

“Clean Water”

Utah Chapter of the American Fisheries Society 2018 Annual Meeting

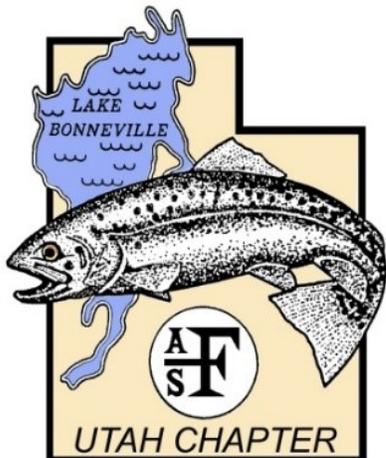


Photo credit: State of Utah DWQ-Monitoring Section; 2012

**Ogden, Utah
March 13th-15th, 2018
PROGRAM**



Photo credit: State of Utah DWQ-Monitoring Section; 2017



Change, Challenge, and Opportunity in Fisheries: **Fishing for Solutions**



**WESTERN DIVISION AMERICAN FISHERIES SOCIETY
ANNUAL MEETING 21-25 MAY 2018
ANCHORAGE - ALASKA**

Anchorage is a bustling metropolis surrounded by wilderness and minutes from adventure in any direction. Join us in May for conversations about change, challenge, and opportunity from across the West to the Last Frontier!

Socials! Sessions! Film Festival! Networking!



**For all your meeting information needs
visit our website:**
www.wdmtg.fisheries.org

Or contact the meeting co-chairs:
Brian Missildine (Western Division AFS President)
Brian.Missildine@dfw.wa.gov
Jeff Falke (Alaska Chapter AFS President-Elect)
afs.alaska.presidentelect@gmail.com

2018 PRESIDENT'S WELCOME

On behalf of the Utah Chapter of the American Fisheries Society Executive Committee, we would like to extend you a warm welcome to our 40th Annual Meeting in Ogden, Utah! A special thanks goes out to Ogden-Eccles Conference Center, Hampton Inn and Suites, Union Grill, and Ben Lomond Hotel for hosting us and providing a comfortable atmosphere.

As I sit in my office writing this message I take a moment to look out my office window only to have the western flank of the Wasatch Mountains distract my train-of-thought once again. The first thing that crosses my mind is how they maintain their ability to distract the eye and stimulate awe, despite the urban sprawl and unsightly growth surrounding the range. There's a noticeable difference this year that I'm sure most of you are aware of by now. There is significantly less snowpack compared to the last few winters. We all know by now that the state of Utah is experiencing one of our poorest snow-years in awhile. The last few weeks have shown signs of hope, but we still have a ways to go to get to normal. As professionals in the field of natural resources, we can't help but wonder what effect highly variable snow-packs will ultimately have on our state's environmental conditions. I personally find reassurance knowing that we have dedicated, hard-working people from all backgrounds in our state working to adapt to environmental changes to assure our wildlife, natural resources, and environment are cared for in the long run.

This year's theme, "Clean Water," is in response to the variety of water quality incidents that have occurred throughout the state recently. These include harmful algal blooms, sediment releases, fish kills, and fish consumption advisories. All too often, the response among government agencies is uncoordinated, because programs from one agency to another, often overlap and it is not always clear who should take the lead in coordinating the response to a particular event. This can lead to an unorganized response to the public, a delay in fixing the problem, and public confusion and frustration knowing there is not a clear process or point of contact to handle these kinds of incidents. At the 2018 meeting, our plenary session will address these challenges and how to improve response effectiveness and coordination. The goal of this year's meeting is to promote a constructive dialogue among professionals of all backgrounds to foster more effective and transparent processes as these incidents take place in the future.

I encourage you to take the time to attend the other sessions we are offering. They include: native genetics and distribution, habitat connectivity, in-stream flow, and a general session that will cover other fishery/aquatic ecology related topics.

I would like to personally thank my fellow Executive Committee for helping me keep my head above water (Cassie Mellon, Paul Thompson, George Weekley, Paul Burnett, Jerrad Goodell, Chance Broderius, and Cody Edwards) during my presidency. I value their patience with my constant questions that just make you want to say, "HUH?!" I've gone through a huge learning curve over the last couple of years. I welcome their constructive criticism and feedback. Despite all of the challenges and constant head-scratching, I appreciate the relationships and knowledge I've built while serving on the Utah AFS Executive Committee. I encourage all of you to consider serving as an Executive Committee officer in the near future if you haven't already. The benefits are intrinsic for career development.

Thank you for your continued support of Utah AFS. If you have any questions please don't hesitate to ask one of the Executive Committee members for help.

Benjamin R. Brown

Benjamin Brown
President

Utah Chapter of the American Fisheries Society

Utah Chapter of the American Fisheries Society Officers and Meeting Sub-Committees 2017-2018

Past President	Cassie Mellon	utafspp@gmail.com
President	Ben Brown	utafsprez@gmail.com
President Elect	Paul Thompson	utafspe@gmail.com
Vice President	George Weekley	utafsvp@gmail.com
Secretary/Treasurer	Paul Burnett	utafstreasurer@gmail.com
2nd Year Committee Member	Jerrad Goodell	utahafs2@gmail.com
1st Year Committee Member	Chance Broderius	utahafs1@gmail.com
Webmaster	Cody Edwards	cedwards@utah.gov
Paper/Poster Judging	Gary Thiede	gary.thiede@usu.edu

A special thank you to Gary Thiede and the USU AFS sub-chapter for volunteering their time and equipment to the meeting!



2017 Best Presentation Awards

The Utah Chapter and Colorado/Wyoming Chapter of the American Fisheries Society is pleased to congratulate the following 2017 best presentation winners:

BEST PAPER:

Brian W. Hodge; Trout Unlimited; PIT technology elucidates the biological effectiveness of a fishway

BEST INFORMATIONAL PAPER:

Jenn Logan; Colorado Parks and Wildlife; Augmentation of a bluehead sucker *Catostomus discobolus* population utilizing captive reared fish

BEST STUDENT PAPER:

Colton Finch; Utah State University; Physical habitat constraints for trout in burned streams

BEST POSTER:

Shai Kamin; GEI Consultants Inc.; Bioaccumulation of selenium and mercury in fish tissue of an urban watershed and reservoir, Denver Colorado

BEST STUDENT POSTER:

Tyler Arnold; Department of Watershed Sciences and Ecology Center-Utah State University; Investigating morphometric differences across and among Arctic Char populations in lakes on the North Slope, Alaska

2017 Awards

The Utah Chapter of the American Fisheries Society is pleased to congratulate the following 2017 award winners:

LIFETIME ACHIEVEMENT AWARD

Krissy Wilson
Patrick Brown

HABITAT CONSERVATIONIST of the YEAR AWARD

Paul Burnett

LEAKY BOOT AWARD

Craig Walker

A Special Thank You to our Meeting Sponsors!

Virgin River Chub (\$2,000+)



Bluehead Sucker (\$500-\$1,000)



Colorado River Cutthroat (\$200-\$500)



Thank You to our Donors!

The following people/companies donated/discounted items or their services for the meeting in some way:

Deer Valley Resort Kent Sorenson Lifetime Products

Melissa Trammel Clam Outdoors

John Schultz Thanksgiving Point Trout Unlimited

Floy Tags Utah Jazz BioWest, Inc

**George Weekley Christenson's
Lakeshore Tackle Sportsman's
Warehouse**

Blue Halo

Red Rock Brewing Yeti Coolers George Sommer

Brighton Ski Resort Benelli Drake Outdoors

Falcon's Ledge Travis Sylvester

**Columbia River and
Knife Company Camp Chef**

**The Western Native Montana Fly
Trout Initiative Company**

Hogle Zoo



Be sure to check out the great auction and fundraising items on display at Union Grill on Tuesday night and Business Meeting Room 103 during the meeting! Tickets will be on sale throughout the meeting. See one of the ExComm officers for more information.

Conference Center Information

OGDEN-ECCLES CONFERENCE CENTER

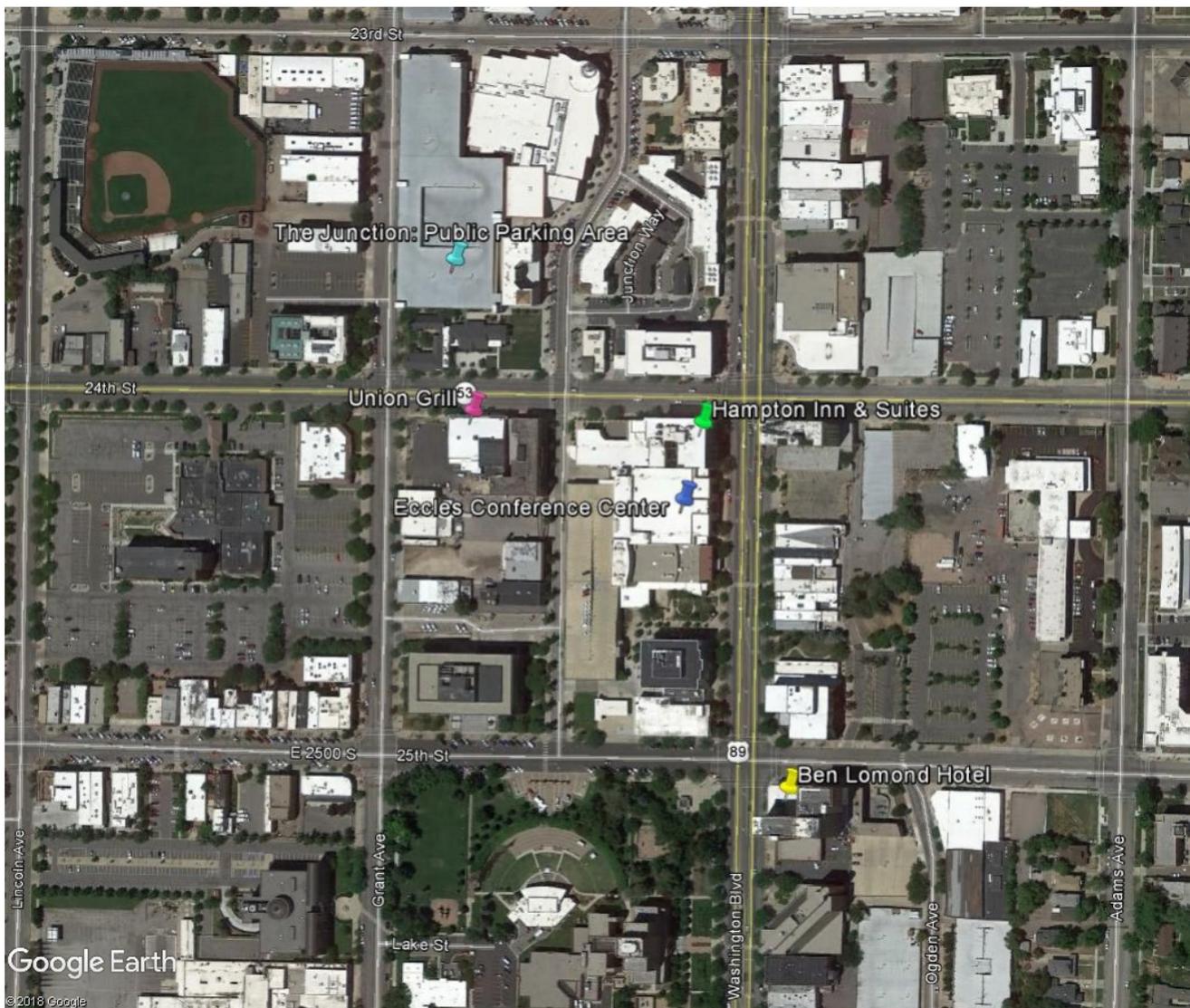
Address: 2415 Washington Blvd; Ogden; 84401

Phone: 801 689 9600

Website: <http://oeccutah.com/>

PARKING: For those of you that are coming to the meeting on a daily basis and not staying at one of the hotels, you will need to find parking (not available at conference center). Your best option is to use one of the several public parking areas at The Junction, which is northwest of the conference center and attached to the Megaplex Theater (see map). Street parking is also available, but limited.

If you are staying at the Hampton Inn or Ben Lomond Hotel, you can park in their designated parking areas and walk to the conference center from there (see hotel for more information).



Hotel Information

If you are staying at the hotel, room reservations were made by Utah AFS ExComm based on who you requested to room with during the registration process.

HAMPTON INN AND SUITES

The Hampton Inn is conveniently located next door to the Ogden-Eccles Conference Center.

Address: 2401 Washington Blvd; Ogden; 84401

Phone: 801 394 9400

Website: <http://www.hamptoninnogden.com/>

Check-in time is 3:00 pm and check-out time is 12:00 pm. Hotel parking and conference center parking is separate. If you are staying at the hotel you can park in hotel parking structure, which is west of the hotel. See the next page for more information.

Directions:

From the NORTH: I-15 South to 21st Street, Exit 343. Go east on 21st Street, turn right on Washington Blvd., go south three blocks to 24th Street. The hotel is located on the right hand corner across from the Wells Fargo Building. Park in the loading area at the curb. Parking access will be given at check-in. Parking is one-half block from the hotel.

From the SOUTH: Take I-15 North to 24th. Street, Exit 342. Turn right and go east on 24th Street over the viaduct to Washington Blvd. The hotel is located on the right hand corner of 24th and Washington across from the Wells Fargo Building.

To check-in/register: Park at the curb on 24th ST. or Washington Blvd. in the Valet/ Loading area. Parking access will be given at check-in. Parking located one-half block from hotel.

BEN LOMOND HOTEL

Due to the high number of meeting registrants this year, some of you will be staying at the Ben Lomond Hotel (if this is the case you have been notified by now).

Address: 2510 Washington Blvd; Ogden; 84401

Phone: 801 627 1900

Website: <http://www.benlmondsuites.com/>

Check-in time is 4:00 pm and check-out time is 11:00 am. Hotel parking and conference center parking is separate.

Directions: Directions to the hotel are the same as Hampton Inn and Suites. The Ben Lomond is about one block to the south of the Ogden-Eccles Center on the east side of the road (Washington Blvd and 25th Street).

Meals and Socials

Meals are included with your registration fees. Breakfast is provided by both hotels from 6:00 am-10:00 am. Lunch will be provided at the Ogden-Eccles Conference Center on Wednesday and Thursday. Utah AFS is hosting a welcoming social at Union Grill on Tuesday evening. The banquet and fundraising event will be held at the Ogden-Eccles Conference Center on Wednesday evening. See below for more information on the welcoming social and banquet.

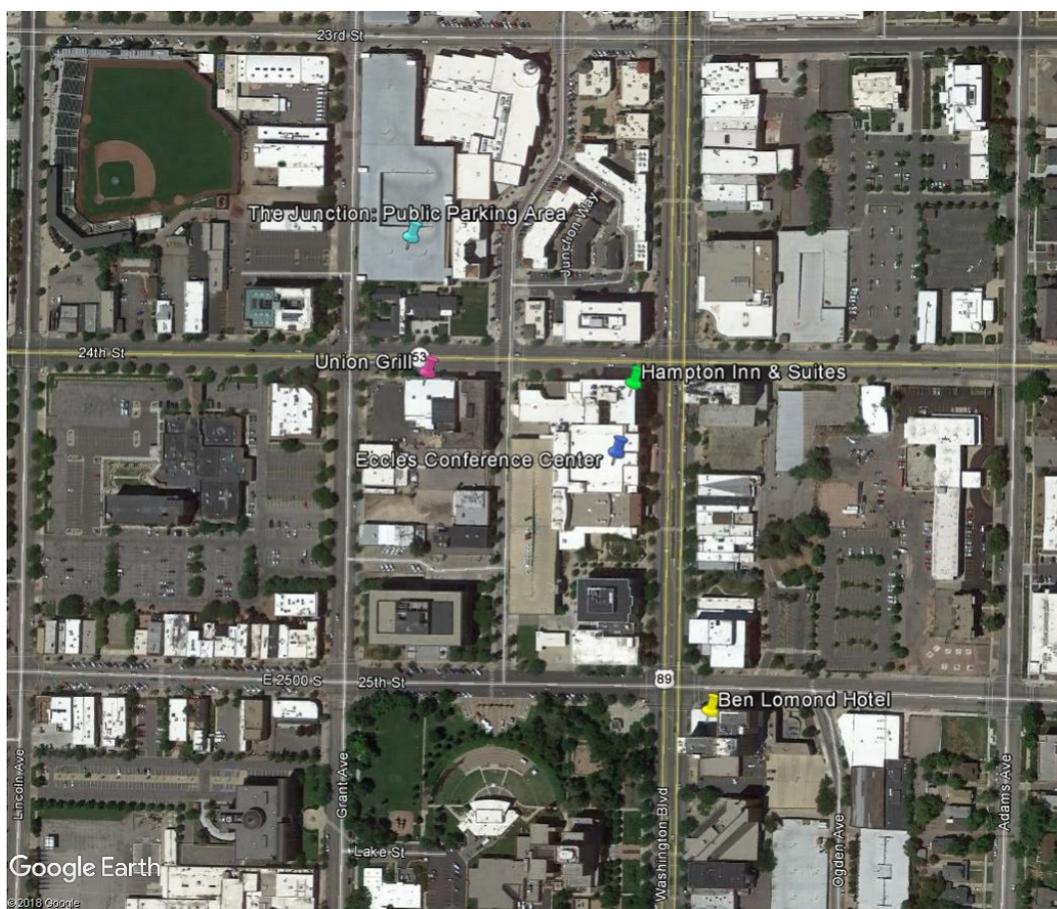
Welcome Social - Come join us to kick off the 2018 Utah AFS Annual Meeting. A buffet will be provided along with two free drink tickets. A cash bar will be available as well.

When: Tuesday, March 13th; 6:00 pm - 10:00 pm

Location: Union Grill (walking distance from hotel)

Address: 315 24th Street, Ogden, 84401

Phone: 801 621 2830



Banquet - The Banquet will be held on Wednesday, March 14th from 6:00 pm to 10:00 pm in the Junior Ballroom. Beer and wine will be provided. A cash bar will also be available.

Fundraising Event - Be sure to check out the great raffle items on display in Meeting Room 103. They will also be on display at Union Grill during the welcoming social. The fundraising event will occur after the banquet meal and awards presentation on Wednesday evening. Everyone is invited to participate. Raffle tickets will be available for purchase throughout the meeting. Tickets can be purchased from one of the Utah AFS ExComm members. Cash and credit cards are accepted!

Fundraising Event Break-down

General Raffle

\$1/ticket or wingspan of tickets for \$20

- Deer Valley - summer lift tickets
- Brighton Resort - 2 ski passes
- CRKT - 3 knives
- WNTI - hat and stickers
- Hogle Zoo - 2, 2 day passes
- Montana Fly Company - flies, fly-tying gear, and nippers
- Wright and McGill fly reel
- Scientific Anglers - 5 weight fly line
- Clam Outdoor items
- Thanksgiving Point - 4 day passes
- BioWest - Sage fly rod
- Sportsman's Warehouse items
- Christenson's Lakeshore Tackle

Silent Auction

- June sucker native fish necklace by Melissa Trammel
- Floy Tags - 500 tags, tagging gun, and ruler
- Red Rock Brewing Company - 2, \$25 gift certificates
- Falcon's Ledge - 1 membership
- Bonneville cisco prints by Joseph Tomelleri
- Utah Jazz - 2 autographed pictures

Deck of Cards Game

Package 1 (\$20/ card)

Redington Wayfarer fly rod package (rod, reel, and line); John Schultz - box of hand-tied flies; George Weekley - oak fly rod rack; Travis Sylvester - Cutthroat Slam canvas print

Package 2 (\$20/ card)

Benelli - Super Nova shotgun

Package 3 (\$25/ card)

Yeti - Hopper Flip 12 cooler; Lifetime Products - Tamarack sit-on-top kayak; Travis Sylvester - bull trout canvas print

Package 4 (\$10/ card)

Camp Chef - smoker

Package 5 (\$15/ card)

Yeti - Tundra 64 cooler

Schedule at a Glance

Tuesday, March 13th

<u>Time</u>	<u>Event</u>	<u>Location</u>
1:00 PM - 5:00 PM	Continuing Education - Fisheries Management through the use of Triploid Fish: Willard Bay Walleye Example	Willard Bay State Park South Marina / Ogden-Eccles Center Meeting Room 101-102
1:00 PM - 5:00 PM	Continuing Education - Urban Stream Restoration: Applications on the Ogden and lower Weber Rivers	Ogden-Eccles Center Meeting Room 101-102/ Ogden River
1:00 PM - 5:00 PM	Registration	Ogden-Eccles Center Main Entry/Lobby
5:30 PM - 7:00 PM	Registration	Union Grill
6:00 PM - 10:00 PM	Welcome Social	Union Grill

Wednesday, March 14th

7:30 AM - 5:30 PM	Registration	Main Entry/Lobby
7:00 AM - 5:00 PM	Presentation Download	Registration Desk
9:00 AM - 9:15 AM	Opening remarks and presidential message by Ben Brown	Junior Ballroom
9:15 AM - 11:50 AM	Plenary Session	Junior Ballroom
11:50 AM - 12:00 AM	Western Division Message by Jackie Watson	Junior Ballroom
12:00 PM - 1:30 PM	Lunch - provided by Utah AFS	Southeast Lobby
12:30 PM - 1:30 PM	Utah AFS Business Meeting Luncheon	Junior Ballroom
1:30 PM - 4:30 PM	Contributed Papers - Concurrent Sessions	Executive Room 100/ Meeting Room 101-102
4:30 PM - 5:45 PM	Poster Session	North Corridor
6:00 PM - 10:00 PM	Banquet/Fundraising event/Awards	Junior Ballroom

Thursday, March 15th

7:30 AM - 10:00 AM	Presentation Download	Registration Desk
8:30 AM - 12:10 PM	Contributed Papers - Concurrent Sessions	Executive Room 100/ Meeting Room 101-102
12:10 PM	Lunch - provided by Utah AFS	Lounge
12:10 PM	Adjourn	

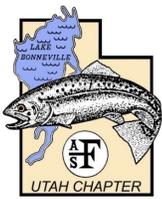
**Utah Chapter of the American Fisheries Society
Business Meeting Agenda**

March 14th, 2018; 12:30-1:30 p.m.
Ogden-Eccles Conference Center – Junior Ballroom



AGENDA

1. Determination of a quorum
2. President's Welcome/opening remarks: Ben Brown
3. Treasurer's report: Paul Burnett
4. President Elect message: Paul Thompson
5. 2019 meeting plan: George Weekley
6. Election results: Ben Brown
7. Question and discussion from membership
8. Time Pending - Open dialogue: What should Utah AFS ExComm's role be in policy and advocacy?
 - a. Where should we stand as advocates?
 - b. Do we have support from members to respond?
 - c. Case in point: Utah Stream Access Bill (Utah specific) and Recovering America's Wildlife Act (directed from Society)
 - d. Good opportunity to develop a new sub-committee



AGENDA

Wednesday, March 14th
Plenary Session
Room: Junior Ballroom
Moderator: Ben Brown

9:00 - 9:15	Ben Brown: Opening Remarks and Presidential Message	
9:15 - 9:30	Ben Holcomb: Utah's Response to Cyanobacteria Harmful Algal Blooms	
9:30 - 9:45	George Weekley: Harmful Algal Blooms and Aquatic Effects	
9:45 - 10:00	Kevin Okleberry: DWQ's Spills Reporting and Resolution	
10:00 - 10:15	Chris Cline: Introduction to Natural Resource Damage Assessment and Restoration (NRDAR): A Tool for restoring resources injured by oil or hazardous materials releases	
10:15 - 10:30	Liliana Benavidez: Salt Lake County Health Department HAB Response	
10:30 - 10:50	BREAK - Southeast Lobby	
10:50 - 11:50	Open forum discussion	
11:50 - 12:00	Jackie Watson: Western Division AFS message	
12:00 - 1:30	LUNCH - Southeast Lobby	
12:30 - 1:30	Utah AFS Membership Business Luncheon - Junior Ballroom	
	Session 1A: Habitat Connectivity	Session 1B: General Session
	Room: Executive Room 100	Room: Meeting Room 101-102
TIME	Moderator: Erin Bertram	Moderator: Ben Holcomb
1:30 - 1:50	Don Wiley/Daniel Olsen: Fish and Wildlife do it! Migrate, that is	Kevin Landom: Shift in fish community trophic structure following carp removal, drought, and harmful algal blooms in a large shallow lake ecosystem
1:50 - 2:10	Don Wiley/Daniel Olsen: Fish and Wildlife do it! Migrate, that is	Ryan Dillingham: Littoral Vegetation, Carp Removal, and Multiyear Drought, and their Association with Macroinvertebrate Community Structure in a Shallow Eutrophic Lake, Utah Lake
2:10 - 2:30	Dan Abeyta: USDA Forest Service - Rise to the Future: National Fish and Aquatic Strategy	Bryan Engelbert: Transforming Desert Landscapes: the Art of Making a Destination Fishery
2:30 - 2:50	Scott Tolentino: Bear Lake Tributaries Fish Passage Improvement and Increase in Wild Cutthroat Trout	Jerrad Goodell: Identifying priority stressors and making causal determinations: Collaborative monitoring with AIM
2:50 - 3:10	BREAK - Lounge	



Wednesday, March 14th

TIME	<p align="center">Session 2A: Habitat Connectivity</p> <p align="center">Room: Executive Room 100</p> <p align="center">Moderator: Don Wiley</p>	<p align="center">Session 2B: In-stream Flows</p> <p align="center">Room: Meeting Room 101-102</p> <p align="center">Moderator: Scott Tolentino</p>
3:10 - 3:30	Susan Washko: Preliminary Evaluation of Trout in Beaver-Altered Streams	Timothy Hawkes: A River Runs Through It: the changing legal landscape of instream flows
3:30 - 3:50	Demitra Blythe: How habitat complexity affects the native fish diversity and food web structure of the Rio Grande in Big Bend National Park, Texas, United States	Jordan Nielson: System Conservation Pilot Program - Could this be an answer to achieving target flows?
3:50 - 4:10	Emanuel Vasquez: Mapping utility of drone-acquired imagery: Detecting potential northern leatherside chub pool habitat of Yellow Creek, Evanston, Wyoming	Dan Keller/Sue Bellagamba: Augmentation of Flows in the Price River by Restoration of Olsen Reservoir & Wetland
4:10 - 4:30	Thomas Hafen: Ecological effects of lake characteristics and arctic char presence on cohabiting native fish assemblages, demographics, and trophic niche	Dan Keller/Sue Bellagamba: Augmentation of Flows in the Price River by Restoration of Olsen Reservoir & Wetland
4:30 - 5:45	POSTER PRESENTATION - North Corridor	
6:00 - 10:00	Banquet/Fundraising Event/Awards - Junior Ballroom	



Thursday, March 15th

TIME	Session 3A: Native Genetics and Distribution Room: Executive Room 100 Moderator: Chance Broderius	Session 3B: General Session Room: Meeting Room 101-102 Moderator: Trina Hedrick
8:30 - 8:50	Randy Oplinger: Maintaining Genetic Diversity within Utah's Wild Salmonid Brood Program	Alan Ward: Evaluation of Fish Sampling Techniques at Strawberry Reservoir
8:50 - 9:10	Erin Bertram: Developing Statewide Priorities & Recovery for Mollusks in Utah	Weston Pearce: Factors Influencing Cutthroat Trout Population Dynamics in Strawberry Reservoir, Utah
9:10 - 9:30	Torrey Rodgers: Environmental DNA sampling of native freshwater mussels in Utah	Mike Hadley: Otter Creek Reservoir: Utah's Preeminent Rainbow Trout Fishery
9:30 - 9:50	Jake Mecham: Preliminary genetics, catch rates, and size structure of a newly discovered population of Least Chub (<i>lotichthys phlegethontis</i>) in the San Pitch River in Sanpete County, Utah.	Garn Birchell: Steinaker Reservoir Creel Survey Results
9:50 - 10:10	Dennis Shiozawa: New perspectives on cutthroat trout evolution	Tyler Arnold: Determining age and size of fecund Walleye (<i>Sander vitreus</i>) in Willard Bay, Utah using non-lethal dorsal spine analysis
10:10 - 10:30	Break - Lounge	



Thursday, March 15th

TIME	Session 4A: General Session Room: Executive Room 100 Moderator: Natalie Boren	
10:30 - 10:50	Mark Belk: A population matrix model for least chub (<i>lotichthyes phlegothonis</i>)	
10:50 - 11:10	Melinda Bennion: Limiting factors and recovery of Woundfin in the Virgin River	
11:10 - 11:30	Erik Woodhouse: Evaluation of the native and non-native fish distribution in the rarely sampled Escalante River and its tributaries	
11:30 - 11:50	Ben Stout: You can do it! Determining fish status from mobile PIT antenna detections	
11:50 - 12:10	Taylor Shamo: Understanding the contemporary sport fishery of the Logan River, Utah: what factors best explain angler catch rates and satisfaction	
12:10	Lunch - Lounge	
12:10	Adjourn - Thanks for coming!!	

POSTERS

Nick Barrett: "Warming up the waters: Implications from individuals to ecosystems"

Alec Boyer: "A tale of two habitats: shape variation between anadromous and lacustrine *Galaxias maculatus* in Chile"

Kenen Goodwin: "Can non-lethal fin rays be used to age the endangered June sucker instead of otoliths?"

Harrison Mohn: "Use of inflow areas by razorback sucker (*Xyrauchen texanus*)"

Kendra Nichols: "Evaluating diet overlap between cutthroat trout and brown trout in instream, experimental enclosures under differing densities: can native trout resist the impacts of nonnative trout when they occur at higher densities?"

Parker Nielson: "Do otoliths of adult fish retain information regarding trophic niches of juvenile stages?"

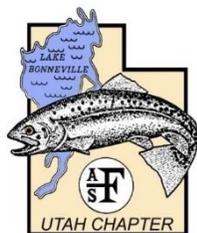
Nicholas Padilla: "Cormorant's: where are they during and after fish stocking in suburban ponds in Northern Utah"

Ronald Rogers: "A nonlethal aging technique for threatened, endangered, and sensitive fishes"

Michael Sorensen: "Ecological exchangeability of dark and dusky rockfish in Southeast Alaska"

Samantha Tilden: "Variation in incidence and age structure of *Sarcotaces arcticus* between two host rockfish species off Southeast Alaska"

Ryan West: "Spatial variation of sculpin diets along the longitudinal gradient in the Logan River, Utah"



2018 Utah Chapter of the American Fisheries Society Contributed Paper Abstracts (alphabetical order)

USDA Forest Service – Rise to the Future: National Fish and Aquatic Strategy

Dan Abeyta: US Forest Service; 324 25th Street, Ogden, Utah 84401; djabeyta@fs.fed.us

Dan Shively; dshively@fs.fed.us

Nathaniel Gillespie; ngillespie@fs.fed.us

John Rothlisberger; jrothlisberger@fs.fed.us

Abstract: The Forest Service has a unique role to foster healthy watersheds and aquatic habitats that sustain abundant, uniquely adapted fish and wildlife populations for the ecological, social, and economic needs of the American people. In order to do this, the agency relies upon and cooperates closely with many branches of State governments, especially fish and wildlife agencies, and other Federal agencies and tribal governments. The updated strategy is needed to integrate Forest Service programs and actions related to fish and aquatic stewardship in all parts of the agency, particularly through watershed-scale restoration and partnerships. This strategy contains six goals:

1. Conserve fish and aquatic resources.
2. Connect people to the outdoors through fishing, boating, and other aquatic activities.
3. Strengthen partnerships and work across boundaries.
4. Deliver and apply scientific research.
5. Build capacity through mentoring and training.
6. Communicate the value and benefits of fish and aquatic resources.

The Forest Service is committed to working agency-wide in an integrated manner to accomplish all six goals in this strategy. More importantly, the Forest Service cannot do it alone and is strongly committed to working in cooperation with States, especially State fish and wildlife agencies, other Federal agencies, and tribal governments and in partnership with nongovernmental organizations, private landowners and water users, the private sector, and others to accomplish specific objectives and tasks identified in the six goals of this strategy.

Presentation Format: Oral

Presentation Type: Professional

Determining age and size of fecund Walleye (*Sander vitreus*) in Willard Bay, Utah using non-lethal dorsal spine analysis

Tyler Arnold: Utah State University; 2695 N 270 E; North Logan, UT, 84341; texarnold008@gmail.com

Chris Penne ; chrispenne@utah.gov

Phaedra Budy; phaedra.budy@usu.edu

Gary Thiede; gary.thiede@usu.edu

Abstract: Walleye (*Sander vitreus*), both in their native and introduced range, are a popular and valuable game fish in North America; therefore, their status and abundance is closely monitored to ensure proper harvest regulations, stocking strategies, and habitat needs. On average, females mature at 450 mm, and males mature at 350 mm. However, Walleye in different environments grow and reach maturation at different sizes and ages, reproducing as early as age-2 in Texas or as late as ages 12-15 in colder Canada. Determining age from spines eliminates the need to lethally sacrifice fish for traditional otolith samples. Dorsal spines were collected to age reproductively active Walleye in Willard Bay, Utah. On average, females from Willard Bay are 509 mm (95% CI: 504-514 mm) and males are 455 mm (95% CI: 449-462 mm). Both sexes range from age 3-8. In addition, Walleye in Willard Bay are growing to a larger size before they reach sexual maturity compared to Walleye in their native range. In conjunction with aging these Walleye, there is potential to back-calculate growth, although this approach proves less certain using spines. Of our sampled fish, the average total length by year one was 164 mm. This information will give insight on length at different ages and how quickly Walleye meet different length categories such as quality, preferred, or memorable sizes. Information such as this could be used to determine size regulations for harvest. Walleye in Willard Bay were on a decline in 2013 and 2014; our age determinations allow managers to assess year-class strength and likely the causes including stocking effectiveness. This information provides important size and age information to managers hoping to continue and enhance this important warm-water fishery.

Presentation Format: Oral

Presentation Type: Student

Warming up the waters: Implications from individuals to ecosystems

Nick Barrett: University Graduate Student; 70S 500E; Logan, UT, 84321; nbarrett1992@gmail.com

Phaedra Budy; phaedra.budy@usu.edu

Soren Brothers; soren.brothers@usu.edu

Abstract: The effects of climatic warming are often both complex and diverse, with consequences spanning across all levels of biological organization, from individuals to ecosystems. Warming may lead to reductions in suitable habitat for fish due to increased surface water temperatures and reduced dissolved oxygen (DO) in deeper waters, potentially causing a “temperature-oxygen squeeze”. To investigate this, we plotted lake temperature and DO profiles from two summers and quantified the volume of habitat considered as poor habitat for Arctic Char (*Salvelinus alpinus*). Our results suggest a combination of increased surface water temperatures, stratification, and hypoxia lead to a largest

reduction in suitable habitat for Arctic Char (73%). As a response, fish may need to locally adapt (e.g., thermoregulate) to changing conditions in order to avoid negative consequences to their growth, survival, and fitness. At the ecosystem level, warming may lead to shifts in whole-lake metabolism due to the temperature-dependencies of metabolic processes. We estimated lake metabolism in four lakes using a modeling approach that incorporates environmental variables coupled with continuous dissolved oxygen data. Preliminary estimates indicate low productivity within these systems, reflecting their ultra-oligotrophic status. However, one small lake (Fog 5) displayed higher levels of metabolic processes, likely due to its morphology (shallow, low volume), relatively low position in the landscape, and higher levels of organic matter. Furthermore, systems with higher productivity, such as Fog 5, may be particularly responsive to warming in terms of shifts in whole-lake metabolism. Additionally, warming may strengthen the feedbacks between individual and ecosystem-level processes (e.g., uptake and production of carbon and oxygen). Thus, in order to fully understand the effects of warming, we must consider both individual & ecosystem-level responses. Future work will consist of modeling the effects of increased water temperatures on suitable habitat for arctic fish and lake metabolism.

Presentation Format: Poster

Presentation Type: Student

A population matrix model for least chub (*Lotichthyes phlegothonis*)

Mark Belk: Brigham Young University; 4102 LSB, Department of Biology; Provo, Utah 84602;

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Nathan St. Andre; nst_andre@live.com

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Abstract: Least chub (*Lotichthyes phlegothonis*) is a small cyprinid endemic to Utah. Currently, it is found in a small fraction of its historic range and it is a species of conservation concern regulated by a conservation agreement. One of the challenges of conserving least chub populations is monitoring population dynamics. To help understand population dynamics of least chub, we developed a simple transition matrix model. We use the model to predict the proportion of juveniles to adults that would represent positive or negative population growth. These values can be used to guide interpretation of numbers of each age class captured during monitoring. Future work will include linking population dynamics to climatic variation or disturbance effects.

Presentation Format: Oral

Presentation Type: Professional

SLCoHD HAB Response

Lili Benavidez: Salt Lake County Health Department; 788 E Woodoak Lane; Murray, UT 84107;
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Abstract: An overview of the Salt Lake County Health Department's role and response to harmful algal blooms.

Presentation Format: Oral

Presentation Type: Professional

Limiting factors and recovery of Woundfin in the Virgin River

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Abstract: Woundfin (*Plagopterus argentissimus*) have been federally listed as an endangered species since 1970. Successful reproduction and recruitment of Woundfin is limited to a 16.3 mile reach in the upper Virgin River in Utah. Currently, only a small portion of Woundfin live to be greater than 1-year old in the wild; the persistence of Woundfin is dependent on the survival and reproductive success of these young fish. Woundfin abundance and distribution has been limited by multiple factors including non-native fish, drought, altered streamflow regimes, diversions, elevated water temperature, decreased turbidity, water management events, and a decline of spawning and rearing habitat.

Since 2000, the Utah Division of Wildlife Resources has worked through the collaborative Virgin River Program to identify and evaluate these factors limiting Woundfin persistence and recruitment. This presentation will highlight the creative ways we have addressed these factors and enhanced Woundfin populations and habitat recovery in the Virgin River.

Presentation Format: Oral

Presentation Type: Professional

Developing Statewide Priorities & Recovery for Mollusks in Utah

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Abstract: In Utah and the great west, water availability is a major threat and limitation for native freshwater organisms especially for endemic and isolated springsnails and other mollusks of Utah. Mollusks of Utah include freshwater and terrestrial gastropods and freshwater mussels. However, very little information exists for the 100+ species of mollusks that exist or have been described in Utah, some having not been described since pre 1929. Several species lack information on locality and range,

genetics and morphology, and current level of threats or stability as a species. I plan to discuss some of the past and most recent efforts being made in Utah by the Utah Division of Wildlife Resources and associated partners in protecting and increasing our knowledge on this very diverse and sensitive group of species.

Presentation Format: Oral

Presentation Type: Professional

Steinaker Reservoir Creel Survey Results

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Trina Hedrick; trinahedrick@utah.gov

Abstract: Steinaker Reservoir is the primary recreation feature of Steinaker State Park located just north of Vernal, Utah. Fish species inhabiting Steinaker Reservoir include Rainbow Trout, Brown Trout, Largemouth Bass, Bluegill and Green Sunfish. Steinaker Reservoir is managed as a multi-story basic yield fishery with annual stocking of 10" rainbow trout. Brown Trout have always been a component of the fishery due to natural input of fish from Ashley Creek. However, to increase angler opportunities for Brown Trout the UDWR recently began stocking Brown Trout fingerlings into the reservoir. The Largemouth Bass and Bluegill component of the fishery are maintained solely through natural reproduction. To assess current angler usage at Steinaker Reservoir, a two-stage roving creel survey was conducted by the UDWR Northeastern Region from April 2016 through March 2017. Basic creel metrics including angler effort, total catch, total harvest, catch rates and harvest rates will be presented. In addition we will also present angler demographics, species preference and angler satisfaction data.

Presentation Format: Oral

Presentation Type: Professional

How habitat complexity affects the native fish diversity and food web structure of the Rio Grande in Big Bend National Park, Texas, United States

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Dr. Phaedra Budy; phaedra.budy@usu.edu

Abstract: Many native fishes within the Rio Grande have been reduced or eradicated by the loss of viable habitat, poor water quality, and spread of invasive species due to the altered flow and sediment regimes of the river. The primary goal of our study was to determine how the modified hydrologic and sediment regimes of the Rio Grande have impacted the aquatic food web structure and function, with an emphasis on native fish diversity. We used a multi-faceted approach to 1) examine the fish community and structure across varying levels of habitat complexity, and 2) quantify and describe the aquatic food web structure and complexity. We observed that fish diversity (Shannon's Diversity Index) and isotopic niche space were greatest and lowest in reaches we a priori classified as high ('complex') and low ('simple') complexity, respectively, at the microhabitat scale. At the macrohabitat scale, where we compared diversity between alluvial valleys and canyons, fish diversity was approximately 59%

greater in canyon reaches than in alluvial reaches. In addition, food chain length and food web structure were higher and more complex in canyon reaches. Further, terrestrial invertebrate abundance varied between native and nonnative vegetation, with nonnative abundance approximately 4% higher than native. Increased terrestrial input from nonnative vegetation may have shifted a system previously dependent on continuously-available autochthonous sources of energy to one dependent on seasonal allochthonous sources of energy. Collectively, our results suggest the modern flow and sediment regimes may limit the availability of suitable or preferred habitat and food resources required for the sustained viability of native fishes within the Rio Grande. As such, native fish recovery and maintenance may depend largely on the effective management of stream flow in the Rio Grande, and concordant changes in lower trophic level productivity and food availability.

Presentation Format: Oral

Presentation Type: Student

A tale of two habitats: shape variation between anadromous and lacustrine *Galaxias maculatus* in Chile

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Abstract: Habitat can drive differing morphology between fish of the same species. Differences in habitat that influence shape of fishes include the presence or absence of predators, whether the water is flowing or standing, and the type of feeding (ram or suction) that is more effective. To determine effects of isolation in lakes versus rivers, we analyzed differences in body shape and head shape between *Galaxias maculatus* from anadromous and lake populations in Chile, and found that anadromous fish are more robust and have smaller eyes than fish found in lakes. These patterns of shape variation are consistent with some other examples of small fishes isolated in lakes compared to anadromous populations. This variation is consistent with habitat-specific selection on body shape.

Presentation Format: Poster

Presentation Type: Student

Introduction to Natural Resource Damage Assessment and Restoration (NRDAR): A Tool for restoring resources injured by oil or hazardous materials releases

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Abstract: What is “NRDAR” besides a funky acronym? “NRDAR” is Natural Resource Damage Assessment and Restoration, which is a technical and legal process for determining what natural resources were injured (e.g., fish and their habitats), where, how much, and for how long after an oil

spill or release of other hazardous substances, and what it will take (time, money, effort) to restore those resources and compensate for the period of time that they were injured. It is similar to an insurance adjustment process, with the goal being to make the “policy holders” (Trustees-- Federal natural resource management agencies, States and Tribes) “whole again.” This presentation will introduce the key concepts of NRDAR, give some examples of how it has been used in Utah, and discuss the role that biologists and fisheries managers have in spill response and restoration.

Presentation Format: Oral

Presentation Type: Professional

Littoral Vegetation, Carp Removal, and Multiyear Drought, and their Association with Macroinvertebrate Community Structure in a Shallow Eutrophic Lake, Utah Lake

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Abstract: Littoral vegetation functions as critical lake habitat by providing substrate for macroinvertebrate communities and refuge from predators. However, common carp (*Cyprinus carpio*) uproot littoral vegetation and lake level fluctuations can leave littoral vegetation desiccated along exposed shorelines. The consequences of introduced common carp and multiyear drought are particularly problematic in Utah Lake, UT, where the juvenile endangered June sucker need access to refuge and resources provided by littoral vegetation to complete their life cycle. A large-scale, whole-lake carp removal was initiated to promote recovery of vegetated habitat, but concurrent multiyear drought, reducing lake depth by >50%, may confound any effects. Here, we test whether macroinvertebrate community structure varies across vegetation communities, responds to carp removal, and is influenced by multiyear drought in Utah Lake. Our findings will provide detail aiding recovery of the endemic endangered June sucker, while simultaneously improving our understanding of ecosystem health in the face of carp removal and multiyear drought.

Presentation Format: Oral

Presentation Type: Student

Transforming Desert Landscapes: the Art of Making a Destination Fishery

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Abstract: As the second driest state in the country, Utah possesses an abundance of desert environments. Since aquatic resources are so limited in these environments, fisheries professionals should focus activities that maximize their potential. The goals of such projects may be intradisciplinary. For example, a stream restoration project can enhance aquatic resources that benefit native

conservation fish species, provide a benefit for anglers, provide potential fire breaks, and provide terrestrial wildlife habitats that are otherwise scarce. Projects should focus on improving habitat in the present and have benefits that can be realized into the future. This presentation focuses on one such project in the Utah Bookcliffs region that is working toward goals of providing aquatic species habitat and refuge, repairing instream and riparian areas from decades of abuse, and having an eye toward self-sustaining recovery in the future with biological controls of flash flooding, stream shading, and increasing water residency time.

Presentation Format: Oral

Presentation Type: Professional

Identifying priority stressors and making causal determinations: Collaborative monitoring with AIM

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Scott Miller

Justin Jimenez

Robin Jones

Abstract: Aquatic Assessment, Inventory, and Monitoring (AIM) data collected by the Bureau of Land Management (BLM) suggested that perennial streams in Carbon and Emery counties of Utah exhibit increased nutrient loading and conductivity levels. Observed values exceeded state water quality standards and therefore did not meet BLM land health standards. However, water quality field data collection was limited to one-time grab samples collected in the summer during low flows, potentially leading to elevated concentrations. Based on aquatic AIM data, the BLM Green River District in 2017 coordinated with the Utah Division of Water Quality to collect monthly water samples within in Carbon and Emery counties to further address potential water quality exceedances following state guidelines. The goals of this monitoring were to determine 1) what is the spatial and temporal extent of water quality impairments, and 2) which land uses and ownership are most strongly associated with changes in water quality. We will assess the attainment of state water quality standards using the temporally intensive sampling data and relate spatial patterns to land use activities such as the percent agriculture, density of oil and gas wells, and watershed geology upstream of sampling points.

Presentation Format: Oral

Presentation Type: Professional

Can non-lethal fin rays be used to age the endangered June Sucker instead of otoliths?

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Abstract: The June Sucker (*Chasmistes liorus*) is endemic to Utah Lake, UT and federally listed as endangered due to severe ecosystem degradation and introductions of nonnative fishes. The wild population has been continuously augmented with captive marked fish, yet individuals have been consistently captured in the lake without marks. State biologists have collected dorsal fin rays for stable isotope natal origin analysis to determine if these unmarked June Sucker may be the result of natural recruitment. We explore the possibility of using non-lethal dorsal fin rays to age June Sucker in order to help biologists determine when, if observed, natural recruitment may have occurred. We compared age estimates between dorsal fin rays and lapilli otoliths obtained from a June Sucker refuge population that perished during a water draining event. Our results show that although percent agreement between two independent readers were similar for both otoliths (31.7%) and dorsal fin rays (29.3%), age estimates were more precise as measured by average coefficient of variation for otoliths (13.2%) than dorsal fin rays (35.0%). Additionally, dorsal fin rays consistently underestimated otolith ages, particularly beyond age five. Thus, we propose that dorsal fin rays cannot be used to accurately age June Sucker older than five years.

Presentation Format: Poster

Presentation Type: Student

Otter Creek Reservoir: Utah's Preeminent Rainbow Trout Fishery

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Abstract: Otter Creek Reservoir in south central Utah has supported one of the state's most popular trout fisheries for over 100 years. A unique combination of productivity and access provides anglers with the opportunity to catch and harvest a limit of quality-sized rainbow trout. An angler survey was conducted at Otter Creek Reservoir in 2016 to fully evaluate measures of angler use and success, as well as overall efficiency of the sport fishery. Results of the survey showed that Otter Creek Reservoir provides a significant draw to anglers from across Utah, as well as non resident anglers. These anglers enjoyed high catch and harvest rates, good success with simple fishing methods, and large average fish size. Management of the fishery is also very efficient as anglers harvest 2.5 times the weight of rainbow trout stocked every year. These results and more demonstrate that Otter Creek Reservoir sustains the most successful rainbow trout sport fishery in Utah.

Presentation Format: Oral

Presentation Type: Professional

Ecological effects of lake characteristics and arctic char presence on cohabiting native fish assemblages, demographics, and trophic niche

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Abstract: Arctic lake ecology is driven by abiotic and biotic factors, and lakes with inlet or outlet streams that allow the free migration of fish typically have biota and trophic structures that differ from isolated lakes. In addition, the presence of Arctic Char (*Salvelinus alpinus*) appears to influence co-occurring native species growth, maximum size attained, diet, and condition. Finally, lake characteristics and morphometry such as lake depth and surface area may affect fish growth and fish distribution across the Arctic landscape. Depending on presence of Arctic Char in lakes, the diets of Lake Trout (*Salvelinus namaycush*) and Arctic Grayling (*Thymallus arcticus*) varied in terms of piscivory and diversity of prey. In lakes without Char, fish prey was 0.4% of Lake Trout diets; yet in lakes with Char, fish prey represented 23% of lake trout diets. In lakes with Char, Grayling diets surprisingly expanded to include more desired trichopteran prey, up to 50% of diets. Both Lake Trout and Grayling were bigger in lakes with Arctic Char present. Diets of all fish became more diverse in lakes without Char. In addition, lake surface area appears to play a role in maximum size of fish.

Presentation Format: Oral

Presentation Type: Student

A River Runs Through It: the changing legal landscape of instream flows

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Abstract: Historically, Utah has had limited legal tools available to protect and restore instream flows, and even those tools have been under utilized. Pressure on scarce water resources is driving new conversations among stakeholders, however, and those conversations are, in turn, creating real potential for legal and policy innovations over the next few years. The presentation will cover existing instream flow laws, as well as as new conservation tools with an instream flow component, including water banking, split season leases, and basin councils.

Presentation Format: Oral

Presentation Type: Professional

Utah's Response to Cyanobacteria Harmful Algal Blooms

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Abstract: Globally, harmful algal blooms (HABs) are occurring at an increasing rate. Along coastal North America, HABs have increased 30 fold since the 1960s. Similar or higher rates are likely in North America's inland waters. These blooms not only have ecological consequences, such as disrupting fisheries, but human health and welfare consequences as well, like recreation and drinking water. Recent examples include nationally, the loss of drinking water to half a million people along Lake Erie and major recreational economy disruptions in Florida to locally, a Utah Chub and bat kill at Scofield Reservoir and major recreational losses at Utah Lake. As a result, Utah Division of Water Quality (DWQ) and Utah Department of Health (DOH) have partnered to produce HAB guidance documents, coordination and action plans to inform and protect the public from these events. This session will provide: 1. 'HABs 101': learning to identify HABs broadly and common taxa found in Utah, 2. overview of action plan guidelines to protect the public, 3. agency plans for communication, coordination, and outreach activities. 4. review 2017 HAB events, and 5. latest techniques adopted by UDWQ for detecting, tracking, and responding to these events.

Presentation Format: Oral

Presentation Type: Professional

Augmentation of Flows in the Price River by Restoration of Olsen Reservoir & Wetland

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Abstract: The lower Price River provides year round habitat for several native fish species including: flannelmouth sucker, bluehead sucker, and speckled dace; additionally seasonal use by endangered fishes of the Colorado River Basin has been well documented. Low flows, poor water quality, and periodic fish kills in late summer are all limiting factors for fish that we intend to address by securing an emergency pool of water used to strategically augment base flows. Olsen Reservoir was built in 1952 on an ephemeral tributary of the Price River to collect and reuse irrigation runoff; however, conversion of flood irrigation to sprinklers resulted in reduced return flows and the loss of valuable wetland habitat. Currently The Nature Conservancy, Utah Division of Wildlife Resources, and Bureau of Land Management are working closely with the Carbon Canal Company to improve the Carbon Canal system so water can be delivered to Olsen Reservoir. The advantage of using Olsen Reservoir as a storage site is its close proximity to the Price River confluence, which will decrease water lost to evaporation and ground seepage. Olsen Reservoir is below major points of diversion so water released at this location will remain in-stream to directly benefit fish. Additionally, storing water at this location will recharge a

desiccated wetland, benefiting a whole host of wildlife and attracting interest from partners. Dealing with water quality concerns due to Mancos Shale deposits in the local geology and balancing the needs of agricultural and the environment are some of the biggest obstacles facing the project; however, we are optimistic that the strong partnerships being built around the Price River will provide the momentum to push the project towards a successful outcome.

Presentation Format: Oral

Presentation Type: Professional

Shift in fish community trophic structure following carp removal, drought, and harmful algal blooms in a large shallow lake ecosystem

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Abstract: Anthropogenic and natural ecosystem disturbances, such as management actions or multiyear drought, can have dramatic effects on aquatic food web structure. In Utah Lake, UT, for instance, over 13,000 tons of invasive common carp had been removed since 2009, and, all the while, the ecosystem has gone through two multiyear drought cycles and numerous harmful algal blooms. We compared the pre-carp removal Utah Lake fish community, 2006-2007, to the fish community half a decade into the common carp removal effort, 2015-2016, to quantify potential disturbance-driven changes in trophic structure using stable isotope community metrics. Isotopic community hull analyses illustrated a dramatic shift toward a more littoral energy source (^{13}C) from historic to more recent times. Our community-wide metrics showed no change in niche diversity at the base of the food web (range in ^{13}C), yet an increase in the degree of trophic diversity (range in ^{15}N), and an increase in the proportion of species with similar trophic niches (increased trophic redundancy) when comparing the historic to the more recent fish community. We assessed the potential ecological relationships among carp removal, drought, algal blooms, and the observed shift in fish community structure, and concluded with assessments of empirical data to help describe these relationships. Our efforts highlighted the utility of applying isotopic community metrics to describe shifts in trophic structure.

Presentation Format: Oral

Presentation Type: Professional

Preliminary genetics, catch rates, and size structure of a newly discovered population of Least Chub (*Iotichthys phlegethontis*) in the San Pitch River in Sanpete County, Utah.

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Abstract: Least Chub (*Iotichthys phlegethontis*) is a small-bodied cyprinid endemic to Utah's Bonneville Basin with six natural populations known to occur in Utah. In 2016, Least Chub were discovered in the San Pitch River just below Gunnison Reservoir, an area where they were not known to occur previously. Passive sampling via minnow trap was conducted to assess catch rates and size structure of this population. Five fin clips were also collected and sent to the Utah State University Molecular Ecology Laboratory to determine the genetic origin of the population. Sampling showed catch rates similar to other natural populations and the presence of multiple age classes. Genetic analyses suggested the San Pitch population of Least Chub are fixed for, or have a high frequency of a single base pair mutation in the mitochondrial cytochrome b gene that distinguishes it from other known populations. However, because only five fin clips were analyzed and reference samples from other populations are minimal, it is difficult to assess whether this difference can be attributed to a founder effect from an unsampled mitotype, if the mutation arose in the population due to a long period of isolation, and if the mitochondrial COI differences are reflected in the nuclear genome. Further sampling of the San Pitch and surrounding populations, as well as microsatellite development and testing will help to answer these questions. In addition, continued sampling will also help to assess the distribution of the San Pitch population.

Presentation Format: Oral

Presentation Type: Professional

USE OF INFLOW AREAS BY RAZORBACK SUCKER (*Xyrauchen texanus*)

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Ron Kegerries

Mark C. McKinstry

Ron Rogers

Abstract: During the last century, populations of endangered Razorback Sucker (*Xyrauchen texanus*) have declined in the Colorado River basin, with the only remaining wild population residing in Lake Mead. Dramatic changes in habitat resulting from altered flow regimes and the presence of nonnative fishes were likely major factors contributing to this decline. The Lake Mead population persists within four prominent inflow areas, therefore, we hypothesize that inflow areas provide important and necessary habitat for natural recruitment and reproduction. In 2011 we initiated Razorback Sucker

investigations at the Lake Powell-San Juan River inflow and the Lake Powell-Colorado River inflow using methodologies developed in Lake Mead. Similar to Lake Mead, we found multiple age-classes of Razorback Sucker in Lake Powell along with larval fish, but wild recruitment in Lake Powell was more difficult to document due to the large numbers of fish stocked into the San Juan and Colorado rivers. Our research suggests that inflow areas in both reservoirs may provide the criteria necessary for Razorback Suckers to reproduce, grow, and persist. These inflows appear to link important riverine and lacustrine habitats, and we should consider them more fully in regards to ongoing Razorback Sucker conservation and recovery efforts.

Presentation Format: Poster

Presentation Type: Professional

Evaluating diet overlap between cutthroat trout and brown trout in instream, experimental enclosures under differing densities: can native trout resist the impacts of nonnative trout when they occur at higher densities?

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Abstract: Historically widespread in the western USA, Bonneville cutthroat trout (*Oncorhynchus clarkii utah*) now occupy less than 40% of their former range. Previous research in the Logan River has firmly established that competition with nonnative brown trout (*Salmo trutta*) reduced growth and condition of these native cutthroat trout. Recent research sought to test whether high densities of native cutthroat trout affect the outcome of competition between these two species. We utilized data from intermediate-scale, replicated, instream enclosure (on average 71 m²) experiments to compare brown trout diets and cutthroat trout diets from these experimental treatments. Our goal was to determine whether trout diet varied by treatment density and whether diets of the two trout species overlapped significantly enough to infer competition or determine that cutthroat trout in the higher density treatments were able to “resist” competition by brown trout. In low-density cutthroat trout treatments, cutthroat trout and brown trout diets were similar and were equally dominated by terrestrial invertebrates (40 – 52% of diet by weight) in this dense forest canopy stream. In the presence of higher densities of cutthroat trout, brown trout diets were primarily composed of aquatic invertebrates (62%) and mollusks (23%), while cutthroat trout primarily consumed terrestrial invertebrates (41%) and mollusks (41%). Additional research is in progress and will give a clearer picture of whether or not population density of native trout can minimize the effects of nonnative and superior competitors such as brown trout.

Presentation Format: Poster

Presentation Type: Student

System Conservation Pilot Program - Could this be an answer to achieving target flows?

Jordan Nielson: Trout Unlimited; 429 W 390 S; Spanish Fork; jnielson@tu.org

Abstract: The System Conservation Pilot Program is a drought mitigation program designed to explore an incentive based, voluntary market for consumptive use water to provide system reliability in the Colorado River. In other words, a market to keep Lake Powell and Lake Mead levels high enough to continue to meet Colorado River compact obligations. In 2017, participants in the program from the Price area were obligated to send nearly 2000 AF down the Price River to Lake Powell. Because of the high water in the spring they sent more than five times that amount.

If all Utah projects are accepted for 2018 there will be an additional 5000 AF in the Colorado River that would have been consumptively used on crops. Far more water will be conserved in the Green River by farmers and ranchers in Wyoming. Additional projects are also developing in Colorado. There may be an opportunity to use the System Conservation Pilot Program in the future to work hand in hand with other conservation goals in the Colorado River.

Presentation Format: Oral

Presentation Type: Professional

Do otoliths of adult fish retain information regarding trophic niches of juvenile stages?

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Abstract: Do otoliths of adult fish retain information regarding trophic niches of juvenile stages?

Many species of fishes exhibit ontogenetic niche shifts between juvenile and adult life stages. Typically, trophic level of fishes increases as they make this ontogenetic shift. Trophic level can be measured from stable isotopes of nitrogen from various tissues in fish. Otoliths have been used to document variation in growth rate over an individual's lifetime. We wondered if otoliths could be used to reveal trophic level of juvenile fishes through analysis of stable isotopes of nitrogen in the inner rings of the otolith. We tested for differences in trophic level between adults and juveniles by comparing nitrogen signatures from inner and outer regions of the otolith. Higher trophic levels should result from outer ring tissue compared to inner ring tissue. Contrary to our expectations, there were no differences in trophic level as determined by nitrogen signatures from inner and outer rings of the otolith. Apparently, otoliths do not retain evidence of trophic level of juvenile stages. Our results are based on relatively few samples, so it may be worthwhile to test our hypothesis in a larger sample and in other species.

Presentation Format: Poster

Presentation Type: Student

DWQ Spills Reporting and Resolution

Kevin Okleberry: Utah Department of Environmental Quality; 195 N 1950 W; Salt Lake City;
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Abstract: In our modern industrialized society there is always the potential for pollutants to enter the waters of the State of Utah. The Utah Department of Environmental Quality maintains a database of environmental incidents from which the Utah Division of Water Quality responds to spills or discharges which affect or threaten water bodies throughout the state. The response to these spills can range from documenting the incident and alerting local authorities, to monitoring the cleanup of the incident, to initiating enforcement action for any violations of the Utah Water Quality Act. The goal of the Division in this process is to ensure that all environmental incidents are properly addressed and any threat to the environment or public health is mitigated or eliminated in a timely manner.

Presentation Format: Oral

Presentation Type: Professional

Maintaining Genetic Diversity within Utah's Wild Salmonid Brood Program

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Abstract: The stocking of hatchery reared fish is essential to the maintenance of Utah's salmonid fisheries. The State routinely collects eggs from wild fish and rears the eggs in a hatchery and then stocks the progeny for various conservation and sportfishing purposes throughout the State. Unfortunately, despite the use of wild-origin brood, the rearing of fish in a hatchery environment can lead to selection towards domesticated traits and a loss of fitness. In my presentation, I will talk about steps that the Utah Division of Wildlife Resources (UDWR) is taking to minimize the effects of domestication within the wild brood program. I will talk about how the UDWR is applying past studies and models to determine fish spawning methods and passing rates that are intended to help maintain genetic diversity and prevent domestication. I will also discuss the development of captive brood program that utilizes progeny from wild origin eggs and how the effects of domestication will be minimized within that program.

Presentation Format: Oral

Presentation Type: Professional

Cormorant's: Where Are They During and After Fish Stocking in Suburban Ponds in Northern Utah

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Abstract: Double-crested Cormorant (*Phalacrocorax auritus*) foraging on fish populations has increasingly become a concern in North America. The Cormorant is a piscivorous bird which populates a wide variety of aquatic habitats. Our research focused on the locations of the birds and their foraging activities in relation to the fish stocking dates in small suburban ponds in northern Utah. Based on a prior study, we hypothesized that the number of cormorants at each pond would increase around the stocking dates. Every morning during May 2017, we censused cormorants for 30 minutes at nine ponds. We also measured turbidity and water temperature. In general, cormorant numbers increased following rainbow trout (*Oncorhynchus mykiss*) stocking. In one case, a higher number of trout stocked was associated with the highest abundance of cormorants. In contrast, stocking of channel catfish (*Ictalurus punctatus*) was not associated with an increase in cormorants. The most turbid pond also had no fish stocking and fewest cormorant observations. This suggests the possibility that stocking lower numbers of trout more frequently could reduce attraction of cormorants.

Presentation Format: Poster

Presentation Type: Student

Factors Influencing Cutthroat Trout Population Dynamics in Strawberry Reservoir, Utah

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Abstract: Numbers of age-3 and older Bear Lake Cutthroat Trout have shown a 53% decrease in Strawberry Reservoir in traditional gill-net surveys from the high in 2007 of 463,861 fish to a low in 2014 of 219,394 fish. It has been hypothesized that stocked Bear Lake Cutthroat Trout are being heavily preyed upon limiting their survival. This research looks at what influences are effecting survival of Age 1 Cutthroat. By identifying the critical factors and bottlenecks influencing stocked Bear Lake Cutthroat Trout survival in Strawberry Reservoir, we will be better able to make adjustments to the stocking program to help improve and sustain Bear Lake Cutthroat Trout populations. With year one of a two year intensive research project completed, preliminary data suggest that we have predators eating a large proportion of stocked fish under 250 mm.

Presentation Format: Oral

Presentation Type: Professional

Environmental DNA sampling of native freshwater mussels in Utah

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Abstract: Native freshwater mussels have seen dramatic declines in the Western United States, likely due to water diversions, habitat loss, and loss of host fish populations. We used environmental DNA (eDNA) to sample for the native freshwater mussels *Anodonta nuttalliana/californiensis* and *Margaritifera falcata* at locations where they historically occurred in Utah. eDNA is a potentially valuable tool for surveys of native freshwater mussels due to the efficiency and sensitivity of sampling compared to traditional survey techniques. We developed species-specific Taqman qPCR eDNA assays for both species. For *Anodonta nuttalliana/californiensis*, we sampled 22 sites in 14 water bodies, and for *Margaritifera falcata*, we sampled 17 sites in 9 water bodies with historical records for these species. *Anodonta nuttalliana/californiensis* eDNA was detected at 10 of 22 sites and 8 of 14 water bodies sampled. *Margaritifera falcata* eDNA was detected at two sites from just one water body. We conclude that eDNA is an efficient method for surveys of native freshwater mussels, with great potential for monitoring these sensitive species.

Presentation Format: Oral

Presentation Type: Professional

A nonlethal aging technique for threatened, endangered, and sensitive fishes

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Abstract: Typical morphological structures used for aging fish include scales, otoliths, opercular bones, vertebrae, branchiostegal bones, and fin rays. Many of these structures are either unreliable for aging many sucker species, or their use requires the fish to be sacrificed. Pectoral fin rays offer a nonlethal and reliable alternative to aging native, sensitive, or listed fish species. Since 1998, BIO-WEST, Inc. (BIO-WEST), has developed, refined, utilized, and benefited from employing a nonlethal aging technique to understand the natural recruitment patterns of a wild population of Razorback Sucker *Xyrauchen texanus* in Lake Mead, Arizona and Nevada. We have successfully aged 570 wild, naturally produced Razorback Suckers from Lake Mead and expanded the use of this technique to successfully age nearly 320 Razorback Suckers and 120 Flannelmouth Suckers *Catostomus latipinnis* captured from the Lower Colorado River. More recently, we have successfully aged 263 native suckers from Lake Powell, Utah. This aging technique has demonstrated that reliable, nonlethal aging of rare and long-lived fishes is feasible while providing valuable data to better inform management, conservation, and recovery efforts.

Presentation Format: Poster

Presentation Type: Professional

Understanding the contemporary sport fishery of the Logan River, Utah: what factors best explain angler catch rates and satisfaction

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Abstract: The Logan River in northern Utah is an extremely popular and Blue Ribbon sport fishery and home to one the largest remaining metapopulations of endemic Bonneville cutthroat trout (*Oncorhynchus clarkii utah*). This fishery is a very popular fishing destination for both native sport fish and nonnative brown trout (*Salmo trutta*), and in a past angler survey (in 2002), overall trip satisfaction was “very satisfactory” (highest rating) for 75% of interviewed in-river anglers. In order to collect contemporary information on this fishery, we conducted a roving creel survey from July to October 2017 to ascertain angler use, fish catch, catch rates, and angler opinions. We contacted over 446 anglers in nine fishing zones on the river including three impoundments. In addition, we aimed to determine which factors best explain angler catch rates and considered concurrent moon phase, barometric pressure, and water temperature data to determine whether these factors affect angler success. Most anglers (62%) were satisfied with their fishing experience, and across the survey period, anglers caught more than 21,000 trout. This catch represented primarily cutthroat trout and brown trout in the river

sections and rainbow trout (*O. mykiss*) in the impoundments, equaling a mean catch rate of 1.0 fish/hr. Anglers harvested over 3,000 trout at a mean harvest rate of 0.1 fish/hr. This information provides insight to best manage the use and understand the value of these two apparently distinct “fishery zones” in the Logan River. We also hope this work will better inform our understanding of angler success and perhaps help educate anglers and others of the value of this fishery.

Presentation Format: Oral

Presentation Type: Student

New perspectives on cutthroat trout evolution

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Abstract: Cutthroat Trout (*Oncorhynchus clarkii*) were thought to have split from rainbow trout (*Oncorhynchus mykiss*) approximately 2 mya and about 1 mya the ancestral cutthroat trout dispersed into the interior of western North America via the Columbia River, forming the four major subspecies (Coastal, Westslope, Lahontan, and Yellowstone cutthroat trout). Yellowstone cutthroat trout later gave rise to the minor subspecies of the Yellowstone complex, the Bonneville, Colorado River, Rio Grande, and Greenback cutthroat trout. However, fossils in the Lahontan Basin place cutthroat trout in that region much earlier than the above time frame. We utilized fossil data to calibrate a molecular clock with an 8000 bp mtDNA-based phylogeny of the extant cutthroat trout subspecies. The rainbow-cutthroat split occurred at least 10 mya. When coupled with recent information on the geological evolution of the Great Basin, our phylogeny suggests that the interior cutthroat trout may have originated in the western Lahontan Basin when it drained directly to the Pacific Ocean. These fish were the ancestors of the interior cutthroat trout.

Presentation Format: Oral

Presentation Type: Professional

Ecological Exchangeability of Dark and Dusky Rockfish in Southeast Alaska

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Abstract: Dark (*Sebastes ciliatus*) and dusky rockfish (*Sebastes variabilis*) have been commercially important off the coasts of Alaska since 1884. In the Gulf of Alaska, dark rockfish constitute around 30% of the catch in the jig fishery while dusky rockfish are important in the trawl and longline fisheries. Both

species were previously considered different forms of the same species, a dark and a light form. Only recently have the two forms been divided into different species, though little research has been conducted to determine if they are ecologically exchangeable. To determine whether dark and dusky rockfish are indeed two distinct species, we performed ecological tests to see if they have the same ecological units. The ecological tests we conducted include stable isotope signatures, growth rate, longevity, and morphology. Our results showed no difference in stable isotope signatures or growth rates between dark and dusky rockfish. Although we found the two species to be ecologically similar, they differed in longevity, with dark rockfish reaching older ages than dusky rockfish. We also found slight differences in morphology between the two species. These results indicate that dark and dusky rockfish of the Frederick Sound are very closely related and are still in the process of diverging into separate species. These results may play a role in conservation efforts of these two rockfish species, because they are currently being managed and regulated in the same way.

Presentation Format: Poster

Presentation Type: Student

You can do it! Determining fish status from mobile PIT antenna detections

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Abstract: Accurate estimates of an organism's vital rates are essential for tracking and understanding the successful recovery of endangered species such as the razorback sucker and the Colorado pikeminnow. Passive Integrated Transponder (PIT) tags allow researchers to track movement and estimate vital rates of fishes. Mobile PIT tag antenna systems (e.g., on a floating raft) have recently been developed to increase resight rates and reduce handling stress, in order to provide robust estimates of survival and population trend and to identify influential management actions. Although promising, mobile systems present new challenges to estimation techniques. Tags, not fish, are detected, thus increasing the chance that shed tags or dead fish with tags (referred to as ghost tags) are being included as live fishes, which can lead to biases in survival and abundance estimates. Because the number of PIT tags used in aquatic systems is constantly increasing, the detection of more dead/shed tags is a given. Thus classification of tags as live or dead is essential and in part motivated this study. Our overall goal for this component of our study is to develop an approach for classifying a detected PIT tag as live or dead/shed. We conducted our study on 273 kilometers of designated critical habitat in the San Juan River over two field seasons. We seeded PIT tags into the river to quantify dead/shed tag movement (900 were resighted); live fish (302 were resighted) movements were identified by matching tag detections with live capture data from electrofishing and stationary antenna data. In our best model, the most important explanatory variables for correct classification of tags were distance moved, direction moved, flood effect, runoff effect, and meters moved per day, and with this model there was

very low error for dead/shed tags (2.1% incorrectly classified as live tags) and higher error for live tags (20.8% incorrectly classified as dead/shed tags). With this method, we can classify detection data as live or dead/shed tags, and use this new source of data to increase our resight rate, potentially improve estimates of vital rates, and even explore habitat associations without disturbing the fish being studied.

Presentation Format: Oral

Presentation Type: Student

Variation in incidence and age structure of *Sarcotaces arcticus* between two host rockfish species off Southeast Alaska

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Abstract: *Sarcotaces arcticus* is a parasitic copepod that could have important impacts on rockfish host species. We compared incidence and age structure of the parasite among sizes and sexes of two species of rockfish. Incidence was high and equal between host species and sexes. Incidence was highest in intermediate size classes of hosts. Adult stages of the parasite are equally common in the small and intermediate host size classes, but less common in the large size class of hosts. Dead parasites were most common in the large size class of hosts. *S. arcticus* shows no differences in incidence or age structure between these two host species of rockfish. High incidence and relatively large size of this parasite could have significant impacts on fecundity and reproductive success in host rockfish species.

Presentation Format: Poster

Presentation Type: Student

Bear Lake Tributaries Fish Passage Improvement and Increase in Wild Cutthroat Trout

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Abstract: Bear Lake is an oligotrophic, historically terminal lake located in Northeastern Utah and Southeast Idaho and in the Bear River Watershed. Up to seven tributary streams provided spawning habitat for native, adfluvial Bonneville cutthroat trout (BVCT). Irrigation diversions and other fish passage barriers, along with irrigation water withdrawal greatly limited BVCT access to these tributaries. In 1973, the Utah Division of Wildlife Resource began a hatchery propagation program to increase BVCT numbers and enhance the lake's sport fishery. Hatchery production was successful and nearly 90 percent of BVCT caught in annual gill-netting surveys in the lake were

hatchery origin during the late 1990's. Beginning in the early 2000s, numerous efforts were undertaken to improve survival of BVCT produced in Bear Lake's tributary streams. These included installation of 14 fish screens, 6 culvert replacements/barrier removal, and installation of 3 fish ladders. Beginning in 2001, and for the first time since the beginning of the BVCT restoration effort, adult fish were passed upstream of the Swan Creek fish trap or relocated to other tributaries. In addition a barrier at the mouth of Fish Haven Creek was removed which opened up over six kilometers of BVCT spawning habitat. As a result, there has been a steady increase in the wild-produced BVCT, with nearly two-thirds of all gill-netted BVCT in the lake being wild in 2014-2017. Also during the last seven years annual hatchery stocking of yearling BVCT was decreased from 270,000 to 170,000. Despite the reduction in hatchery stocking, the overall gill-net catch rate has remained the same or increased. Since 2015, over 80% of the adult BVCT returning to the Swan Creek fish trap were the result of natural recruitment. Anglers are also reporting catching primarily wild BVCT (i.e., no fin clip) in the lake fishery. We conclude that fish passage improvements on the tributary streams are responsible for the increase in natural recruitment of BVCT to Bear Lake. Additional research will be required to determine the magnitude of recruitment for individual tributaries and what steps could be taken to effectively optimize limited tributary stream flows to produce the greatest BVCT recruitment to Bear Lake.

Presentation Format: Oral

Presentation Type: Professional

Mapping utility of drone-acquired imagery: Detecting potential northern leatherside chub pool habitat of Yellow Creek, Evanston, Wyoming

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Abstract: Yellow Creek has been identified by the Utah Division of Wildlife Resources (UDWR) as one of the two drainages in the Upper Bear River that contain native, self-sustaining populations of Northern Leatherside Chub NLSC (*Lepdomeda copei*). During summer 2016, The Utah Chapter of the Nature Conservancy in partnership with UDWR, Trout Unlimited, U.S. Fish and Wildlife, and other government agencies conducted imagery acquisition using drones from the Utah Water Research Laboratory at Utah State University. The main goal of this effort was to collect high resolution imagery (3-6 cms spatial resolution) in a stretch of 46 miles along Yellow Creek that could be utilized to determine habitat conditions for NLSC. In 2017, the GIS lab at Wild Utah Project conducted image analyses of the acquired drone-imagery by applying Normalized Difference Water Index (NDWI) and subsequent geographic information analysis to determine location, size, and spatial distribution of potential NLSC pools along Yellow Creek. The results yielded by this analysis allowed proper identification of 403 potential NLSC pool habitat, determined their location, and concentration according to land ownership parcel data. With increased popularity of drones for imagery acquisition, the methods and results obtained in this

data analysis could be replicated in other watersheds with comparable datasets and could be applied to identify habitat conditions and restoration sites.

Presentation Format: Oral

Presentation Type: Professional

Evaluation of Fish Sampling Techniques at Strawberry Reservoir

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Abstract: Sampling fish in large bodies of water with multiple species occupying a wide variety of habitats throughout the year has often created problems for fisheries managers to be able to accurately assess fish populations. Recent, and on-going, questions about the population structure and habits of fish in Strawberry Reservoir prompted an evaluation of a variety of fish sampling techniques that could be used to better quantify and track populations there. During 2017 we utilized large "curtain" nets set in stratified zones, hydroacoustics surveys, mid-water trawling, and compared these results to our traditional experimental gill net sampling that has been conducted in the same fashion for over 50 years in Strawberry. It was found that our traditional gill netting was over-estimating the proportion of certain fish species, and under-estimating others. By stratifying our sampling to 4 different zones, and using the larger curtain nets, we obtained a much better picture of the fish population structure in Strawberry Reservoir. With the addition of the hydroacoustics data, we were then able to quantify these fish populations reservoir-wide.

Presentation Format: Oral

Presentation Type: Professional

Preliminary Evaluation of Trout in Beaver-Altered Streams

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Abstract: Since beaver populations have recovered from fur trade exploitation, aquatic ecologists have been investigating how these ecosystem engineers alter streams. The physical changes are well understood, but the effects on stream communities are still being studied. Fish utilize beaver pond habitats as temperature and drought refuges, and it seems that beaver ponds are important to young salmon, especially in restoration case studies. Trout feeding patterns and habitat use, however, are not well understood. This study is a preliminary glimpse at how trout in Logan River tributaries interact with beaver-altered habitats. Electrofishing surveys revealed the number and size distributions of trout inhabiting these streams. Fish from beaver ponds and fish from riffles were not different in size or body

condition. A fish caging study showed that yearling growth did not differ by habitat, which was corroborated by recapture data. Recapture data also demonstrated that some individual fish seem to prefer beaver ponds as their summer daytime habitat. This study lays a foundation to further investigate how trout utilize beaver ponds, such as through bioenergetics modeling and more in-depth field-based assessments.

Presentation Format: Oral

Presentation Type: Student

Harmful Algal Blooms and Aquatic Effects

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Abstract: This presentation explores existing research into harmful algal blooms (HABs) and aquatic wildlife responses. The presentation will identify the various mechanisms HABs can cause a physiological response, the types of toxins HABs can produce, and the range of toxin concentrations in various tissues from existing literature. The presentation will also include information on the challenges and uncertainties of evaluating HAB effects to aquatic wildlife and will conclude with information on developed protocol for responding to a HAB wildlife mortality event.

Presentation Format: Oral

Presentation Type: Professional

Spatial variation of sculpin diets along the longitudinal gradient in the Logan River, Utah

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Abstract: Sculpin (*Cottus spp.*) are benthic fishes widely distributed across the Intermountain West and play an important role in the stream food web and native fish community. However, in contrast to the trout with which they coexist, very little is known about the ecology of these important nongame fishes. There are at least two, perhaps three species of sculpin in the Logan River; including Paiute sculpin (*C. beldingii*) in the upper sections of the river and perhaps two species of mottled-sculpin-like species (*C. bairdi*) in the lower river sections. Sculpin are a predatory fish that feed primarily on macroinvertebrates, but have also been observed exhibiting behaviors of piscivory and cannibalism (up to 7% of diet by wet weight). Our goal is to compare and contrast sculpin diets across years, location, and body size and investigate potential drivers of diet differences across locations on the Logan River. Via electrofishing, we collected sculpin abundance and diet information along with several abiotic variables each summer during 2012, 2013, 2014, and 2016 at six different locations along the river. Both

small and large sculpin consumed primarily ephemeropterans (10 – 38% of diets) and dipterans (10 – 35% of diets). At higher elevation sites, where larger substrates and narrower channels are the dominant habitat, sculpin primarily consumed ephemeropterans (22 – 42% of diets), while at lower elevation sites where substrate is more embedded and sedimentation is higher, dipterans (up to 50% of diets) were the dominant prey. Future analysis will identify which factors best explain the degree to which diet varies across sites and will attempt to identify potential differences among species. Sculpin are the only truly benthic species in most rivers of the Intermountain West and as such, identifying and protecting their trophic niche is of conservation importance.

Presentation Format: Poster

Presentation Type: Student

Fish and Wildlife do it! Migrate, that is.

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Abstract: Migration is nearly universal among all wildlife species. The enormous effort a salmon displays to reach its spawning grounds, only to die there, is impressive. The three mile crawl through numerous obstacles undertaken by red crabs on Christmas Island, is equally impressive. Closer to home, a boreal toad in northern Utah travelled nearly 2 miles over a mountain range to a pond on the other side.

Recently, a mule deer moved 65 miles on the Paunsaugunt.

So, why do they do it? Fish and wildlife move for several reasons, locate breeding grounds, food, avoid predation and competition, etc. The Utah Division of Wildlife Resources recently launched the Utah Migration Initiative (UMI) to better understand wildlife species movement patterns. Fish and wildlife need waterways and land that is connected to successfully survive. The UMI is a collaborative effort to research, protect, and celebrate wildlife migrations.

Presentation Format: Oral

Presentation Type: Professional

Evaluation of the native and non-native fish distribution in the rarely sampled Escalante River and its tributaries.

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Abstract: In 2017, the Utah Division of Wildlife Resources (UDWR) in partnership with the Hemingway Foundation, U.S. Fish and Wildlife Service, and the Ute Indian Tribe of the Uintah and Ouray Reservation, conducted a basin-wide native fish inventory effort on the Escalante River and its tributaries in Grand Staircase Escalante National Monument and Glen Canyon National Recreation Area. As part of ongoing

Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker conservation efforts in south central Utah, 2017 surveys were conducted to determine the current distribution and relative abundance of native and non-native fish species.

The Escalante River system is one of the most remote and least accessible river systems in the lower United States. Historically, there has been very little native fish inventory, monitoring, and conservation work relative to other river systems, with previous efforts being limited both spatially and temporally in scale. Sampling by the UDWR in 2017 was the most extensive distribution effort conducted to date, with several sections of the lower Escalante River being sampled for the first time. A summary of results from 2017 on the mainstem Escalante River and tributaries will be presented and compare current and historic distribution of native and non- native fish in the Escalante River Basin, with emphasis on the distribution of Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker.

Presentation Format: Oral

Presentation Type: Professional