2022 PRE-TREATMENT PLAN FOR FISH LAKE, SPOKANE COUNTY, WASHINGTON

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1.0 INTRODUCTION

Fish Lake is located in southwest Spokane County, approximately 2 miles northwest of the town of Cheney (Figure 1). The Washington Department of Fish and Wildlife (WDFW) stocks Brook Trout *Salvelinus fontinalis* fry in the spring (200 fish/acre) and tiger trout (Brook Trout x Brown Trout *Salmo Trutta* hybrid) fingerlings in the fall (200 fish/acre; Baker 2012a). Fish Lake is open to fishing from the 4th Saturday in April through September 30th, with an estimated 3,000 angler-trips annually when trout fishing is excellent (Baker and Osborne 2012b). Fish Lake has been managed as a trout fishery for decades, but due to illegal introductions, has required treatment with rotenone 5 times (1956, 1968, 1975, 1998, 2012; Baker and Osborne 2012). Previous treatments primarily targeted Brown Bullhead *Ameiurus nebulosus*, Pumpkinseed Sunfish *Lepomis gibbosus*, and Yellow Perch *Perca flavescens*. Trout growth, condition, and survival, as well as angler participation, have gradually worsened as populations of Pumpkinseed Sunfish, Tench *Tinca tinca*, and Yellow Perch have proliferated (WDFW unpublished data). WDFW proposes a rehabilitation of Fish Lake in October 2022 to remove nuisance species and restore the recreational trout fishery.

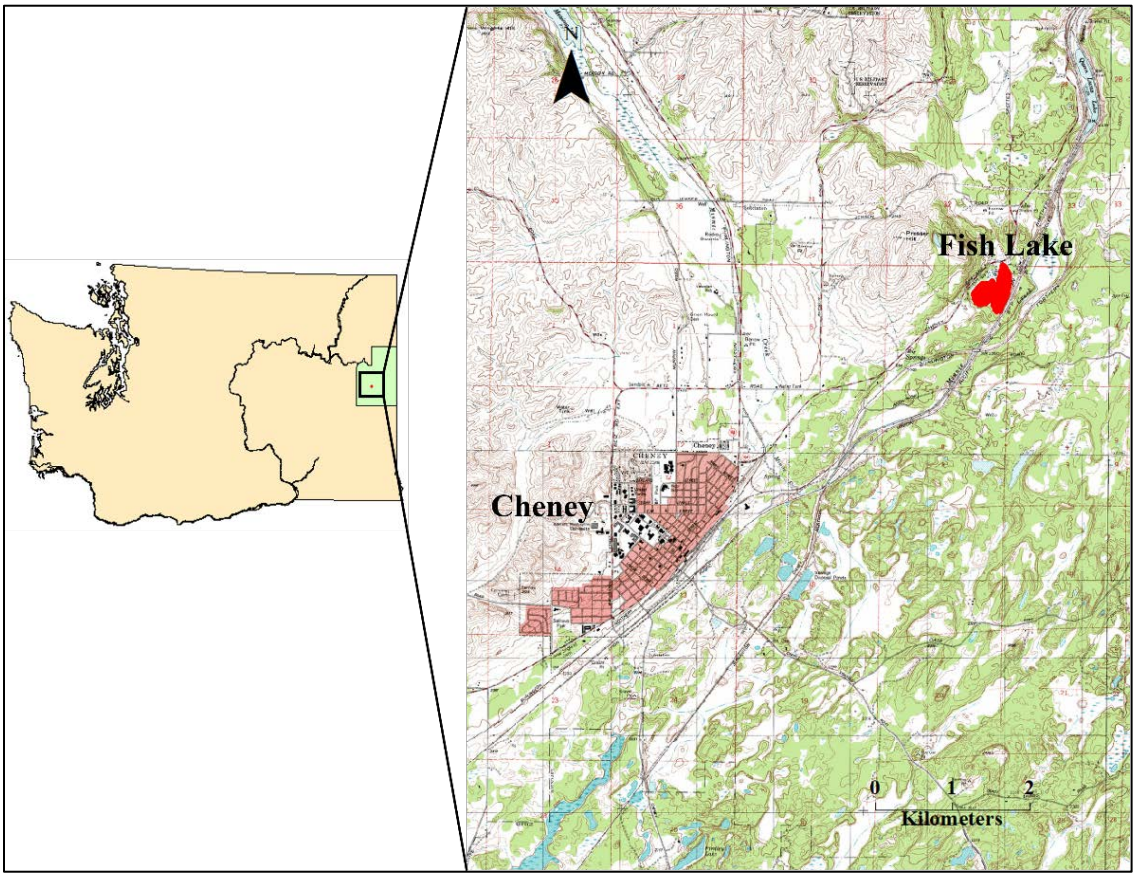

Figure 1. Fish Lake (red) area map, location in Spokane County (green), and Washington State.

2.0 WATER DESCRIPTION

1. **WATER:** Fish Lake
2. **COUNTY:** Spokane
3. **LOCATION:** T23N, R42E, S4 and S5; and T24N, R42E, S32 and S33. Center of Lake is located at 47.51879N, -117.52063W.
4. **LAKE DESCRIPTION:** Fish Lake has a seasonal outlet, which will be dry at the time of treatment.
    - Area (acres): 47
    - Volume (acre-feet): 1,357
    - Maximum depth (feet): 48
    - Average depth (feet): 29
5. **WATER WITHDRAWALS:** There are multiple surface water withdrawals and rights, including potable, irrigation, and stockwater designations. See Appendix Table A.1 for a list of water rights.
6. **OUTLET:** Seasonally intermittent stream (Minnie Creek; will be dry at time of treatment).
7. **STREAM:** Yes. Seasonally intermittent outlet will be dry at time of treatment.
8. **PUBLIC ACCESS:** Yes
9. **LAND OWNERSHIP:** Public 15%, 85% Private
10. **ESTABLISHED RESORTS:** None.
11. **TARGET SPECIES:** Pumpkinseed Sunfish, Tench, and Yellow Perch
12. **DATE LAST REHABILITATED:** October 22, 2012
13. **PROPOSED TREATMENT DATE RANGE:** October 10-14, 2022
14. **RESTOCKING DATE:** Spring 2023
15. **SPECIES:** Rainbow Trout *Oncorhynchus mykiss*, Brook Trout, and tiger trout
16. **CATCHABLES:** 5,000 Rainbow Trout, spring 2023; 5,000 Rainbow Trout, spring 2024. Up to 1,500 jumbo Brook Trout annually as availability allows.
    FRY/FINGERLINGS: 12,000 Brook Trout fry and 12,000 tiger trout fingerlings beginning in spring 2023 and annually thereafter.

3.0 TOXICANT(S) AND DEACTIVATION

1. **TOXICANT(S):** Rotenone Powder Fish Toxicant (powder formulation; EPA Reg. #89459-32) and CFT Legumine Fish Toxicant (liquid formulation; EPA Reg. #655-899).
2. **TOXICANT CONCENTRATION (ppm):** up to 2.5
3. **TOXICANT AMOUNT (gal of liquid and lbs of powder rotenone product @ 5% active ingredient; ai):** up to 55 gal liquid and 8,816 lbs powder.
4. **METHOD OF TOXICANT APPLICATION:** Pumper boat slurry and airboat spray.
5. **DEACTIVATION (OXIDIZER):** N/A.
6. **OXIDIZER CONCENTRATION (ppm):** N/A
7. **OXIDIZER AMOUNT (lbs of powder):** N/A
8. **METHOD OF OXIDIZER APPLICATION:** N/A

4.0 PURPOSE

WDFW provides many types of fisheries in response to public desires, managing both trout and warmwater recreational fisheries with a variety of fish species. Public demand for, and participation in, production trout fisheries is high. These fisheries are prized as relaxed outdoor opportunities for families to recreate together, offer an appropriate challenge for occasional or novice anglers, and are integral to the state and local economies.

Alternatives to rehabilitation are costly or impractical. To maintain a trout fishery comparable to that produced via lake rehabilitation followed by fry and fingerling trout stocking in Fish Lake would require annual plants of 7,500 to 10,000 catchable-sized trout. Stocking of catchable-sized fish is more than ten times as expensive as fry planting, and Region 1 lacks the hatchery space and water to institute a catchable fish-stocking program as a substitute for lake rehabilitation.

5.0 DESCRIPTION OF FISH SPECIES TO BE ERADICATED AND HOW DMP ACTION THRESHOLDS ARE MET

The fish species targeted for eradication are Pumpkinseed Sunfish, Tench, and Yellow Perch.

The Discharge Management Plan for the State of Washington Department of Ecology (DOE) Fishery Resource Management General National Pollutant Discharge Elimination System (NPDES) Permit No. 0041009 stipulates (Section B, subsection 2, item a and in Section C, subsection 1, item a) that demonstrated slow growth rate of trout and increasing numbers (and high relative abundance) of panfish and/or predatory fish are thresholds for lake rehabilitation (Bolding et al. 2015). Trout growth is currently poor, and Pumpkinseed Sunfish, Tench, and Yellow Perch are increasingly abundant (WDFW unpublished data).

6.0 INTENDED OUTCOME/MEASURE OF SUCCESS

WDFW intends to restore Fish Lake to a popular, easily accessible trout fishery based on fry and fingerling-stocked trout. The average catch rates should be 4 to 5 fish/angler on Opening Day of fishing season with a sustained harvest of 2 to 3 fish/angler for the duration of the season. Trout fry stocked the previous spring should be a minimum of 11 inches, and harvest of carryover fish should be 10 to 15 percent of the overall harvest. Success will be measured during Opening Day and spot-check creel contacts and periodic biological surveys. Beneficial effects of lake rehabilitation should be expected to last approximately 7 to 9 years under the current management scheme. Additionally, abandonment of this lake as a trout monoculture fishery may invite other illegal fish introductions across the state in trout-only managed lakes.

7.0 RESOURCE IMPACTS

1. The targeted populations of Pumpkinseed Sunfish, Tench, and Yellow Perch will be eradicated or drastically reduced.

2. Regional Lands, Habitat, Wildlife, and Non-Game managers have been apprised of the proposed Fish Lake rehabilitation. No unmitigated concerns have been expressed regarding the potential impacts to non-targeted species.

3. Rotenone is highly toxic to gill-breathing organisms because it is absorbed directly into the bloodstream through the gill epithelium. According to Bradbury (1986), the effects of rotenone on benthos are variable, depending on rotenone concentration and species. Crustaceans are most tolerant while smaller insects are most affected. Immediate reduction of populations averages 25%, and survival doubles when access to bottom sediments exists. Benthic communities generally recover to at least pre-treatment levels within two months. Zooplankton are more severely impacted, and communities generally take twelve to twenty-four months to fully recover (McGann and Strecker 2018). Risk to amphibians is dependent on life stage. Obligate gill-breathing stages (tadpoles) experience mortality rates similar to fish, while lung-breathing adults are not negatively affected. Mortality of transitional stages is directly related to the proportion of oxygen obtained via gills (Grisak et al. 2007, Billman et al. 2012). Amphibians native to Washington metamorphose to adulthood by late summer, so the timing of lake rehabilitations (fall) results in minimal impact to those species. Rotenone concentrations applied in piscicide treatments are essentially non-toxic to lung-breathing organisms (birds, mammals, reptiles, and adult amphibians) because the primary route of exposure is through ingestion, and natural enzymes in the digestive tract are effective at neutralizing rotenone (Ling 2003). In addition, rotenone does not concentrate in fish tissue and is quickly broken down in the environment (Ling 2003).

4. Application of rotenone under this proposal has been determined "not likely" to affect threatened and/or endangered species or their habitat by the United States Fish and Wildlife Service (Behan 2017) because:

- No threatened or endangered species (aquatic or terrestrial) are present in the treatment area.
- Fish Lake does not fall within designated critical habitat.
- Negative impacts to aquatic habitats are temporary.
- Treatment will not impact terrestrial habitats.
- Disturbance associated with treatment activities is temporary and short in duration.
- Rotenone will be contained within the project area.
- Routes of entry for lung-breathing aquatic or terrestrial organisms are limited; thus, direct mortality from ingesting water or fish containing rotenone is very unlikely.
- Reductions of prey (fish or aquatic invertebrates) due to treatment are temporary.

8.0 MITIGATING FOR ADVERSE IMPACTS

1. Drinking or irrigation water will be provided on request to landowners who utilize lake water for potable or irrigation during the period of rotenone toxicity.

2. Fall rehabilitation will not interfere with spring nesting of waterfowl, mating of adult amphibians, or rearing of juvenile amphibians.

3. Livestock use of the waters to be treated will not be significantly affected. There are no product label restrictions for stockwatering for any of the products to be used in this treatment. The concentration of rotenone used in the treatment will be far below that considered harmful to mammals or birds. Landowners will be notified of the rehabilitation and potential exposure of livestock to rotenone.

4. Appropriate respirators and other personal protective equipment (PPE) will be utilized by staff involved with mixing and applying liquid and powdered rotenone per the product label and American Fisheries Society Rotenone Standard Operating Procedure (SOP) manual (Finlayson et al. 2018).

5. The lake will be posted according to NPDES requirements, providing information about rotenone product(s) to be applied, application date(s), and public use and water use restrictions, as well as contact information for WDFW project lead(s) and the DOE NPDES permit manager (DOE 2015).

9.0 RECREATIONAL IMPACT

Fish Lake is open to fishing annually from the 4th Saturday in April through September 30th under statewide harvest rules for game fish. The proposed rotenone treatment will occur after the closure of the 2022 fishing season, and catchable trout will be stocked prior to the 2023 fishing season to ensure no gap in angling opportunity. No other recreational impacts are anticipated, as treatment will not impede pleasure boating or wildlife viewing and will occur during the fall when water temperatures are too cold for swimming, water skiing, or beach activities.

10.0 ECONOMIC IMPACTS

An estimated minimum of 3,000 trips made to Fish Lake as a result of the proposed management action would result in an economic impact totaling $120,000 per year (2011 dollars; based USFWS estimate of $40.00 per trip; USFWS 2013). If the project is successful for 8 years it will generate an estimated $960,000 in economic activity. The total annual cost to plant this lake with trout fry is less than $3,000. The estimated cost of rehabilitation is $80,000 (including costs of rotenone, time, and travel). The investment will be realized within the first year of treatment.

11.0 RELATED MANAGEMENT ACTION

See Section 1.0 (INTRODUCTION) for post-treatment fish stocking information.

Increased penalties and enforcement activities are desirable if WDFW is to dissuade illegal stocking of state-managed waters. Educating the public about the cost of rehabilitation, with emphasis on what WDFW might otherwise be able to accomplish with those resources, is advised. That outreach and education could help curb illegal fish introductions and turn local opinion against offenders.

12.0 PUBLIC CONTACT

Public meetings will be held during May/June 2022 online and/or in Spokane County and Olympia to explain WDFW 2022 rehabilitation proposals, garner public input, and address concerns.

13.0 PRE-TREATMENT ANALYTICAL METHODS USED FOR MONITORING

The following pre-treatment monitoring is required by DOE (2015).

13.1 Water Chemistry

WDFW must collect pre-treatment measurements of water chemistry, including water temperature, dissolved oxygen, and pH, at a representative location in the treatment water within 24 hours prior to treatment. Pre-treatment water chemistry data will be collected using a YSI multimeter (Yellow Springs International/Xylem; Yellow Springs, OH).

13.2 Volatile Organic Compounds (VOC)

If potable water rights/withdrawals are present in the treatment water AND liquid rotenone is applied, WDFW must collect a water sample to test for background levels of VOCs. These samples must be sent to an accredited environmental laboratory within 48 hours for processing. VOC detection levels must be ≤ 0.5 ppb. VOC samples will be collected from Fish Lake in the week leading up to treatment.

14.0 POST-TREATMENT ANALYTICAL METHODS USED FOR MONITORING

The following post-treatment monitoring is required by DOE (2015).

14.1 Water Chemistry

WDFW must collect post-treatment measurements of water chemistry, including water temperature, dissolved oxygen, and pH, at a representative location within 24 hours following treatment. Post-treatment water chemistry data will be collected using methods described above (Pre-Treatment).

14.2 Trout Toxicity Bioassay

Beginning 24 hours following the rotenone application, again at 7 days following the treatment, and continuing weekly thereafter until all fish survive 48 consecutive hours, caged sentinel fish (e.g., Rainbow Trout fingerlings) must be placed in the treated waterbody and monitored for survival. Five sentinel fish will be placed in a cage at each bioassay location, with the number of locations based on whether potable water rights are present for the treated waterbody. If no potable rights are present, a single bioassay is required. If potable rights are present, then bioassay must occur at 3 locations representative of the potable withdrawals or at the number of locations equal to 20% of the number of potable water rights, whichever number is greatest. Bioassay would occur at 3 locations in Fish Lake following treatment (15 potable water rights x 0.2 = 3 locations; Appendix).

14.3 Water Withdrawals

1. **Potable Water Rights**

   Potable water withdrawals from the treated water body must cease prior to treatment and cannot resume until ***BOTH*** following conditions are met:

- **Rotenone concentration**

Potable water withdrawals from the treatment water may resume only after rotenone concentration in the treated waterbody falls below 40 ppb (active ingredient). Rotenone concentrations must be analyzed by methods listed in SOP 16 of the Rotenone SOP manual (Finlayson et al. 2018), which includes bioassay with salmonids. Bioassay must be conducted in locations representative of potable withdrawals from the treated waterbody, and result in 100% survival of bioassay fish at all locations before potable withdrawals may resume. Bioassay must be conducted at a minimum of three locations, or at the number of locations equal to 20% of the number of potable withdrawals from the treatment water, whichever number of locations is greatest. Bioassay will occur in 3 locations in Fish Lake (see Section 14.2 for more information).

- **Volatile Organic Compounds (VOC)**

Potable water withdrawals may not resume until VOC concentrations return to background (pre-treatment) levels or fall below 0.5 ppb. Samples must be sent to an accredited environmental laboratory within 48 hours for processing. VOC detection levels must be ≤ 0.5 ppb. WDFW will collect VOC samples within a month following treatment, and as needed thereafter until detection levels are at baseline or are ≤ 0.5 ppb.

2. **Irrigation or Livestock Withdrawals:**
   Treatment waters must meet standards applicable to crop irrigation and livestock watering required by the rotenone product labels before water withdrawals can resume. Irrigation is unlikely to occur at the time of treatment, as it will be outside of the growing season (WSUE 2022), and the lake will detoxify naturally prior to spring 2023. However, if irrigators with valid water rights require irrigation water at the time of treatment, WDFW will provide it as necessary. Currently, there are no livestock watering restrictions for the rotenone products proposed for use in this treatment. Thus, no water will be provided for livestock watering.

15.0 REFERENCES

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APPENDIX

Table A. 1. Fish Lake surface water rights.

Record #	Name	Source	Latitude	Longitude	Potable	Period of Withdrawal	Purpose
S3-159622CL	Myers, Thomas E.	Fish Lake	47.5198	-117.5167	?	Continuous	Not specified
S3-159642CL	Myers, Thomas E.	Fish Lake	47.5205	-117.517	Y	Continuous	Domestic and Irrigation
S3-159625CL	Myers, Thomas E.	Fish Lake	47.5198	-117.5172	Y	Continuous	Domestic and Irrigation
S3-141674CL	Chissus, Ed C.	Fish Lake	47.5187	-117.5225	Y	Continuous	Domestic and Irrigation
S3-055980CL	Hudson, Sr., Jerry	Fish Lake	47.5189	-117.5224	Y	Continuous	Domestic and Irrigation
S3-036451CL	Meili, Harold W.	Fish Lake	47.5191	-117.522	Y	Continuous	Domestic and Irrigation
S3-035212CL	Weetman, Grant W.	Fish Lake	47.5184	-117.5229	Y	Not specified	Domestic and Irrigation
S3-28609CWRIS	Feil, Joseph F.	Fish Lake	47.5196	-117.5205	Y	Continuous	Domestic
S3-26617CWRIS	Lindell, Rene R.	Fish Lake	47.5191	-117.521	Y	Continuous	Domestic
S3-26619CWRIS	Weetman, Velma A.	Fish Lake	47.518	-117.5222	Y	Continuous	Domestic
S3-26638CWRIS	Mittelstadt, Don C.	Fish Lake	47.518	-117.5231	Y	Continuous	Domestic
S3-26644CWRIS	Meili, Harold W.	Fish Lake	47.5161	-117.5212	Y	Continuous	Domestic
S3-26645CWRIS	Meili, Harold W.	Fish Lake	47.5189	-117.5217	Y	Continuous	Domestic
S3-26647CWRIS	Chissus, Edith	Fish Lake	47.5184	-117.5222	Y	Continuous	Domestic
S3-26650CWRIS	Barner, Donald J.	Fish Lake	47.5187	-117.522	Y	Continuous	Domestic
S3-01300CWRIS	Pease, Ruth E.	Fish Lake	47.5212	-117.5183	N	May 1-September 15	Irrigation