

Protecting Our Water Recreation Programs: Harmful Algal Blooms & *E. coli*

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Utah Division of Water Quality
Water Quality Health Advisory Panel
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HABs



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DWQ HAB Advisory Process

Monitoring

Routine
DWQ and partners monitor prioritized lakes on a monthly basis



Response
DWQ and partners monitor lakes on advisory on a weekly basis

Data Collected
Microcystin and Anatoxin-a Cell Count (Taxonomy)



Detection

Inform LHD

Present data collected along with DWQ recommendation. Assist in answering site specific questions

Communication

Phone call with all stakeholders (i.e. DNR, USFS, etc.) for site specific context

Advisory

Signs

Work with LHD and partners to post signs, make sure signs get posted

Communication

Alert stakeholders to advisory decision. Post information, maps, and narrative about advisory on habs.utah.gov



2020 HAB Advisory Season Updates



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2019 Advisory Thresholds

	Reported	Warning	Danger
Relative Probability of Acute Health Risk	Low	Moderate	High
Cyano Cell Density (cells/mL)	<20,000	20,000	>10,000,000
Microcystin (ug/L)	<4	4	>2,000
Cylindrospermopsin (ug/L)	<8	8	>8
Anatoxin-a (ug/L)	non-detect	Detection - 90	>90
Health Risks	Variable/Negligible	-Potential for long-term illness -Short term effects (e.g. skin and eye irritation, nausea, vomiting, diarrhea)	-Potential for acute poisoning -Potential for long-term illness -Short term effects (e.g. skin and eye irritation, nausea, vomiting, diarrhea)
Recommended Actions	LHD specific	Issue Warning Advisory Post Warning signs No primary contact recreation Weekly sampling minimum	Issue Danger Advisory Post Danger signs No recreation Consider Closure Weekly sampling minimum

2019 Advisory Thresholds

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Health Risks	Variable/Negligible	-Potential for long-term illness -Short term effects (e.g. skin and eye irritation, nausea, vomiting, diarrhea)	-Potential for acute poisoning -Potential for long-term illness -Short term effects (e.g. skin and eye irritation, nausea, vomiting, diarrhea)
Recommended Actions	LHD specific	Issue Warning Advisory Post Warning signs No primary contact recreation Weekly sampling minimum	Issue Danger Advisory Post Danger signs No recreation Consider Closure Weekly sampling minimum



2020 Advisory Threshold Changes

Parameter	2019	2020	Benchmarks
Microcystin	4 ug/L	8 ug/L	2019 EPA Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin
Cylindrospermopsin	8 ug/L	15 ug/L	2019 EPA Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin
Anatoxin-a	>0.0 ug/L	15 ug/L	2019 EPA Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin State of Oregon
Toxigenic Cyanobacteria Cell Density	20,000 cells/mL	100,000 cells/mL	2019 EPA Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin World Health Organization, 2003. Guidelines for safe recreational water environments, Volume 1, Chapter 8: Algae and cyanobacteria in freshwater.



“Pre-Advisory” Tier: Health Watch

This is **not a formal advisory level**. Rather, these are lines of evidence that a cyano bloom is present or may become more severe. Increased monitoring and surveillance are strongly recommended. Indicators may include:

- Visual reports
- Reports of animal or human illness
- Detection of cyanotoxins below thresholds
- Detectable levels should be defined using appropriate QA/QC procedures

Consider cautioning users of the waterbody depending on specifics of the event and waterbody.



Admin Draft 2020 Guidance

Observed / Potential Bloom	Warning Advisory	Danger Advisory
<p>This is not a formal advisory level. Rather, these are indicators that a bloom may exist or may become more severe. Increased monitoring and surveillance are strongly recommended. Indicators may include:</p> <ul style="list-style-type: none"> • Visual reports • Reports of animal or human illness • Detection of cyanotoxins below thresholds • Detectable levels should be defined using appropriate QA/QC procedures <p>Consider cautioning users of the waterbody depending on specifics of the event and waterbody.</p>	<p>Cyanobacterial Cell Density (cells/mL) ^{1,2,3}</p> <p>5,000 - 100,000</p> <p>Human symptoms have been reported within this range³. An advisory should be issued at 100,000 cells/mL. Below 100,000 cells/mL, take into account other contextual information and consider issuing an advisory.</p>	<p>10,000,000</p>
	<p>Microcystins (µg/L) ^{1,2}</p> <p>8</p>	<p>2,000</p>
	<p>Cylindrospermopsin (µg/L) ³</p>	<p>15 *</p>
	<p>Anatoxin-a (µg/L) ^{3,4,5}</p> <p>15</p>	<p>90</p>
<p>Health Risks ^{1,2,3}</p>	<p>Potential for long-term illness</p> <p>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</p>	<p>Potential for acute poisoning</p> <p>Potential for long-term illness</p> <p>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</p>
<p>Recommended Actions</p>	<p>Issue WARNING advisory</p> <p>Post WARNING signs</p> <p>Sampling recommended at least weekly</p>	<p>Issue DANGER advisory</p> <p>Post DANGER signs</p> <p>Consider CLOSURE</p> <p>Sampling recommended at least weekly</p>

Guidance sources

¹ WHO, 1999. Toxic cyanobacteria in water.

² WHO, 2003. Guidelines for safe recreational water environments, Volume 1, Chapter 8: Algae and cyanobacteria in fresh water.

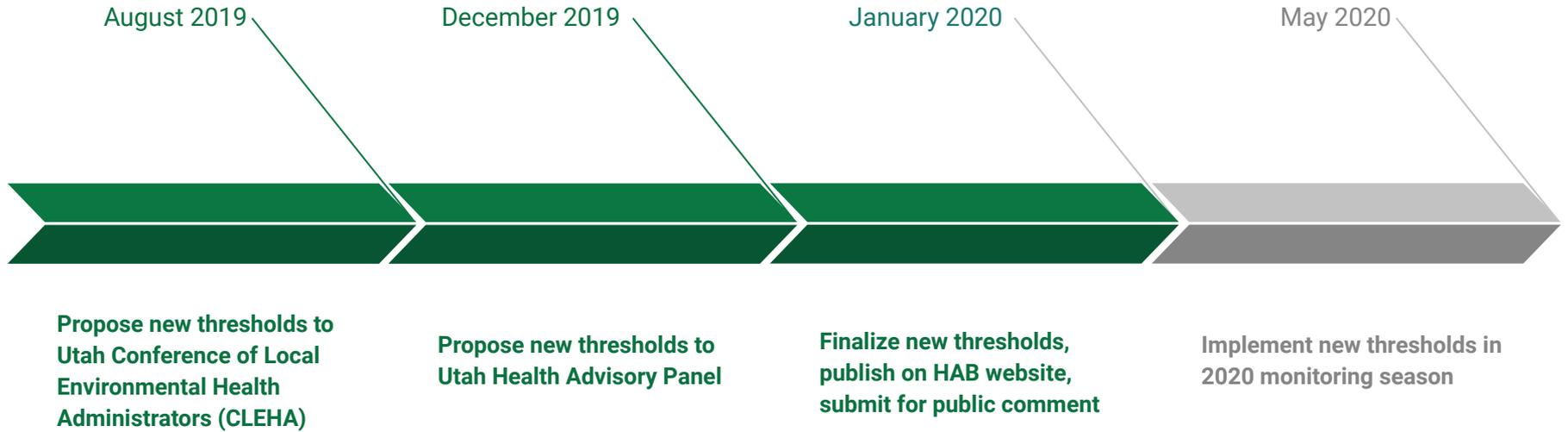
³ EPA, 2019. Recommended human health recreational ambient water quality criteria or swimming advisories for microcystins and cylindrospermopsin.

⁴ OHA, 2019. Oregon Health Authority. Recreational use public advisory guidelines: cyanobacterial blooms in freshwater bodies.

⁵ CWQMC, 2016. California Water Quality Monitoring Council. Cyanobacteria guidance for recreational and related water uses (2016 update).

* Data are sparse on where cylindrospermopsin advisory break points should be. Consult with UDEQ and UDOH as needed on this issue.

Utah DEQ/DOH Timeline



Public Comment Summary

Comment (broad)	UDOH/UDWQ Response
1 Issue with using cyanobacteria cell counts for protecting public health in recreational waters	Detail UDOH/UDWQ rationale for using cyanobacteria (includes benchmarking with EPA, WHO, peer reviewed studies and other states, communication efficiencies and more)
2 Confusion if advisories are based on non-toxigenic species	Note that UDWQ only reports and makes advisory recommendations based on toxigenic species; make clear in guidance
3 Issue and confusion with guidance table formatting	Make guidance table less cluttered and add 'toxigenic' to cyanobacteria cell count sections

Final Draft 2020 Guidance

Observed / Potential Bloom	Warning Advisory	Danger Advisory
<p>This is not a formal advisory level. Rather, these are indicators that a bloom may exist or may become more severe. Increased monitoring and surveillance are strongly recommended. Indicators may include:</p> <ul style="list-style-type: none"> • Visual reports • Reports of animal or human illness • Detection of cyanotoxins or toxicogenic cyanobacterial cell density below thresholds • Detectable levels should be defined using appropriate QA/QC procedures <p>Consider cautioning users of the waterbody depending on specifics of the event and waterbody.</p>	<p>Toxigenic Cyanobacterial Cell Density (cells/mL) ^{1, 2, 3}</p> <p>100,000 ^A</p>	<p>10,000,000</p>
	<p>Microcystins (µg/L) ^{1, 2}</p> <p>8</p>	<p>2,000</p>
	<p>Cylindrospermopsin (µg/L) ³</p>	<p>15 ^B</p>
	<p>Anatoxin-a (µg/L) ^{3, 4, 5}</p> <p>15</p>	<p>90</p>
	<p>Health Risks ^{1, 2, 3}</p> <p>Potential for long-term illness</p> <p>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</p>	<p>Potential for acute poisoning</p> <p>Potential for long-term illness</p> <p>Short-term effects (e.g., skin and eye irritation, nausea, vomiting, diarrhea)</p>
	<p>Recommended Actions</p> <p>Issue WARNING advisory to avoid primary contact recreation</p> <p>Post WARNING signs</p> <p>Sampling recommended at least weekly</p>	<p>Issue DANGER advisory to stay away from the waterbody</p> <p>Post DANGER signs</p> <p>Consider CLOSURE</p> <p>Sampling recommended at least weekly</p>

¹ WHO, 1999. Toxic cyanobacteria in water.

² WHO, 2003. Guidelines for safe recreational water environments, Volume 1, Chapter 8: Algae and cyanobacteria in fresh water.

³ EPA, 2019. Recommended human health recreational ambient water quality criteria or swimming advisories for microcystins and cylindrospermopsin.

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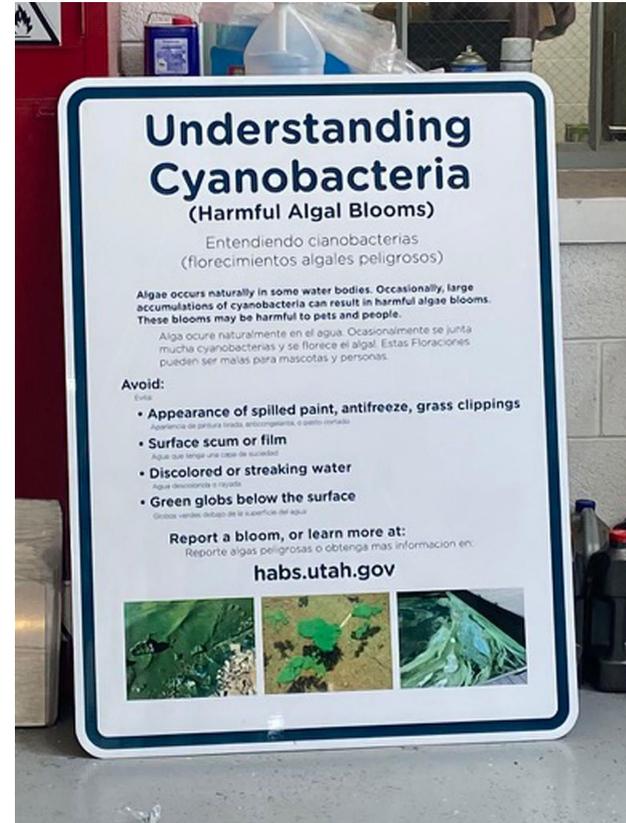
⁵ CWQMC, 2016. California Water Quality Monitoring Council. Cyanobacteria guidance for recreational and related water uses (2016 update).

^A Human symptoms have been reported between 5,000 – 100,000 cells/ml (EPA 2019). At 5,000 – 100,000 cells/mL, LHDs should take into account contextual information and consider issuing an advisory.

^B Data are sparse on where cylindrospermopsin advisory break points should be. Consult with UDEQ and UDOH as needed on this issue.

Permanent Signs - State Parks

- Put on State Park waterbody beaches
- **Will not replace warning and danger signs or advisory process**
 - Serve as more permanent and continuous caution to recreators
 - Placeholder if advisory signs cannot be placed immediately after detection of HAB above threshold



2020 E. coli Program



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2020 ~~E. coli~~ Program Waterborne Pathogen Advisory Program



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2020 Program Re-build Goals



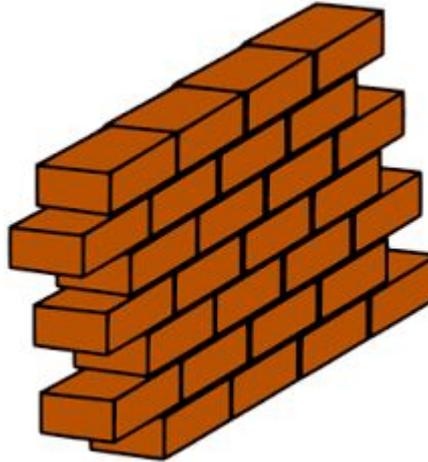
Joint program support (in spirit and practice!) across UDWQ, UDOH, and state health agencies

Credible, timely data and communication to support advisory decisions

Quickly identify waterbodies that pose unacceptable exposure to human pathogens

Assessment vs. Advisory

- Long-term monitoring for the purpose of assessment listing
- Clean Water Act
 - Restore and maintain the chemical, biological, and physical integrity of the Nation's waters
 - National Goal – “Fishable and Swimmable”
 - Primarily focused on point sources of pollution
 - Amended in 1987 to address nonpoint sources



- Short-term monitoring for the purpose of advisory and response
- Uses rapid monitoring and data collection to protect recreational human health more instantaneously

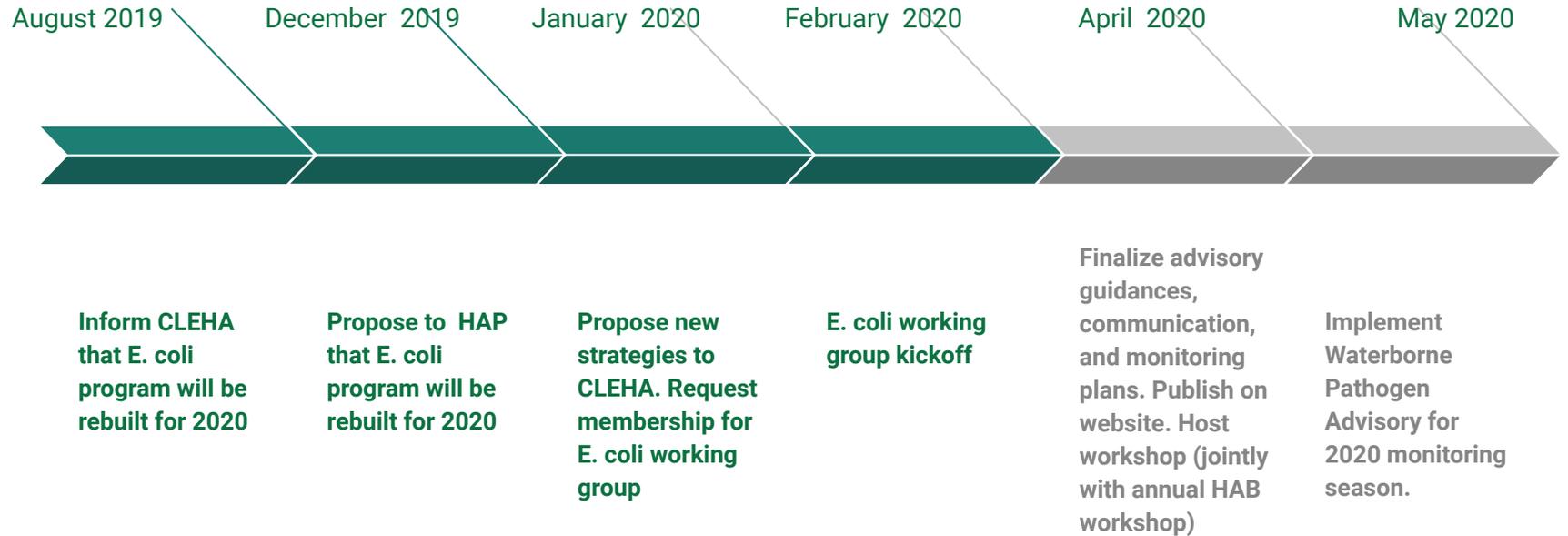
Working towards a cohesive strategy

Identified issues with current program

1. Currently disjointed program implementation across LHDs
2. Lacks consistent response protocol (data sharing, TAT, response, etc.)
3. Lacks DOH/LHD input
4. Advisory criteria lack a connection to current recreational health risks
5. Priorities not efficiently or clearly conveyed to cooperative agencies
 - a. currently focuses on an assessment or TMDL context
6. Missing multiple efficiencies to align with HAB program



Utah DEQ/DOH Timeline



Joint DOH/DWQ/LHD advisory guidance



Workgroup objectives and tasks

1. Review/update advisory objectives and implementation
 - a. Science and literature review
 - b. Benchmarking across states
2. Establish priority waterbodies
 - a. Develop transparent method
 - b. DWQ's at-risk identification
 - c. LHD input for local high recreation waters
 - d. Cooperator input for local high recreation waters
3. Communication
 - a. Align with current HAB program processes

Objective 1: Science/Policy Review- Benchmark with States

1. Advisory Process
2. Advisory Thresholds
3. Communication and Signs

Breakout groups from work group: LHDs, DWQ, DOH, cooperators

ADVISORY

High levels of BACTERIA have been detected in this WATER.

N.H. Dept. of Environmental Services

**WATER CURRENTLY NOT
SUITABLE FOR WADING
OR SWIMMING!**

Exposure to this water may cause nausea, vomiting, diarrhea, or fever.

Children, the elderly and others with sensitive immune systems are especially vulnerable.

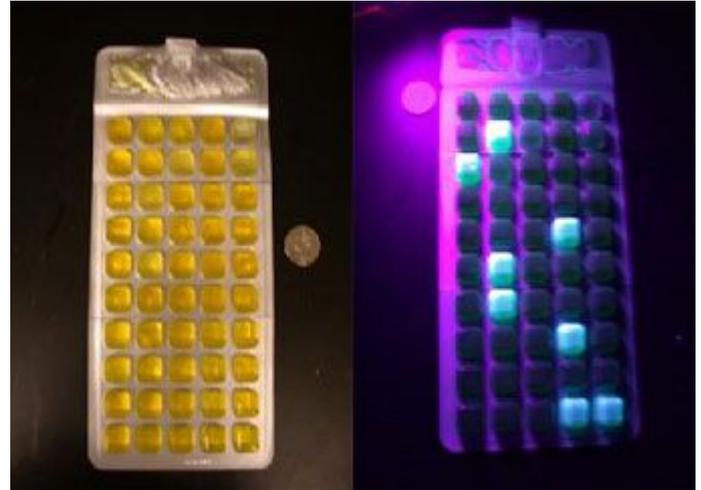
All current advisories posted at www.des.nh.gov.
Click "beach advisory" in left column

CONTACT INFORMATION:
NHDES Beach Program
29 Hazen Dr.; Concord, NH
(603) 271-0698
beaches@des.nh.gov



Objective 1: Science/Policy Review- Benchmarking: Process and Thresholds

- Majority of states do not require a validation sample within 24 hours
 - However, this was requested by most Utah LHDs; data supports use
- Utah is the only Intermountain state not using the latest EPA Beach Action Value (BAV)



Objective 1: Science/Policy Review- E. coli Beach Action Value

New in the EPA 2012 RWQC document were:

1. Values that protect public health similarly in both **marine and fresh waters**
2. A new tool for use in notification programs: **Beach Action Value**, or BAV for use in notification/advisory programs.
3. A **single threshold** rather than different values based on use intensity

Currently: **409 cfu**, based on EPA 1986 RWQC document and Utah WQ assessment criteria

“EPA suggests that states use a BAV as a conservative, precautionary tool for making beach notification decisions”

Table 5. Beach Action Values (BAVs).

Indicator	Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators	OR	Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators
	BAV (Units per 100 mL)		BAV (Units per 100 mL)
Enterococci – culturable (fresh and marine) ^a	70 cfu		60 cfu
<i>E. coli</i> – culturable (fresh) ^b	235 cfu		190 cfu
<i>Enterococcus</i> spp. – qPCR (fresh and marine) ^c	1,000 cce		640 cce

^a Enterococci measured using EPA Method 1600 (U.S. EPA, 2002a), or another equivalent method that measures culturable enterococci.

^b *E. coli* measured using EPA Method 1603 (U.S. EPA, 2002b), or any other equivalent method that measures culturable *E. coli*.

^c EPA *Enterococcus* spp. Method 1611 for qPCR (U.S. EPA, 2012b). See section 5.2.

Objective 2: Identifying Priority Waterbodies

- a. Develop transparent method
- b. DWQ's at-risk identification
- c. LHD input for local high recreation waters
- d. Cooperator input for local high recreation waters



What is risk?

‘Primary contact recreation typically includes activities where immersion and ingestion are likely and there is a high degree of bodily contact with the water, such as swimming, bathing, surfing, waterskiing, tubing, skin diving, water play by children, or similar water-contact activities.’



Objective 2: Created list of 'at-risk' sites for 2020

Comprised of:

- DWQ identified beaches
- list of **local** high exposure risk waterbodies/ beaches



Objective 2: Waterborne Pathogen Site Prioritization

- Call for priority monitoring locations from LHDs
- Prioritize sites based on recreational exposure risk:

Annual Visitation Ranking	
0-10000	0
10000 - 40000	1
40000 - 150000	2
>150000	3

Urban Areas	1
Urban/Ag Influences	1
Past high values (> 235 MPN/100mL)	1
Past advisory	2
Advertised for swimming	2
Advertised for rafting/paddleboarding	1

Objective 2: Waterborne Pathogen Site Prioritization

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Waterbody	SP 2019 Visitation	visitation points	Located in an urban area	urban area points	nearby urban or ag influence	urban/ag influence points	past high levels (>235) 2012-2019	high level points	Advertised for swimming	swimming points	Comments	Total points
2	Utah Lake	127222	2	yes		1 yes	1	advisory	2	yes	2	Provo, orem, american fork, li	8
3	Deer Creek	412627	3			yes	1	yes	1	Yes	2	Heber watershed/provo river, i	7
4	Rockport	136905	2			yes	1	advisory	2	Yes	2	Weber River drainage	7
5	Bear Lake	382767	3			yes	1	no	0	Yes	2	stream outflow by Rendezvou	6
6	Willard Bay	517106	3					yes	1	yes	2		6
7	Starvation	111225	3			yes	1	no	0	yes	2		6
8	Jordanelle	598154	3					no	0	Yes	2		5
9	East Canyon	143195	2			yes	1	no	0	yes	2		5
10	Green River	81428	2			yes	1	yes	1	river rafting	1	River Rafting	5
11	Sand Hollow	827527	3					no	0	yes	2		5
12	Hyrum	97083	2					yes	1	yes	2		5
13	Yuba	103601	2			yes	1	no	0	yes	2		5
14	Highland Glen			yes		1 yes	1	yes	1	yes	2	in town	5
15	Manila Creek Pond			yes		1 yes	1	yes	1	yes	2	in town	5
16	Mill Creek (Moab)			yes		1 yes	1	yes	1	yes	2	in Moab, used by club for swir	5
17	Gunlock	58288	2			yes	1	no	0	yes	2		5
18	Echo	55487	2			yes	1	no	0	Yes	2	new state park in 2019	5

Objective 2: Waterborne Pathogen Site Prioritization

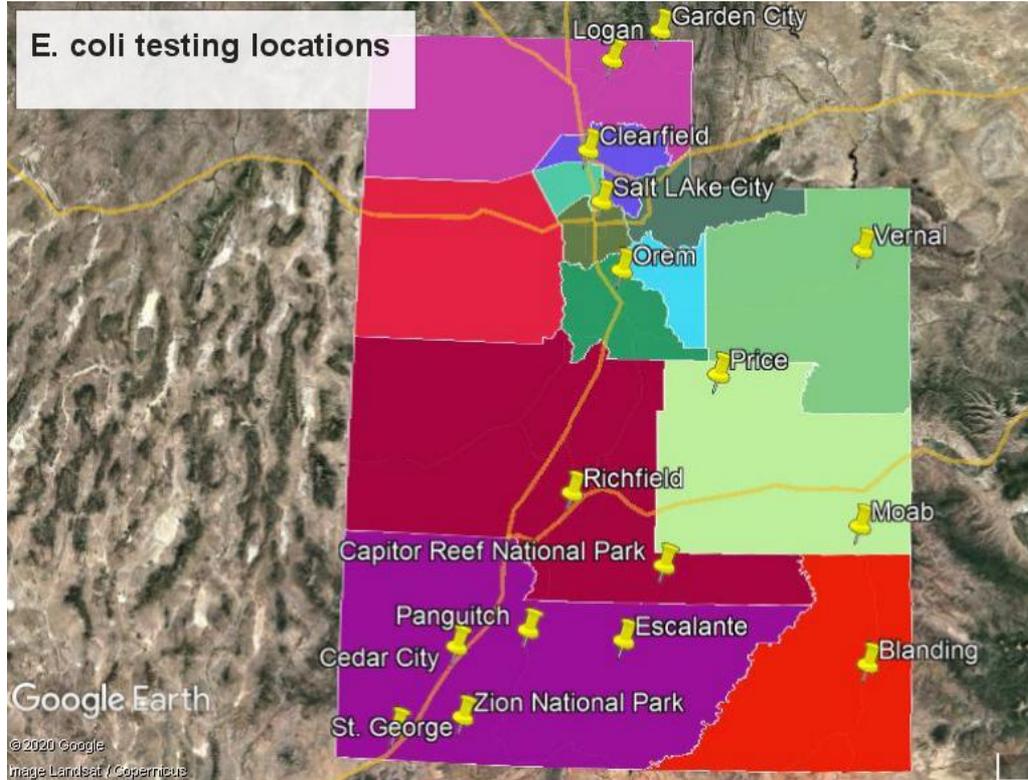
How will the prioritization be used?

Determine how to best allocate resources

- DWQ monitoring assistance
- Monitoring supplies
- Speed of response follow-up monitoring
 - recommend within 24 hours as much as possible
- Placement of signs where resources are limited



Objective 2: Monitoring Network



Network of LHDs and Cooperators through the state with E. coli monitoring equipment

Objective 2: Waterborne Pathogen site prioritization

- Currently have 64 priority waterbodies identified.
- Monitor sites monthly May - October.
- During a normal season, the main challenge will be the follow-up and advisory response, especially in more rural areas.
- As possible, post signs where sampling is more challenging or lower priority

Objective 3: Improve Program Communication

1. Within DWQ
2. DWQ and LHDs/cooperators
3. Public
4. Media



Objective 3: Waterborne Pathogen Communication

Key Messages

1. Take time before playtime. Check water conditions before you go.
2. Don't swallow water when you swim.
3. Wash your hands with clean water before eating, preparing food, or touching your mouth.



Questions/Discussion



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