Big Sand Wash Reservoir
Fisheries Management Plan 2023-2028

Purpose

The Big Sand Wash Reservoir (BSW) Management Plan defines goals for all fish species present within the reservoir for the next five years, including management of illegally introduced species and introduction of forage species. It also sets the stage for longer-term management of the reservoir and establishes criteria for evaluating monitoring efforts and future management.

This plan was put together with input from biologists and law enforcement personnel with the Utah Division of Wildlife Resources (UDWR) and from local anglers. Team members included:

- Nathan Belliston (angler)
- Braxton Bolton (angler)
- Natalie Boren (UDWR)
- Kirk Bostick (angler)
- Andrew Ercanbrack (angler)
- Brian Gardner (angler)
- Jim Grisley (angler)
- Trina Hedrick (UDWR)
- Ben Kurtz (angler)
- Morgan Larsen (UDWR)
- Tiffany Lindsay (angler)
- Craig Walker (UDWR)

In addition, habitat improvement options were discussed with Moon Lake Water Users Association (MLWUA) before implementation.

Constraints

All recommendations have considered the following:

1. existing state and federal laws and policies;
2. life history/biology of fish species;
3. that some species (e.g., brown trout) are present in the drainage above the reservoir and cannot be eradicated;
4. limnology of the reservoir;
5. morphometry of the reservoir basin;
6. current budgetary and funding constraints;
7. availability of alternative fish species for stocking; and
8. public perceptions and expectations.

Desired Condition Statement

The BSW management team would like BSW to be a family-oriented fishery that provides opportunities for anglers of all skill levels. We envision it providing a sought-after fishery in the middle of UDWR's Northeastern Management Region where risk of illegal introductions stemming from the reservoir are minimal. The team especially wants to see BSW have enough forage to feed all fish in the system while still providing ample sport fish for anglers.

Current Condition

Big Sand Wash Reservoir is 649 surface acres, originally built in 1964 with a large expansion completed in 2007. The UDWR owns the bottom 1200 acre-feet (AF) of water for fisheries conservation purposes. The reservoir contains Largemouth Bass (*Micropterus salmoides*), Smallmouth Bass (*Micropterus dolomieu*), Yellow Perch (*Perca flavescens*), Brown Trout (*Salmo trutta*), Rainbow Trout (*Oncorhynchus*

mykiss), and Walleye (*Sander vitreus*). This is the current assemblage of the most common species as verified by the UDWR in 2022. Several other species (splake (*Salvelinus namaycush x Salvelinus fontinalis*) and Colorado River Cutthroat Trout (*Oncorhynchus clarkia pleuriticus*)) have been documented in BSW and likely moved into the reservoir from upstream sources (e.g., Moon Lake).

Prior to 2014, UDWR had only stocked Rainbow Trout into the reservoir and at one point it was managed as a basic yield family fishery, utilizing fingerling-sized fish. Rainbow Trout are currently stocked as catchables (10 inches) at a rate of 15 fish/ac (at full pool). Tiger trout fingerlings were stocked for a few years from 2015 through 2020; however, the species rarely returned to the creel and the quota was moved elsewhere. In addition, sterile Walleye were stocked between 2016 and 2020 in an attempt to suppress the establishment of an illegally introduced population of fertile Walleye in BSW. However, because the stocking of sterile Walleye was sporadic and the survival of stocked individuals was limited, the population of fertile Walleye is now well established.

It is likely that both Largemouth and Smallmouth Bass entered the reservoir from upstream sources and nearby ponds located on private properties above BSW. Two documented illegal introductions into the reservoir, Yellow Perch and Walleye, were documented in 2013 and 2015, respectively. Yellow Perch have become well established and have recruited in consecutive year classes, for at least eight years. Stomach content analysis of fish collected in April 2015 showed Brown Trout, Walleye and Smallmouth Bass using Yellow Perch as forage; subsequent years and surveys showed Rainbow Trout also consuming Yellow Perch. By 2020, we had documented successful recruitment of Walleye; however, it was not until the winter of 2020-2021 that anglers began catching them in larger numbers. Angler catch rates for Walleye in BSW have continued to increase as has the popularity of the Walleye fishery at BSW among anglers.

Big Sand Wash Reservoir is predominantly surrounded by private land and has limited public access. Boaters and anglers can access the lake via the main boat ramp and anglers have drive-in/walk-in access at multiple locations on the east side. We are currently working with Duchesne County, MLWUA, and private landowners to improve the east-side access points. Improvements include paving the boat ramp parking area, chip sealing the road into the boat ramp, moving the vault toilet on top of the dam, and fencing/signing the east side access areas to direct recreation to specific areas. In the future, if determined to be needed, we may install additional bathrooms.

Escapement Prevention

The BSW dam remodel project in 2007 increased the storage capacity of the reservoir greatly. The current outlet on this system is a six-foot tunnel with a gate. The intake for this structure has a screen with two 4-inch metal grates. With the dam remodel, the water users constructed a 30-inch pressurized water delivery pipeline that runs 12 miles into the neighboring town of Roosevelt and is directly delivered into a secondary water system for culinary and irrigation purposes. The pipeline is pressurized to 300 PSI and water is forced through 3/8-inch holes. The MLWUA manager has indicated that he has never observed a live fish at the end of this pipeline as by the time a fish reaches the end of the pipeline, it is in small pieces. The entire drainage was upgraded to an automated web based system that can be viewed at the following web site: *http://www.duchesneriver.org/.*

Water from BSW occasionally leaves the reservoir in an open canal leading from the dam. The MLWUA staff indicated that this water is only used for irrigation purposes and is used up in the neighboring

agricultural fields between the reservoir and Roosevelt, Utah. The ditch that runs from the reservoir occasionally has water and runs down Sand Wash Creek to Hancock Cove in Roosevelt. For most of the year, water from BSW has no opportunity to reach the Duchesne River. However, there is a chance water from BSW could reach the Duchesne River during years when spring flows increase before irrigation withdrawals occur in April. During these occurrences, water could travel from Sand Wash Creek to a diversion in the Dry Gulch drainage and travel into the Duchesne River. The distance from BSW to the Duchesne River via Dry Gulch is approximately 26 miles. Water from Sand Wash Creek to the Lake Fork drainage never has the option of entering the Duchesne River as it is all diverted and placed into a pressurized irrigation pipeline downstream of the reservoir (Figure 1).

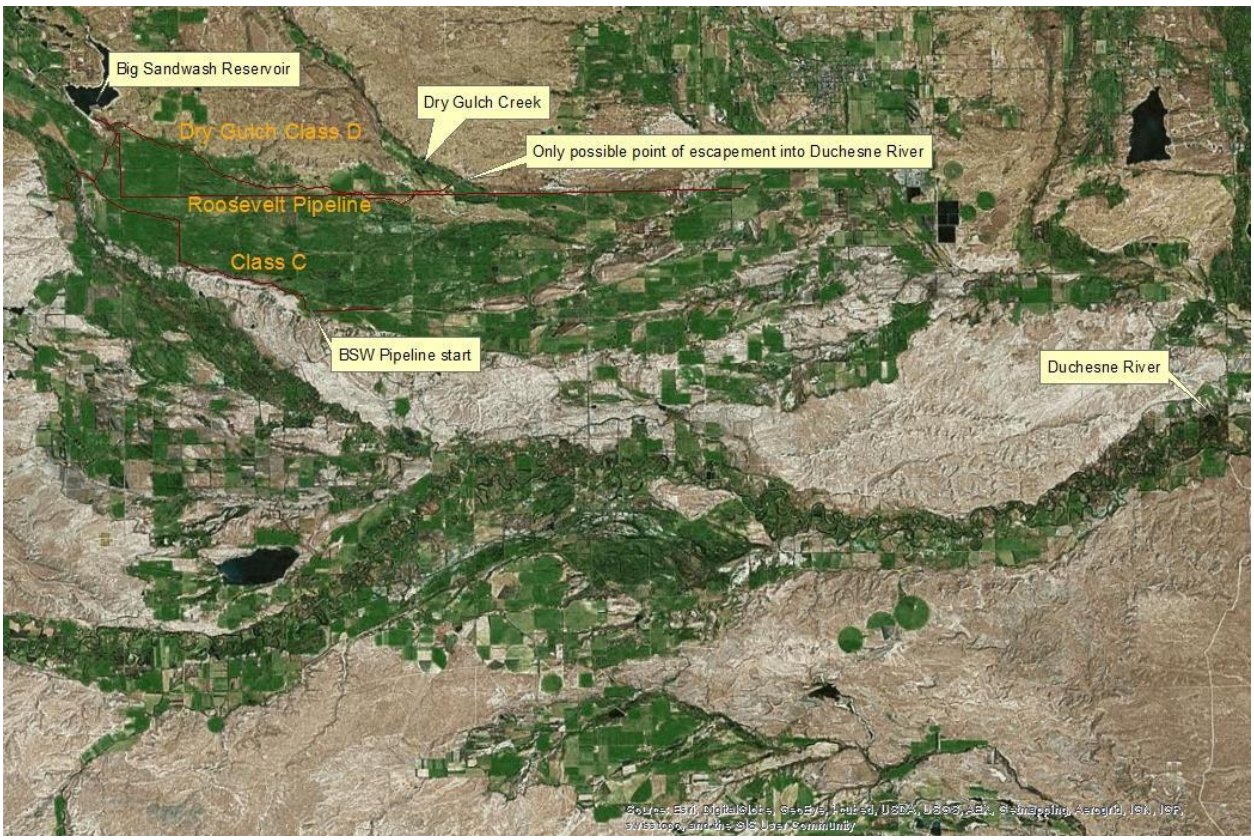

Figure 1. Pipeline and canal systems leaving BSW in relation to the Duchesne River. All information about each canal and pipeline can be found at *http://www.duchesneriver.org/.*

After talking extensively with MLWUA staff, it appears that BSW spills almost every year but the probability of water reaching the Duchesne River is very low and therefore the risk of BSW fish reaching critical habitat for the four big-river endangered fishes found in the Colorado River Basin is extremely low (the lowest two miles of the Duchesne River is considered critical habitat).

Visions, Goals, Objectives and Tools for Management of Big Sand Wash Reservoir

The following vision statement was developed by the BSW management team:

"Adaptively manage fish populations in Big Sand Wash Reservoir to provide an enjoyable recreational experience for local anglers seeking both quality and family-oriented opportunities."

Goals

1. Manage BSW as an Opportunity water for Rainbow Trout and Walleye, a Quality water for Smallmouth Bass and a Unique water for Brown Trout (see Appendix A for management concept definitions).
2. Protect and improve the forage base in BSW, focusing Yellow Perch management on protecting them more than as an Opportunity fishery until their population improves.
3. Fill current data gaps.

Objectives (by goal) and Tools to accomplish each Objective

1. **Manage BSW as an Opportunity water for Rainbow Trout and Walleye, a Quality water for Smallmouth Bass, and a Unique water for Brown Trout.**

   Objective #1: Manage BSW as an Opportunity (see Appendix A for "opportunity" definition in this context) Rainbow Trout and Walleye fishery. Maintain Rainbow Trout catch rates above 0.2 fish per angler hour and above 10.5 fish per net night. Monitor catch rates for Walleye alongside those for Yellow Perch and identify targets based on how well the Yellow Perch are faring.

   Tools to accomplish this objective:

   - Stock 10" Rainbow Trout at 26.7 pounds/acre in 2023 and 37.5 pounds per acre in 2024. Continue stocking 37.5 pounds per acre in 2025 but increase the size stocked to 12 inches. This will decrease the total number of RT stocked and could assist Yellow Perch if the two species are competing extensively or if RT are predating upon Yellow Perch extensively. Evaluate changes with biannual sampling (every other year). As the Walleye population increases in size, consider a stocking adjustment for Rainbow Trout if returns decline (e.g., stocking after Nov 1st if Walleye predation is an issue).
   - Monitor BSW annually using at least one technique to monitor these species (netting for Rainbow Trout and Walleye, electrofishing for Smallmouth Bass) and if abundance falls below the targets identified in the UDWR's stocking strategy for each management concept (see Appendix B), explore options to increase numbers.
   - Evaluate the new Walleye daily bag limit and adjust as needed to maximize the effectiveness of harvest while attempting to reduce density of Walleye size classes most impactful to forage availability. Balance this with the catch rate targets, reducing Walleye targets as needed to improve the forage base.
   - Analyze the relationship between catch rates during the last creel survey and sampling catch rates over that same time period to determine if sampling catch rate can serve as a surrogate for creel catch rates since creel surveys are only completed once every 10+ years. In addition, spot creels, tagged fish returns, and the Utah Fish Planner (https://dwrapps.utah.gov/fishing/fStart) could all be used as tools to track angler catch rates.

Objective #2: Manage BSW as a Quality (see Appendix A for "quality" definition in this context) Smallmouth Bass fishery in the future. Provide anglers the opportunity to catch and harvest a memorable or trophy-sized bass (Appendix A).

Tools to accomplish this objective:

- Monitor SMB every other year using electrofishing to evaluate size distribution and abundance. At least 60% of SMB should be of Quality size (11-inches), 7-10% should be Preferred size (14-inches), and there should be at least a few Memorable sized fish in the system (17-inches).
- Determine mortality limit (mortality cap) to ensure size goals for SMB can be met.
- Collect spines from Smallmouth Bass in 2023 for age and growth purposes. Utilize information from this analysis to evaluate whether a regulation change is necessary (minimum harvest length, slot limit, or potentially protecting the spawn), or if reducing annual mortality would suffice (e.g., using habitat structures).
- Pursue habitat installations providing structure for fry, larvae, and/or juvenile Smallmouth Bass to improve annual survival.
- Before the 2028 revision, discuss the pros and cons of considering this area for a Blue Ribbon Fishery status. Concern was expressed in 2023 that if the pressure increased at this water, Smallmouth Bass would be vulnerable during the spawn and could be heavily impacted given the reservoir's small size. Before assigning Blue Ribbon status, a thorough review of the Smallmouth Bass population is warranted to better understand current mortality rates and how certain regulations would affect the fishery.

Objective #3: Manage BSW as a Unique (see Appendix A for "Unique" definition in this context) Brown Trout fishery. Provide anglers the opportunity to catch and harvest a memorable or trophy-sized Brown Trout, even if only rarely (Appendix A).

Tools to accomplish this objective:

- Maintain < 0.1 fish/hr creel catch rate for Brown Trout (monitored using spot creels or Dedicated Hunter creels during this cycle). The current rate (2020-2021) is 0.005 fish/hr and ranged from 0.0 fish/hr six of the creel months to 0.02 fish/hr in September and February.
- Maintain a gill net catch rate of 0.5 fish per net night or less in spring nets. Recent catch rates have ranged from 0.25 fish per net night in April 2019 to 0.75 fish per net night in April 2018. The most recent catch rates (2022) have been closer to 0.5 fish per net night.
- Consider stocking Brown Trout at small sizes (less than 3 inches) and low numbers (≤ 5,000 fish) every 4–5 years if excess fish are available, but do not overstock or stock in years with low Yellow Perch production. Evaluate survival 2-3 years post-stock.

2. **Protect and improve the forage base in BSW, focusing Yellow Perch management on protecting them more than as an Opportunity fishery until their population improves.**

Objective #1: Protect early life stages of Yellow Perch to increase annual survival.

Tools to accomplish this objective:

- Monitor Yellow Perch populations for increases and decreases in populations.
- Pursue habitat installations providing structure for fry, larvae, and/or juvenile Yellow Perch to improve annual survival. Complete a diversified habitat installation plan that is approved by the BSWMT and MLWUA.
- Assess use of the hypolimnion as cover by age-1 Yellow Perch, specifically looking for hypoxic areas after stratification occurs. Consider placing habitat structures just within or just outside of the hypoxic area(s) if present.
- Monitor effectiveness of the 10 Yellow Perch limit implemented January 1, 2023. Revise as needed, acknowledging that Yellow Perch are their "own worst enemy" and are highly cannibalistic when abundance is high. If abundance is high, the daily bag limit should be increased as a response.
- Consider adjusting the Rainbow Trout quota to improve conditions for Yellow Perch (e.g. increasing the size, while keeping pounds the same each year as mentioned earlier). As time allows, monitor the diet of Rainbow Trout and Yellow Perch in multiple seasons to determine extent of competition and/or predation.

Objective #2: Increase the forage base in BSW by stocking an additional forage species into the reservoir.

Tools to accomplish this objective:

- Research other forage species options and pursue stocking of at least one non-game species into BSW.
    - Research additional forage species that might do well in BSW and other waters within the Northeastern Region. Any species considered would have to be available for purchase from a disease-free certified source and would have to be compatible with the Upper Colorado River Endangered Fish Recovery Program's (Program) Nonnative Stocking Policy agreed upon by all Program members, including the UDWR.
    - Mountain Sucker successfully reproduced and recruited in this waterbody, until the late 1990s when UDWR reset BSW using rotenone. The goal of restoring this species to BSW would be to increase propagule pressure of a forage species to the point that it can become established within a reservoir despite the diverse predator assemblage present. The species will be disease tested in Moon Lake in FY24 and if certified disease-free, collected annually in June and transferred to BSW for at least five years. This effort would be monitored during gill netting activities and we would look for signs of reproduction and recruitment. After five years, if we haven't seen any signs of recruitment, we will reconsider the use of this species as forage here.
    - Monitoring for this species would occur along with other identified tasks for the year and would attempt to answer the questions:
        - Are Mountain Sucker reproducing and recruiting on their own in BSW?
        - Are Mountain Sucker being utilized as forage by other species in BSW?

- Are Mountain Sucker taking the predation pressure off of Yellow Perch (evaluate using Yellow Perch abundance information)?

3. **Fill current data gaps.**

Objective #1: Gather pertinent and useful data to manage BSW using tools and management techniques available to UDWR managers.

Tools to accomplish this objective:

- Establish a baseline zooplankton community sample in 2023 and follow-up with zooplankton community sampling every three years after that.
- Study the limnology of the reservoir, specifically how DO, pH, and temperature at depth change over the irrigation season. Research this is in wet, average, and dry hydrological years to determine if reservoir elevations and rapidity of drawdowns affect conditions. Determine if the hypoliminion ever goes anoxic and if so, at what time of year and reservoir elevation is it more likely? Does it disappear later in the year and if so, when?
- Monitor crayfish populations in 2023 and every three years after that to assess trends through time.
- Monitor Walleye growth and condition over time to inform regulation changes.
- Monitor Yellow Perch abundance over time, following methods identified in the current effort to standardize monitoring statewide (final methods anticipated by December 31, 2023).
- Determine age, growth rates, and natural mortality of Smallmouth Bass (continue to gather data for this and build up over time).
- Conduct a programmatic creel survey at BSW every 10 years (next creel would be 2030-2031).

Discussion

Big Sand Wash Reservoir is surrounded by several small communities, which use this reservoir as a family oriented fishery, but also wish to have the opportunity to catch larger fish. With escapement issues being minimal at this reservoir, the UDWR has a unique opportunity to manage Smallmouth Bass as a Quality fishery that would benefit both local anglers and destination anglers.

This reservoir should remain a family-oriented fishery that provides a good fishing experience for all levels of anglers. This management plan provides flexibility to allow for adjustments as conditions change in the reservoir. At this point in time, BSW is a productive system with the ability to grow large fish of multiple species, both cold and warm water. It is considered a two-tier fishery and will be managed as such.

Timeline for Implementation

- March 2023 – Finalize management plan with MT.
- April 2023 – Submit management plan to partners for review, comments.
- April 2023 – Stock Rainbow Trout (10k fish at 10-inches).
- Summer 2023 – Monitor zooplankton and crayfish, conduct water quality monitoring after likely stratification and then at the end-of-year elevation.

- August 2023 – Electrofish or net for Yellow Perch.
- September 2023 – Submit management plan to NER RAC as an information item. Electrofish for Smallmouth Bass, collecting SMB spines in addition to length and weight. Determine SMB population estimate from this survey.
- October 2023 – Install habitat structures if funding is received. Complete Fall Walleye Index Netting.
- Winter 2023-2024 – Research out-of-state forage options.
- Spring 2024 – Net BSW for Rainbow Trout, Walleye, and Yellow Perch obtaining information on condition and abundance.
- April 2024 – Stock Rainbow Trout (14k fish at 10-inches).
- June 2024 – Disease certification for Mountain Sucker
- Summer 2024 – Conduct water quality monitoring after likely stratification and then at the end-of-year elevation (if a different hydrologic water year from 2023). Request Dedicated Hunters for spot creel surveys throughout the summer.
- Fall 2024 – Install habitat structures if funding is received. Monitor previously installed habitat structures.
- April 2025 – Stock Rainbow Trout (5700 fish at 12-inches).
- June 2025 – Transfer Mountain Sucker if disease free.
- Summer 2025 – Conduct water quality monitoring after likely stratification and then at the end-of-year elevation (if a different hydrologic water year from 2023 and 2024).
- September 2025 – Electrofish for Smallmouth Bass.
- October 2025 – Complete Fall Walleye Index Netting. Install habitat structures if funding is received. Monitor previously installed habitat structures.
- Spring 2026 – Net BSW for Rainbow Trout, Walleye, and Yellow Perch obtaining information on condition and abundance.
- April 2026 – Stock Rainbow Trout (5700 fish at 12-inches).
- June 2026 – Transfer Mountain Sucker if disease free.
- Summer 2026 – Monitor zooplankton and crayfish, conduct water quality monitoring after likely stratification and then at the end-of-year elevation (if a different hydrologic water year from 2023-2025). Request Dedicated Hunters for spot creel surveys throughout the summer.
- October 2026 – Install habitat structures if funding is received. Monitor previously installed habitat structures.
- April 2027 – Stock Rainbow Trout (5700 fish at 12-inches).
- June 2027 – Transfer Mountain Sucker if disease free.
- Summer 2027 – Conduct water quality monitoring after likely stratification and then at the end-of-year elevation (if a different hydrologic water year from 2023-2026).
- September 2027 – Electrofish for Smallmouth Bass, collecting spines in addition to length and weight. Determine population estimate from this survey.
- October 2027 – Complete Fall Walleye Index Netting. Install habitat structures if funding is received. Monitor previously installed habitat structures.
- Spring 2028 – Net BSW for Rainbow Trout, Walleye, and Yellow Perch obtaining information on condition and abundance.
- April 2028 – Stock Rainbow Trout (5700 fish at 12-inches).
- June 2028 – Transfer Mountain Sucker if disease free (year four of five).

- Summer 2028 – Conduct water quality monitoring after likely stratification and then at the end-of-year elevation (if a different hydrologic water year from 2023-2027). Request Dedicated Hunters for spot creel surveys throughout the summer.
- Fall 2028 – Install habitat structures if funding is received. Monitor previously installed habitat structures.

- In all years, assess stocking rates and adjust, knowing that changes may be 1-2 years out, depending on size and number of fish requested.

Appendix A

In 2023, UDWR finalized a statewide stocking strategy that defines the fisheries management concepts used in the state. The management concepts can be characterized as follows.

Opportunity: Provide a high catch rate for a species. The size of fish caught is typically near catchable size.

Unique: Provide anglers the chance to catch a species that is not common to the state or a waterbody (e.g., Golden Trout, Striped Bass, etc.).

Quality: Provide anglers the chance to catch larger fish than at an opportunity fishery. Anglers will catch many stock or quality sized fish but have a good chance to catch preferred size fish.

Trophy: Provide anglers the chance to catch memorable sized fish. Anglers should expect to catch many stock or quality length fish with occasional preferred, memorable, or trophy sized fish caught.

Predator Management: A fishery that utilizes a predator to control a prey species that is either non-native or has a tendency to achieve densities that are detrimental to a fishery (e.g., Utah Chub).

Wild Fishery: A fishery that is sustained by natural reproduction.

Native Fish Water: A waters that is solely managed for native fish conservation.

In the above definitions, terms that categorize the size distribution of a fishery are referenced (stock, quality, preferred, memorable, trophy). These terms are defined in fisheries management texts and are borrowed from Gabelhouse 1984:

Stock: 20-26% of the species' world record length (Anderson and Weithman 1978),
Quality: 36-41% of the species' world record length,
Preferred: 45-55% of the species' world record length,
Memorable: 59-64% of the species' world record length, and
Trophy: 74-80% of the species' world record length.

Works Cited

Gabelhouse, D.W., Jr. 1984. A length-categorization system to assess fish stocks. North American Journal of Fisheries Management 4:273-285.

Anderson, R.O. and A.S. Weithman 1978. The concept of balance for coolwater fish populations. Pages 371-381 *in* R.L. Kendall, editor. Selected coolwater fishes of North America. American Fisheries Society Special Publication 11, Bethesda, Maryland.

Appendix B

Species	Concept	PSD	RSD-P	RSD-M	Net CPUE(fish/net-night)	Creel CPUE (fish/hr)	Fulton's K[a]	Relative Weight	Predator/ Prey Biomass Ratio	ROI	Growth (inches; 1 & 2 years post-stocking)	L∞ (percentile)	Angler Exploitation Rate (%
Trout	Opportunity	10 (0-70)			10 (>5)	0.35-3.0	0.85-1.0	85-100		>50%			
	Quality	60 (>30)	>5		5-20	0.2-1.5	>0.95	>95		>150%	>4		
	Trophy	65 (>40)	>10	≥5	<20	<0.5	>1.0	>100[c]		>100%	>6		
	Predator Mgmt.	65 (>40)	>10	≥5	<20	<0.5	>1.0	100 (90-110)	0.05-0.10	>50%	>6		
Muskie[d]	Opportunity				0.05-0.06	0.02-0.03						<33rd	33.3-36.8
	Quality				0.03-0.04	0.01-0.02		>100				33rd-67th	25.7-28.4
	Trophy				0.03-0.04	0.01-0.02		>100				>67th	25.7-28.4
	Predator Mgmt.				0.01-0.02	0.01-0.02		>80				33rd-67th	≥ 27.0
Wiper	Opportunity	75 (>60)			7.5 (1-20)	0.11 (>0.075)		85 (>75)					
	Predator Mgmt.	70 (>40)			20 (3.5-30.5)			80 (>75)			5 (>3)		
Walleye	Opportunity	65 (>40)			4.5 (1.0-9.1)			90 (>80)					
Catfish	Opportunity (not community fishery)	75 (40-90)			7 (1-14)	0.07 (0.02-0.14)				>50%			
	Community Fishery					0.25 (0.1-0.4)							