algae Cell Density (cells/mL)	Health Risks	Action Recommended	Microcystin Concentrations (µg/L)	Relative Probability of Acute Health Risk
<20,000	Negligible	None	<4	Low
20,000-100,000	Short-term effects e.g. skin irritation, gastrointestinal illness	Issue caution advisory; Post **CAUTION** sign; Weekly sampling recommended	4-20	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	20-20,000	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**	>2,000	Very High

HAB Decision-making Algorithm



Division of Water Quality

Coordination



Potential exposure groups:
Pets/pet owners, Property owners
Recreational Users, Water systems
customers

Interested groups:
Advocacy groups Business owners Interested citizens
Legislatures Local governments Medical providers
Regulatory agencies Researchers Veterinarians

Thanks OR DOH

Division of Water Quality

Coordination

- Partners:

UDEQ: DWQ/DDW, UDNR, Local Health Departments, UT Poison Control, UDAF, UDEM, Water Conservancy Districts, US EPA and NOAA, USFWS, Rushforth Phycology, Universities, volunteer monitors and more to come…

Develop inter-agency coordination process

- Local Health Departments are the lead
- All relevant agencies should be notified
- Public Notification Process

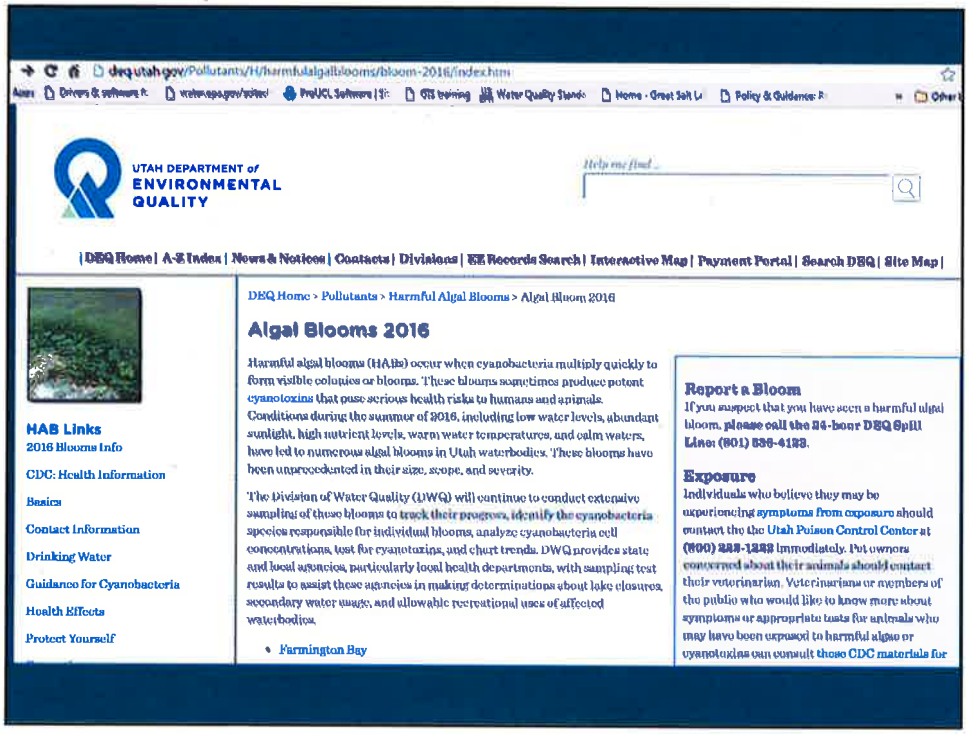
Outreach: Contact and Websites

DEQ 24-hour Spill Line: 801.536.4123

Utah Poison Control Center: 1.800.222.1222

DEQ website:
HABS.UTAH.GOV

UT Department of Health:
http://health.utah.gov/enviroepi/appletree/HAB


deq.utah.gov/Pollutants/H/harmfulalgalblooms/bloom-2016/index.htm
UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
Help me find ...
| DEQ Home | A-Z Index | News & Notices | Contacts | Divisions | EE Records Search | Interactive Map | Payment Portal | Search DEQ | Site Map |
HAB Links
2016 Blooms Info
CDC: Health Information
Basics
Contact Information
Drinking Water
Guidance for Cyanobacteria
Health Effects
Protect Yourself
DEQ Home > Pollutants > Harmful Algal Blooms > Algal Bloom 2016
Algal Blooms 2016
Harmful algal blooms (HABs) occur when cyanobacteria multiply quickly to form visible colonies or blooms. These blooms sometimes produce potent cyanotoxins that pose serious health risks to humans and animals. Conditions during the summer of 2016, including low water levels, abundant sunlight, high nutrient levels, warm water temperatures, and calm waters, have led to numerous algal blooms in Utah waterbodies. These blooms have been unprecedented in their size, scope, and severity.
The Division of Water Quality (DWQ) will continue to conduct extensive sampling of these blooms to track their progress, identify the cyanobacteria species responsible for individual blooms, analyze cyanobacteria cell concentrations, test for cyanotoxins, and chart trends. DWQ provides state and local agencies, particularly local health departments, with sampling test results to assist these agencies in making determinations about lake closures, secondary water usage, and allowable recreational uses of affected waterbodies.
Farmington Bay
Report a Bloom
If you suspect that you have seen a harmful algal bloom, please call the 24-hour DEQ Spill Line: (801) 536-4123.
Exposure
Individuals who believe they may be experiencing symptoms from exposure should contact the the Utah Poison Control Center at (800) 222-1222 immediately. Pet owners concerned about their animals should contact their veterinarian. Veterinarians or members of the public who would like to know more about symptoms or appropriate tests for animals who may have been exposed to harmful algae or cyanotoxins can consult these CDC materials for


Utah Lake 2016
Division of Water Quality

Utah Lake 2016

Division of Water Quality

Utah Lake Closure

Department of Environmental Quality

Utah County Health Department

NEWS RELEASE
July13, 2016

CONTACT
Donna Kemp Spangler
Communications Director
Office: 801-536-4434
Cell: 801-324-4944

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.

DANGER

LAKE CLOSED
due to toxic algae

KEEP OUT OF LAKE

Call your doctor or veterinarian if you or your animals have sudden or unexplained sickness or signs of poisoning.

Division of Water Quality

Timeline

July 13	July 14	July 15	July 16	July 17	July 18	July 19
•Bloom reported to DWQ •Large algal mats observed between Provo Bay and Utah Lake State Park •First samples collected	•DWQ collected additional phytoplankton and toxin samples for analysis •Large visible mats observed on July 13 had been blown to southside shores •Aphanizomenon samples > 10,000,000 cells per mL were confirmed	•Utah Lake closure issued by Utah County Health Department and Department of Health •UDAF advisory issued •Samples collected at public access locations, Utah Lake Outlet ,and Jordan Narrows •Aerial survey	•Aerial survey showed algal scum moving into Jordan River •Algae scums redeveloping in public access locations •Utah Poison Control reports illnesses related to HAB exposure	•Jordan River samples >700,000 cells/mL Aphanizomenon •Salt Lake County Health Department posts "Warning" signs	•Several municipalities shut down secondary water supply •Guidance issued for residential irrigation	•Utah County Jordan River closure issued

Utah Poison Control Center

536 Reported Cases (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

What about irrigation use?

Scofield 2016

Scofield 2016

Scofield 2016

Payson Lakes 2016

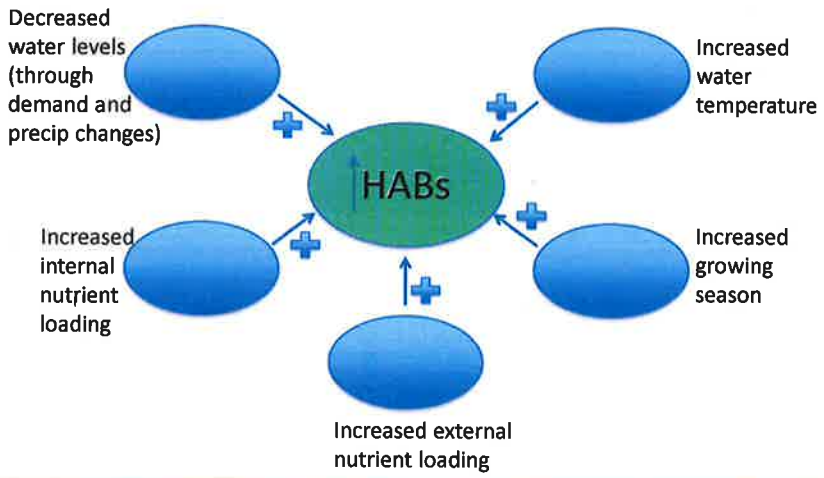
QUESTIONS

Why are the frequency and magnitude of blooms increasing?

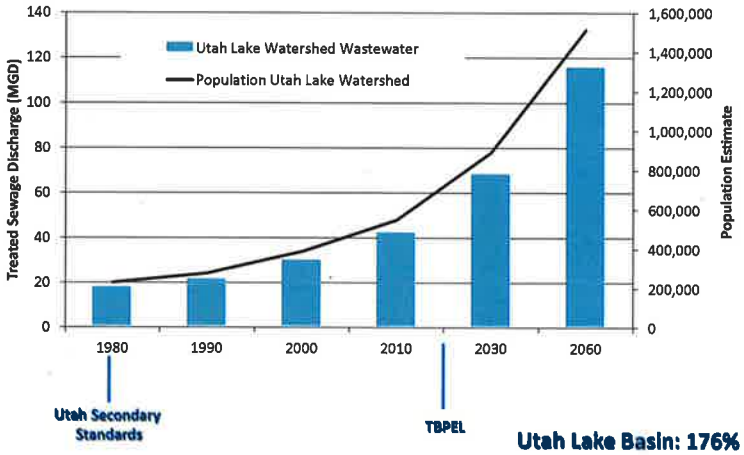
Why are the frequency and magnitude of blooms increasing?

- Excess nutrients (N&P)
- Increasing temperatures

Multiplier effects of temperature & nutrients



Population Growth



Utah Lake Basin: 176% Growth

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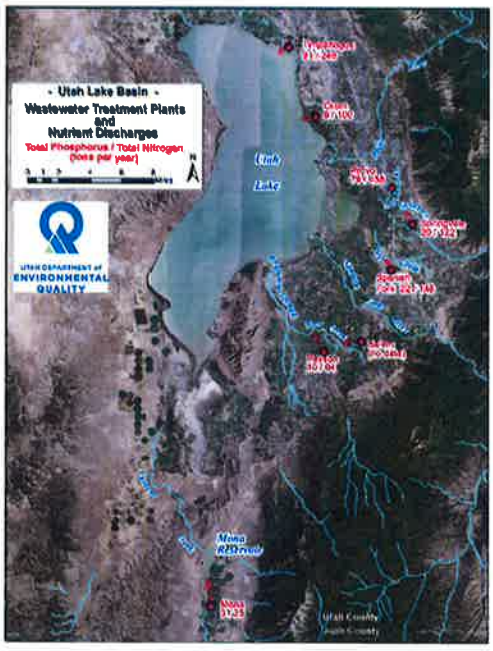
Nutrient Sources

- Publically owned treatment works (POTWs) (largest)
- Stormwater
- Agricultural runoff
- Natural background



Taking Action

What can we do?

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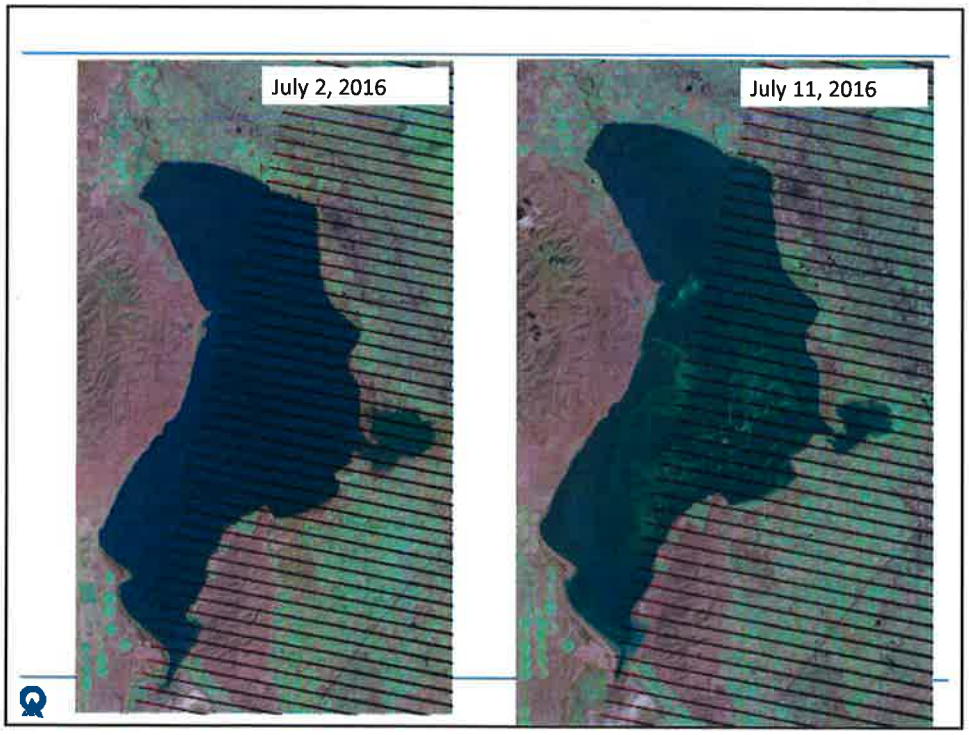

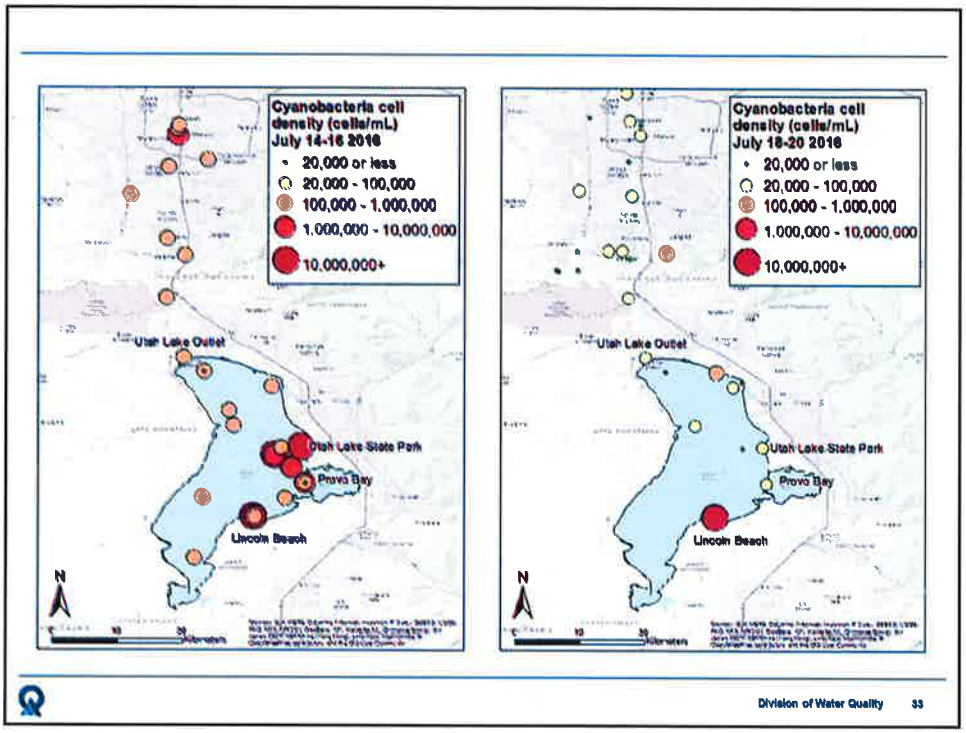
Cyanobacteria cell density (cells/mL) July 14-16 2016
20,000 or less
20,000 - 100,000
100,000 - 1,000,000
1,000,000 - 10,000,000
10,000,000+
Utah Lake Outlet
Utah Lake State Park
Provo Bay
Lincoln Beach
N
Cyanobacteria cell density (cells/mL) July 18-20 2016
20,000 or less
20,000 - 100,000
100,000 - 1,000,000
1,000,000 - 10,000,000
10,000,000+
Utah Lake Outlet
Utah Lake State Park
Provo Bay
Lincoln Beach
N
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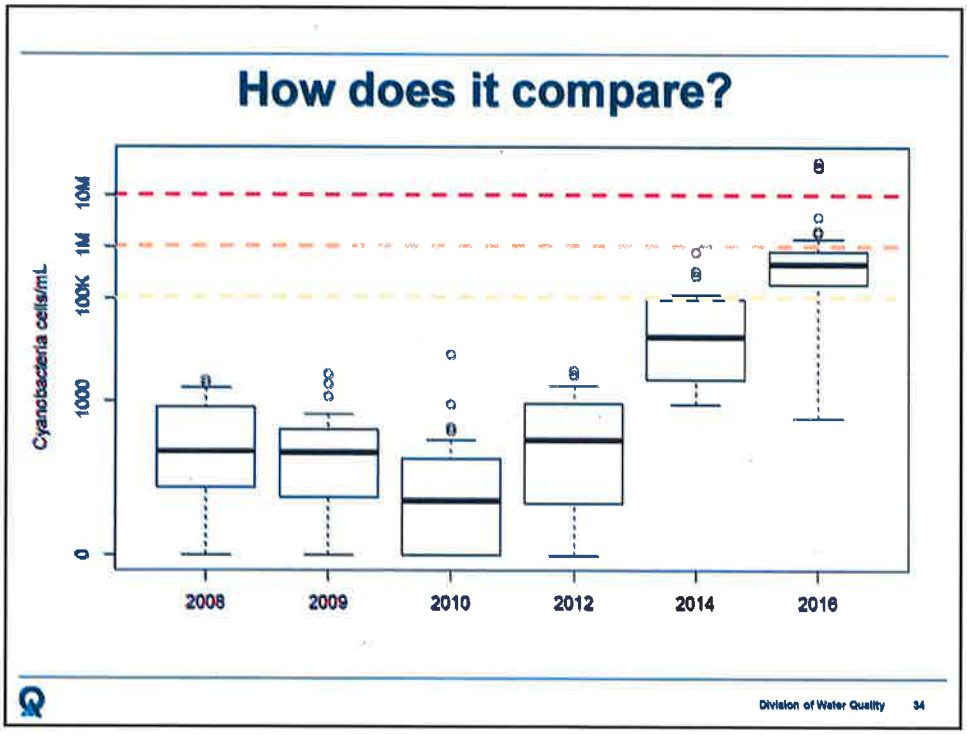
How does it compare?
Cyanobacteria cells/mL
0
1000
100K
1M
10M
2008
2009
2010
2012
2014
2016
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Outreach: HAB Tri-Fold Fact Sheet

Fact Sheet: Harmful Algal Blooms in Utah Lakes

Harmful algal blooms (HABs) are the result of a rapid increase or accumulation of algae on the surface of a water body. Cyanobacteria (or blue-green algae) can flourish and cause blooms in Utah lakes when nutrients, sunlight and temperatures are just right. Some types of blue-green algae can produce toxins which can harm the liver or nervous systems of humans and animals. The algae itself can cause rashes, be irritant with skin, or stomach and lung problems. It is unadvised to eat fish caught in HAB conditions.

How Can I Tell if the Water is Safe?

You may see these blooms on ponds and lakes throughout Utah. They can be a variety of colors, such as fluorescent blue, green, white, red or brown. More than one color may be present. They may look like thick paint floating on the water and frequently give off a foul odor.

The Dos and Don'ts of Harmful Algal Blooms

DON'T swim, water ski or boat in areas where the water is discolored or where you see foam, scum or mats of algae on the water.

DON'T let pets or livestock swim in or drink from areas where the water is discolored or where you see foam, scum or mats of algae on the water.

DON'T let pets lick algae off of their fur.

DO rinse yourself and your pet immediately if there is contact with algae-affected waters.

DO look for beach postings and water quality notices before swimming.

DO get medical treatment right away if you think you, your pet or your livestock might have been poisoned by algal toxins.

Potential Symptoms

Blue-green algae related illness becomes a concern in Utah as the weather warms and people and pets spend more time outside on or near lakes. Illnesses can be caused by toxins produced by the algae or by the algae themselves. Symptoms will vary depending on the type of exposure.

The most common exposure for people is skin contact with scum or water containing algae cells or toxins.

HAB-Related Skin Rash

People may also inhale tiny droplets of water containing toxins or cells; this is most common when people are water skiing, wakeboarding, etc.

The most common exposure for animals is ingesting water with toxins or algal cells.

Common Human Symptoms include:

Sore throat, congestion, cough, wheezing, eye irritation, rash, blistering, abdominal pain, headache, vomiting and diarrhea.

Common Animal Symptoms include:

Vomiting, lethargy, diarrhea, convulsions, difficulty breathing and general weakness.

If you need urgent information related to a suspected algal exposure, call the
Utah Poison Control Center:
1-800-222-1222.

For more information: [UDEQ content/webpage; UDOH content/webpage]

What else can we do?

WQ monitoring & assessments

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Lake Assessment Guidance

Recreational Use Support

Beneficial Use Supported:

- The beneficial use is supported if cyanobacteria cell counts <20,000 cells/mL.

Beneficial Use Not Supported:

- The beneficial use is not supported if the cyanobacteria cell count exceeds 100,000 cells/mL for more than one sampling event or other narrative indicators (e.g., phycocyanin, chlorophyll-a, HAB beach warnings, suggest recreational uses are not being attained).

Insufficient Data and Information

- The waterbody will be categorized 3A if there is one exceedance >20,000 cells/mL. These waterbodies will be prioritized for further evaluation with respective public health managing partners such as the State Health Department and State Parks Departments.

Monitoring: Utah's Vulnerable Waters

A significant proportion of surface acres in Utah have excess nutrients; some of these waters are sources of drinking water and/or have high uses of recreation.

Affects in-state tourism and water-based recreational uses, such as fishing and boating–recently estimated at $2.4B/year in UT.

Improving water quality could see the recreational value increase by $48M/year.

Monitoring: Utah's Vulnerable Waters

Drinking water sources
High-use recreational water

	Drinking water sources	State Parks	Other high recreation uses
Reservoirs			
Historic elevated cyanobacteria concentrations	11	16	2
Nutrient related impairments	4	9	2
Completed TMDLs	1	5	1
Streams			
Historic elevated cyanobacteria concentrations	5	1	1
Nutrient related impairments	2	1	0
Completed TMDLs	0	1	0

Monitoring: Utah's Vulnerable Waters

Increase monitoring of most vulnerable waters

- Coordination with Division of Drinking Water, State Parks, Water Conservancy Districts, District Engineers, and Local Health Departments.
- DWQ and partners have scopes and trained staff to provide initial screen at select locations (via NOAA pilot program)
- Targeted core areas to receive more frequent monitoring: Utah Lake, Pineview/East Canyon, Scofield Reservoirs

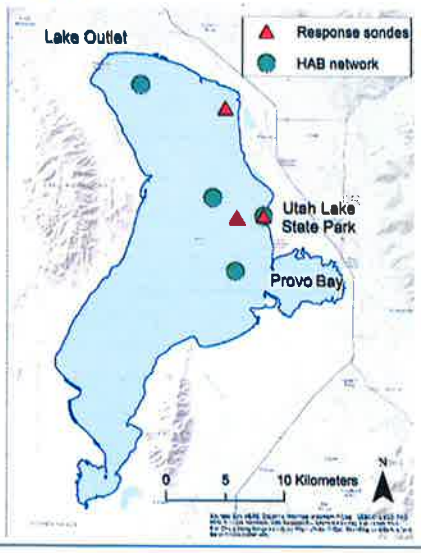
Monitoring: Utah's Vulnerable Waters

Target Drinking Water and High Recreational Use Waterbodies

- EPA Region 8 providing monthly cyanotoxin testing at Utah Lake
- EPA and NOAA providing bloom-event toxin testing as needed
- Prioritizing high-frequency data collection at Utah Lake, Scofield, & Farmington Bay– USGS-CYAN Project

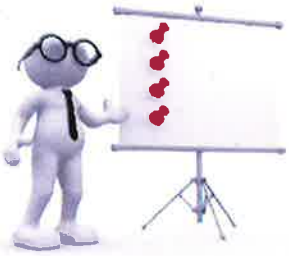
HAB Monitoring Network

- Utah Water Quality Board Funding - $100,000
  - 3 Open water buoys
  - YSI sondes (dissolved oxygen, pH, temperature, specific conductivity, chlorophyll a, phycocyanin)
  - Telemetered real-time data linked to publicly available I-Utah network.
  - Water chemistry and phytoplankton sampling



Developing Numeric Nutrient Criteria

National goal for state's to develop statewide standards or site-specific standards

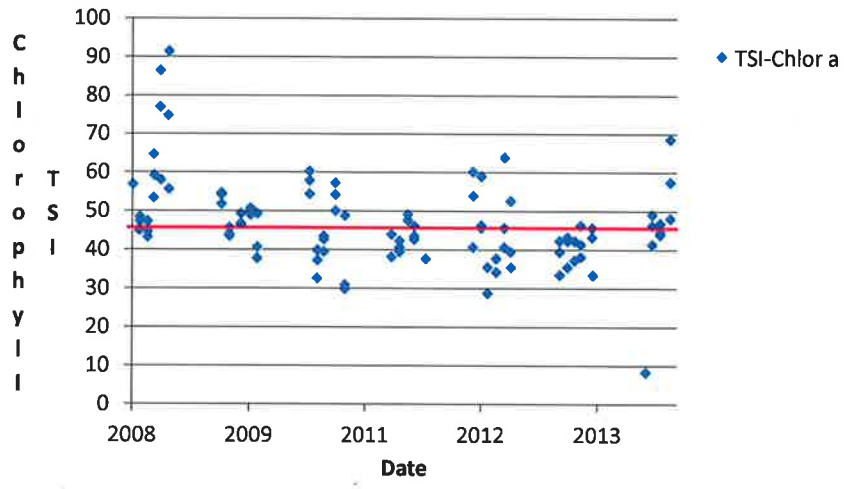


Nutrient Reduction Success: Deer Creek Reservoir

Deer Creek Reservoir Algal Blooms (1970s)

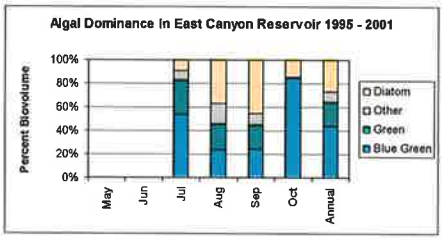
Deer Creek Reservoir Algal Blooms (1990s)

Deer Creek Reservoir

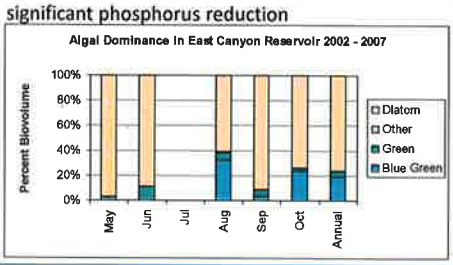


Algal shift in East Canyon Reservoir

IKONOS Multispectral Imagery of East Canyon Reservoir
Collected October 11, 2000



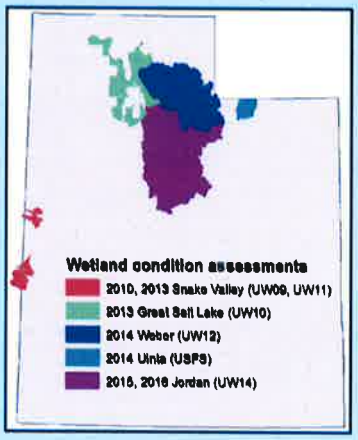
2003: Major upgrade of East Canyon WWTP including significant phosphorus reduction

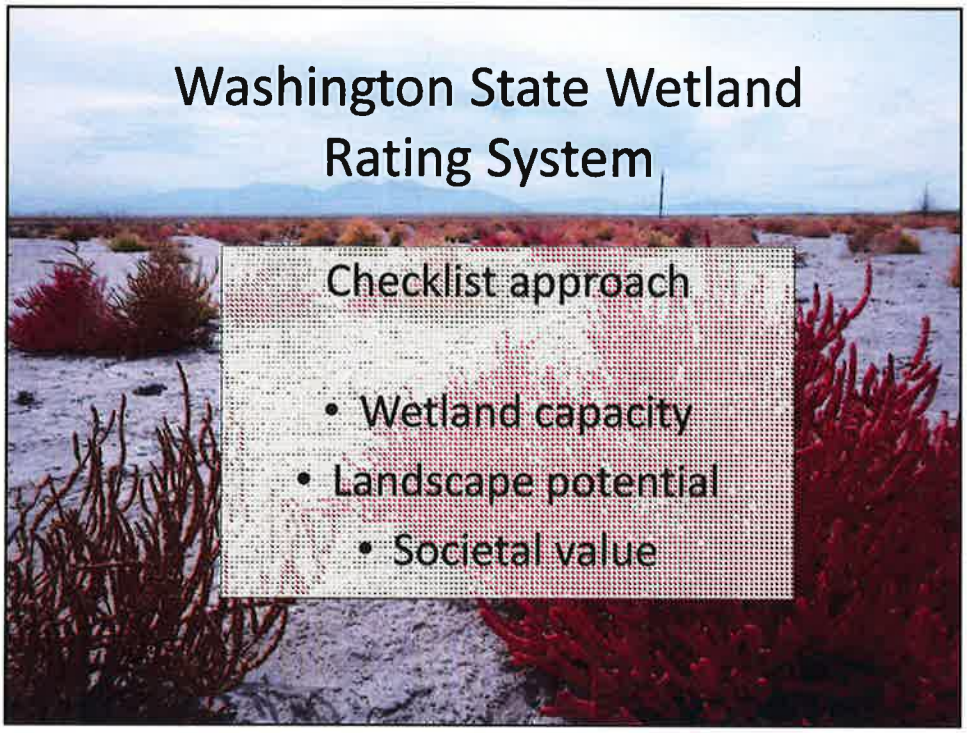


QUESTIONS

Wetland Program Field Surveys

- Focus has been on *condition* (deviation from natural state)
- Need to add *functional* component to evaluation to:
  - Assess mitigation needs
  - Estimate functional capacity within watersheds





Capacity- Brief Review

- Vegetation cover
  - Physical retention
  - Nutrient uptake by plants, but often high turnover
- Hydrology
  - Slow moving water, long residence time
  - Constantly wet areas have less decomposition
  - Fluctuating oxidation levels promote higher nitrogen removal; also need adequate carbon
  - Conflicting information about phosphorus and water levels
- Soil type (organics, clays)
- Loading rate

Site Capacity

- The top 5 cm of soil is true clay or true organic.
- At least ¼ of wetland is seasonally ponded (surface water ≥2 consecutive months, but drying annually).

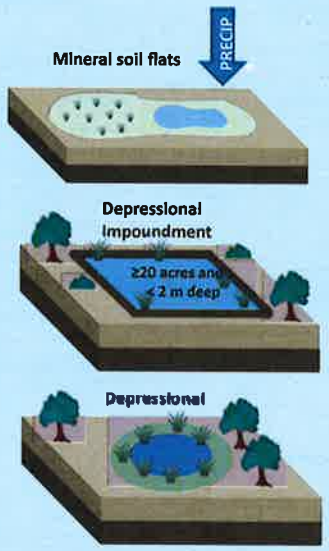
Site Capacity

- >50% of wetland is covered by persistent herbaceous vegetation ≥13 cm tall and dense enough to obscure ground.
- >33% of wetland is covered by persistent herbaceous vegetation ≥1 m tall
- >33% of wetland has over-story cover from trees or shrubs at least 1 m tall.

Taller and woody vegetation provides more support in extreme flows, but is three measures overkill?

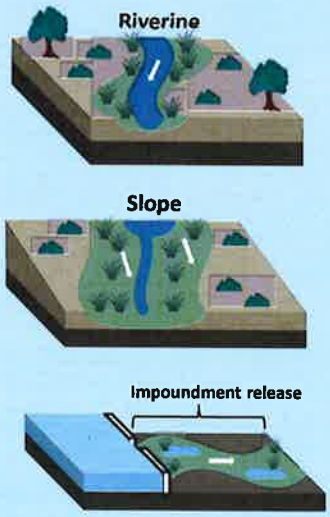
Site Capacity

- Wetland is **mineral soil flat, depressional impoundment**, or **depressional** and waterbody either has no surface water outlet or an intermittently flowing outlet.



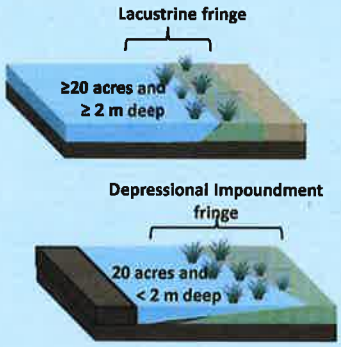
Site Capacity

- Wetland is **riverine** and at least 1/5 of wetland has surface depressions that can trap sediments during flooding events.
- Wetland is **slope** or **impoundment release** and average surface slope is 1% or less.



Site Capacity

- Wetland is **lacustrine fringe** or **depressional impoundment fringe** and the average width of vegetation extending into the lake or impoundment is at least 5 m.



Landscape Potential

- At least 10% of the area within 50 m that could run-off to wetland is in land use likely to generate pollutant runoff.
- At least 10% of the area within 50 m that could run-off to wetland is in land use likely to generate sediment or nutrient runoff.

Landscape Potential

- Stormwater pipe directly feeds wetland.
- There are homes within 75 m of wetland that are likely to be on septic system (outside special service districts and municipal boundaries).

Landscape Potential

- Wetland is immediately adjacent to lake or stream with known algal bloom issues. **Is there an up-to-date list somewhere?**
- Wetland is immediately adjacent to a lake used by power boats.
- There are other sources of pollutants coming into wetland not listed above.

Landscape Potential

Sites connected to streams/rivers:

- ≥10% of contributing basin is composed of land use likely to generate pollutants.
- ≥10% of contributing basin is composed of land use likely to generate sediment or nutrients.
- Wetland is within an incorporated city.

Societal Value

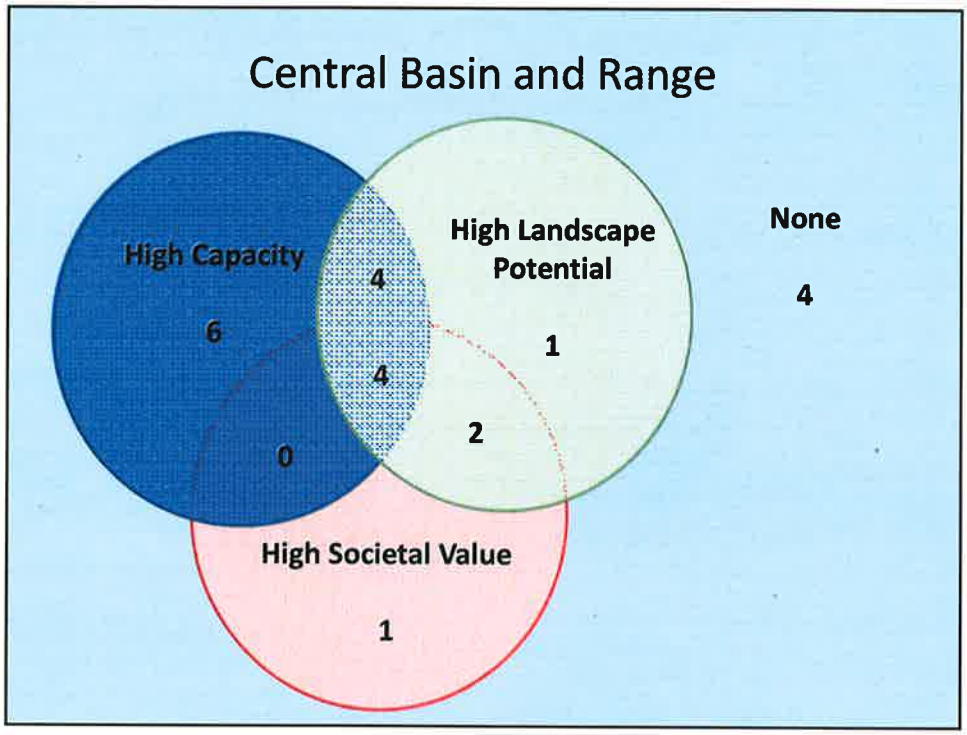
- Wetland is within 50 m of and at least occasionally dischargers to stream, river, or lake.
- Wetland is in area designated as category 1 or 2 waters in anti-degradation policy (exceptional recreational/ecological significance) .
- Wetland is in DWQ Assessment Unit that is impaired.
- Wetland is in a DWQ Assessment Unit that has some record of exceedances, but not rated as impaired.

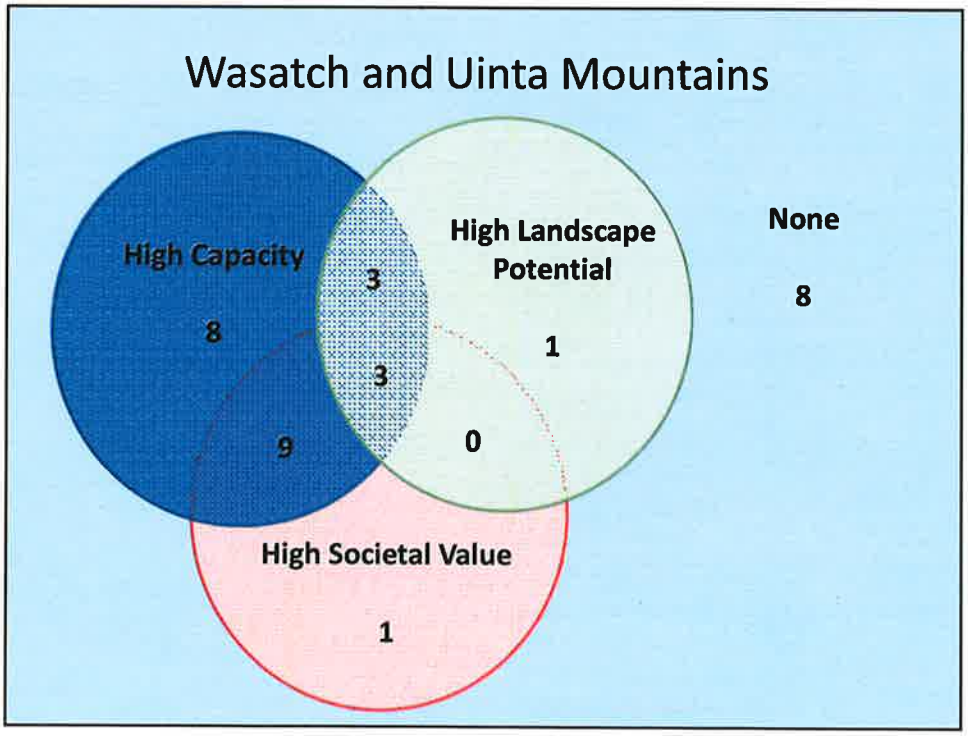
Unresolved Questions

- Does it matter whether sites have standing water versus saturated soils?
- Does list make sense without separating out wetland types by HGM class?
- Should we be measuring potential future landscape potential; e.g. if area around wetland *may* become developed and thus potential would increase?

2016 Results

Measure	Basin and Range (n=22)	Wasatch/Uinta Mtns (n=30)
High capacity	45%	61%
High landscape potential	41%	21%
High society value	27%	36%


Central Basin and Range
High Capacity
6
4
4
High Landscape Potential
1
2
0
High Societal Value
1
None
4


Wasatch and Uinta Mountains
High Capacity
8
3
3
High Landscape Potential
1
0
9
High Societal Value
1
None
8

Site Capacity

Description	n
>50% of wetland is covered by persistent herbaceous vegetation ≥13 cm tall	47
>33% of wetland is covered by persistent herbaceous vegetation ≥1 m tall	25
The top 5 cm of soil true clay or true organic.	22
>33% of wetland has over-story cover from tree or shrubs at least 1 m tall	14
At least ¼ of wetland is seasonally ponded (surface water ≥2 consecutive months, but drying annually).	13
Wetland has no surface water outlet or an intermittently flowing outlet.	11
Wetland is riverine and at least 1/5 of wetland has surface depressions that can trap sediments during flooding events.	9
Wetland is slope or impoundment release and average surface slope is 1%.	7
The average width of vegetation (including aquatic bed) extending into the lake or impoundment is at least 5 m.	4

Landscape Potential

Description	n
Contributing basin with at least 10% pollutant run-off potential	18
Contributing basin with at least 10% sediment/nutrient run-off potential	17
Within incorporated area	16
Wetland is immediately adjacent to lake or stream with known algae bloom issues.	13
Wetland is immediately adjacent to a lake used by power boats.	5
At least 10% of the area within 50 m that could run-off to wetland is in land use likely to generate sediment or nutrient runoff to site.	5
At least 10% of the area within 50 m that could run-off to wetland is in land use likely to generate pollutants besides nutrients/sediment	5
Stormwater pipe directly feeds wetland or both feeds waterbodies that directly feed wetland and are within 500 m of wetland.	4
There are other sources of pollutants coming into wetland not listed above. List in comments	1

Societal Value

Description	n
Category 4 or 5 waters	29
Wetland is within 50 m of and at least occasionally dischargers to stream, river, or lake.	20
Anti-degradation category 1	17
Category 3 waters with history of exceedances	6

Water Quality Improvement Functional Assessment

Capacity to improve water quality

- ☐ 1. The top 5 cm of soil is true clay (clay, silty clay, sandy clay) or true organic.
- ☐ 2. At least ½ of AA is covered by **persistent** (meaning dead stalks will be standing in winter) **herbaceous vegetation ≥13 cm tall** (~height of clipboard) and dense enough to obscure ground; estimate vegetation height based on likely flood season conditions. Ignore areas with water >1 m deep for percent estimates.
- ☐ 3. At least 1/3 of AA is covered by **persistent herbaceous vegetation ≥1 m tall** and dense enough to obscure ground (see definitions from above). Ignore areas with water >1 m deep for percent estimates.
- ☐ 4. At least 1/3 of AA has over-story cover from **tree or shrubs at least 1 m tall** (ignore stream channels).
- ☐ 5. At least ¼ of AA is **seasonally ponded** (surface water ≥2 consecutive months, but drying annually).
- ☐ 7. Wetland is **lacustrine fringe**, **depressional impoundment**, or **depressional** and waterbody either has no surface water outlet or an intermittently flowing outlet.
- ☐ 8. Wetland is **riverine** and at least 1/5 of wetland has surface depressions that can trap sediments during flooding events.
- ☐ 9. Wetland is **lacustrine fringe, depressional impoundment,** or **depressional impoundment fringe** and the average width of vegetation (including aquatic bed) extending into the lake or impoundment is at least 5 m.
- ☐ 10. Wetland is **slope** or **impoundment release** and average surface slope is 1% or less (1.75°).

Landscape potential

- ☐ 11. There are homes within 75 m of wetland that are likely to be on septic system (outside special service district and municipal boundaries- see office evaluation).
- ☐ 12. Stormwater pipe directly feeds wetland or both feeds waterbodies that directly feed wetland and are within 500 m of wetland.
- ☐ 13. At least 10% of the area within 50 m that could run-off to AA is in land use likely to generate sediment (fertilizer, animal manure, etc.) or nutrient (cropland, dirt roads, pasture, clearcut forest, OHV tracks, golf course, etc.) runoff to site. If surrounding land use is pasture/rangeland, check box only if 10% of area has disturbed soils or if animal dung density is very high.
- ☐ 14. At least 10% of the area within 50 m that could run-off to AA is in land use likely to generate pollutants besides nutrients/sediment (paved roads, parking lots, houses, commercial buildings, oil and gas wells, mines, etc.)
- ☐ 15. Wetland is immediately adjacent to a lake used by power boats.
- ☐ 16. Wetland is immediately adjacent to lake or stream with known algal blooms issues.[1]
- ☐ 17. There are other sources of pollutants coming into wetland not listed above. List:
- ☐ Contributing basin with at least 10% pollutant run-off potential
- ☐ Contributing basin with at least 10% sediment/nutrient run-off potential

Valued by society

- ☐ 18. Wetland is within 50 m of and at least occasionally dischargers to stream, river, or lake.
- ☐ Wetland is listed as a category 4 or 5 waterbody in latest Integrated Report.
- ☐ Wetland is listed as category 3 water with history of exceedances in latest Integrated Report.
- ☐ Wetland is located in an area classified as category 1 or 2 for anti-degradation.

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
WATER QUALITY

TIBBLE FORK DAM SEDIMENT RELEASE

Mining in American Fork Canyon

- Mining began in 1870
- Several mines operated in upper American Fork Canyon
- The mines produced gold, silver, copper, lead and zinc ores
- Smelters operated in canyon
- Most mining ended prior to World War II
- Ores were transported down a tram conveyor to a "tipple station" at confluence of Deer Creek and North Fork American Fork River, hence the name "Tibble Fork"

Pacific Mine, American Fork Canyon

Environmental Legacy of Mining

- Uncovered tailings piles remain outside of several mines
- Some mines are discharging contaminated groundwater
- Some streams flowing over tailings, dissolving metals
- Contaminated water and sediment flowing directly into streams
- Primary contaminants of concern are Arsenic, Cadmium, Copper, Lead, Mercury and Zinc

Map of Mary Ellen Gulch, American Fork Canyon

Environmental Impact of Mines

Acid mine drainage and tailings pile, Live Yankee Mine, American Fork Canyon

Tibble Fork Reservoir

- Dam built in 1966 for flood control and sediment retention
- Dam is currently being seismically upgraded and raised 15 feet to increase water storage
- Stores approximately 258 acre-feet of water (~ 385 ac. ft. after upgrade)
- About 14 acres in size (23 after upgrade)
- Construction began in June 2016 and will be completed in December 2016

Tibble Fork Reservoir prior to construction

August 20, 2016 Sediment Release

- On August 20, 2016 the contractor and dam operator began a planned draw down to lower the water level of the reservoir
- The North Fork of the American Fork River began eroding the sediment which had accumulated in the lake bed from upstream
- The erosion released an estimated 8,700 cubic yards (unconfirmed) of sediment into the North Fork.
- The water contained large amounts of suspended solids
- The release lasted for several days and killed an estimated 5,250 fish

American Fork River, near mouth of American Fork Canyon

Eyewitness video

https://www.youtube.com/watch?v=92oIgITaXJo

Water Quality Above Dam, 23 Aug 16

North Fork of American Fork River above Tibble Fork Reservoir

Water Quality Below Dam, 23 Aug 16

North Fork of American Fork River below Tibble Fork Dam

Fish Kill Below Dam

Dead trout in North Fork American Fork River below Tibble Fork Dam

Erosion of sediment in lake bed

North Fork of American Fork River flowing through bottom of Tibble Fork Reservoir

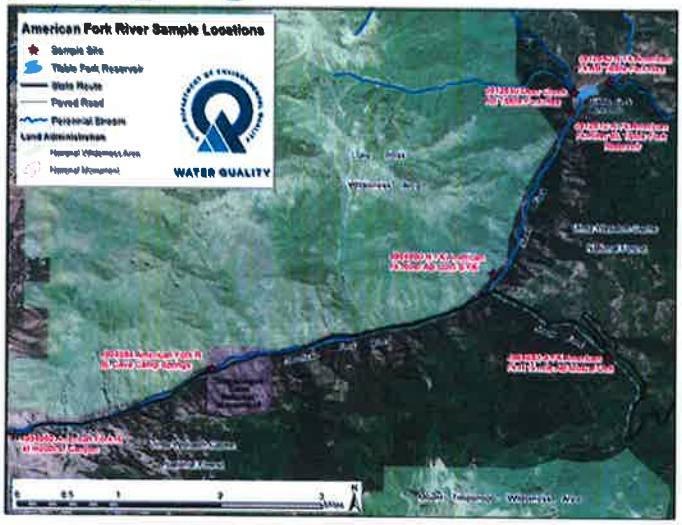
Division of Water Quality Response

- Division of Water Quality not notified of discharge until August 23, 2016
- DWQ consulted with several agencies, including Forest Service, Park Service, National Resource Conservation Service, Division of Wildlife Resources, and Utah County Health Department
- DWQ took samples at several points upstream and downstream of dam
- Contractor for dam construction dug a canal to allow the river to bypass the sediment in the lake bed and prevent further erosion

Bypass Canal

Bypass Canal in bottom of Tibble Fork Reservoir

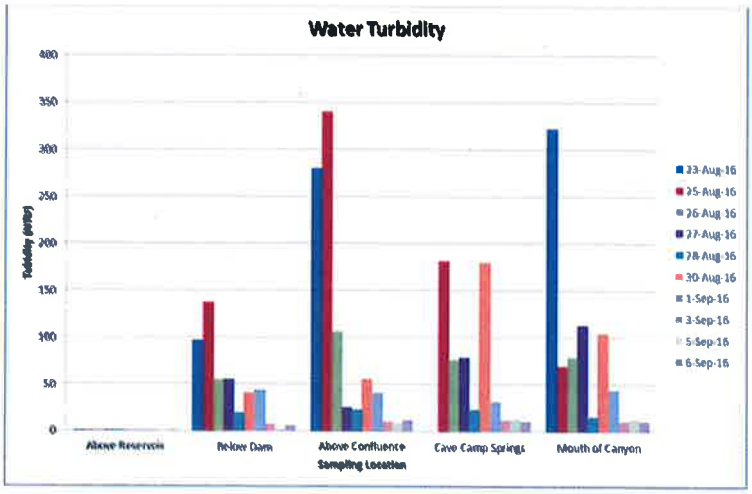
DWQ Sampling Stations



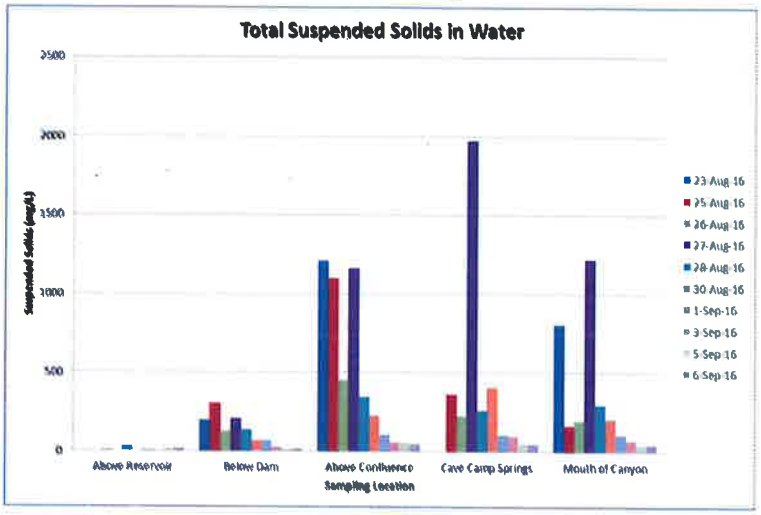
DWQ Sampling Plan

- Samples were taken for two weeks after discharge to monitor water quality and determine scope of spill
- Water samples were analyzed for water chemistry, dissolved metals, total metals, turbidity, and suspended solids
- Sediment samples were analyzed for total metals
- Metal results were screened for human health, agricultural use, and aquatic wildlife health
- Water turbidity and dissolved solids were used as an indicator for overall water quality

Water Turbidity Sample Results



Suspended Solids Sample Results



Sediment Metals Sampling Results

No Exceedance | Above Screening Level

				Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Zinc	Molybdenum
Health Based Comparison Values for Recreation				165,438	68	753	33,086	331	97	213,402	1,654	1,654	115,799	400	7,775	1,158	3,309	827	827	1,654	49,626	827
Monitoring Location	Site Description	Collection Date	Collection Time	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
5912640	N FK American FK CK AB Tibble Fork Res	8/23/2016	2:25:00 PM	8,840	ND	13	60	ND	2	20	5	ND	17,300	40	498	0	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
		8/29/2016	8:40:00 AM	10,300	ND	13	38	ND	2	26	7	ND	29,600	43	471	0	21	ND	ND	27	266	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	ND	ND	ND	35	280	ND
		8/27/2016	9:37:00 AM	7,540	3	19	178	ND	2	17	6	23	23,900	114	442	0	ND	ND	ND	22	309	ND
		8/29/2016	9:00:00 AM	7,950	ND	18	137	ND	2	18	6	20	25,000	105	391	0	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	569	0	ND	ND	ND	42	601	ND
		8/27/2016	9:43:00 AM	8,800	ND	20	138	ND	2	18	6	25	26,800	128	471	0	ND	ND	ND	22	342	ND
		8/29/2016	9:20:00 AM	10,000	ND	21	181	ND	3	19	7	25	28,300	154	491	0	ND	ND	ND	23	370	ND
4994964 - b	American Fork River BL Cave Camp Springs - Blw Water Line	8/1/2016	12:18:00 PM	NS	10	39	NS	0	6	23	NS	66	NS	415	NS	0	30	0	0	NS	850	NS
		8/3/2016	10:55:00 AM	NS	6	31	NS	0	4	27	NS	44	NS	262	NS	0	0	0	0	NS	484	NS
4994964 - a	American Fork River BL Cave Camp Springs - Abv Water Line	8/1/2016	12:18:00 PM	NS	0	22	NS	0	3	21	NS	33	NS	183	NS	0	0	0	0	NS	339	NS
		8/3/2016	10:55:00 AM	NS	0	20	NS	0	2	22	NS	24	NS	142	NS	0	0	0	0	NS	330	NS
4994964	American Fork River BL Cave Camp Springs	8/27/2016	10:05:00 AM	7,680	4	19	139	ND	2	15	6	20	24,300	128	483	0	ND	ND	ND	19	321	ND
		8/29/2016	9:35:00 AM	8,360	ND	15	107	ND	2	18	5	20	21,300	93	357	0	ND	ND	ND	24	295	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	578	0	26	ND	ND	36	509	ND
		8/27/2016	10:20:00 AM	16,600	12	49	180	ND	8	30	13	92	41,000	522	616	1	36	ND	3	38	916	ND
		8/29/2016	10:00:00 AM	9,550	ND	22	116	ND	3	18	7	31	23,100	170	440	0	ND	ND	ND	22	351	ND

Sediment Metals Sampling Results

No Exceedence | Above Screening Level

				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	
Monitoring Location	Site Description	Collection Date	Collection Time	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	313	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	297	ND
		8/28/2016	9:40:00 AM	10,300	ND	13	38	ND	2	26	7	ND	29,600	43	471	0.1	21	ND	ND	27	295	ND
5912810	N FK American FK R BL Tibble Fork Res	8/23/2016	2:45:00 PM	7,750	ND	16	161	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	176	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	282	ND
4994990	N FK American FK R AB confl S FK	8/23/2016	3:00:00 PM	11,700	8	34	162	ND	5	26	9	56	15,700	347	560	0.4	ND	ND	ND	42	691	ND
		8/27/2016	9:45:00 AM	8,800	ND	20	158	ND	3	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 - Abv 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
		9/7/2016	10:55:00 AM	NS	6	31	NS	0	4	27	NS	44	NS	292	NS	0.3	0	0	0	NS	484	NS
4994984 - a	American Fork River BL Cave Camp Springs - Abv Water Line	9/1/2016	12:18:00 PM	NS	0	22	NS	0	3	21	NS	33	NS	163	NS	0.2	0	0	0	NS	339	NS
		9/7/2016	10:55:00 AM	NS	0	20	NS	0	2	22	NS	24	NS	142	NS	0.2	0	0	0	NS	330	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	463	0.2	ND	ND	ND	19	321	ND
		8/28/2016	9:35:00 AM	9,390	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	578	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	622	616	0.6	38	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

Sampling Conclusions

- Although heavy metals were present in the water column they did not exceed the screening values for recreation and agricultural use, or aquatic life
- Water Turbidity and Suspended Solids returned to near-normal levels within 3 weeks of original discharge
- The bypass canal appeared to significantly reduce turbidity and suspended solids
- Levels of lead in the sediment sometimes exceeded the human health screening values
- Levels of arsenic, cadmium, lead, and zinc in the sediment exceeded the aquatic life screening values both upstream and downstream from the dam
- In general, levels of heavy metals in the sediment were 2 to 7 times higher downstream than upstream

Enforcement Action

- Six violations of the Utah Water Quality Act and Water Quality Rules were documented
- Notice of Violation was issued to North Utah County Water Conservancy District on September 28, 2016
- District will be responsible for the cost of the investigation and the settlement agreement to resolve the NOV may contain a monetary penalty
- District will be responsible to determine damage to stream and will be required to formulate a plan for restoration and monitoring

Dam Construction at Tibble Fork Reservoir