2022 PRE-TREATMENT AND MANAGEMENT PLAN FOR WILLIAMS LAKE, SPOKANE COUNTY, WASHINGTON

Randall Osborne[1], Bill Baker[2], and Brian Walker[2]
Washington Department of Fish and Wildlife
Fish Management Division

[1]District 2
2315 N. Discovery Place
Spokane Valley, WA 99216

[2]District 1
755 S. Main St.
Colville, WA 99114

Table of Contents

List of Figures

List of Tables

1.0 INTRODUCTION

Williams Lake is located in southwest Spokane County, approximately 12 miles southwest of the town of Cheney (Figure 1). The Washington Department of Fish and Wildlife (WDFW) manages Williams Lake as a trout monoculture fishery and stocks Rainbow Trout *Oncorhynchus mykiss* fingerlings annually during the spring at a rate of 200-300 fish per surface acre, along with Westslope Cutthroat Trout *Oncorhynchus clarki lewisi* fingerlings at a rate of 100-150 fish per surface acre (Osborne 2015a). Williams Lake is open seasonally from the 4th Saturday in April through September 30th, with an estimated 20,000 angler-trips annually when trout fishing is excellent (Osborne 2015b). Williams Lake has been managed as a Trout fishery for decades, but the presence of illegally introduced non-native game fish and regulated fish species via direct introduction as well as immigration from seasonally intermittent connectivity with Badger Lake, has resulted in the necessity to rehabilitate (treat with rotenone) eight times to remove target fish species and restore quality trout fishing opportunity (1956, 1962, 1971, 1982, 1988, 1995, 2003, 2015; Osborne 2015c). Previous treatments primarily targeted Largemouth Bass *Micropterus Salmoides*, Pumpkinseed Sunfish *Lepomis gibbosus*, Tench *Tinca tinca*, and Yellow Perch *Perca Flavescens*. Following the 2015 treatment, a high-water event in spring 2016 inundated the fish control structure at the outlet of Williams Lake and allowed non-native game fish species to invade from the downstream wetland complex. Since 2016, trout growth, condition, and survival, as well as angler participation, have gradually worsened as populations of Pumpkinseed Sunfish, Tench, and Yellow Perch have proliferated (WDFW unpublished data). WDFW proposes to rehabilitate Williams Lake in October 2022 to remove target species and restore the recreational trout fishery.

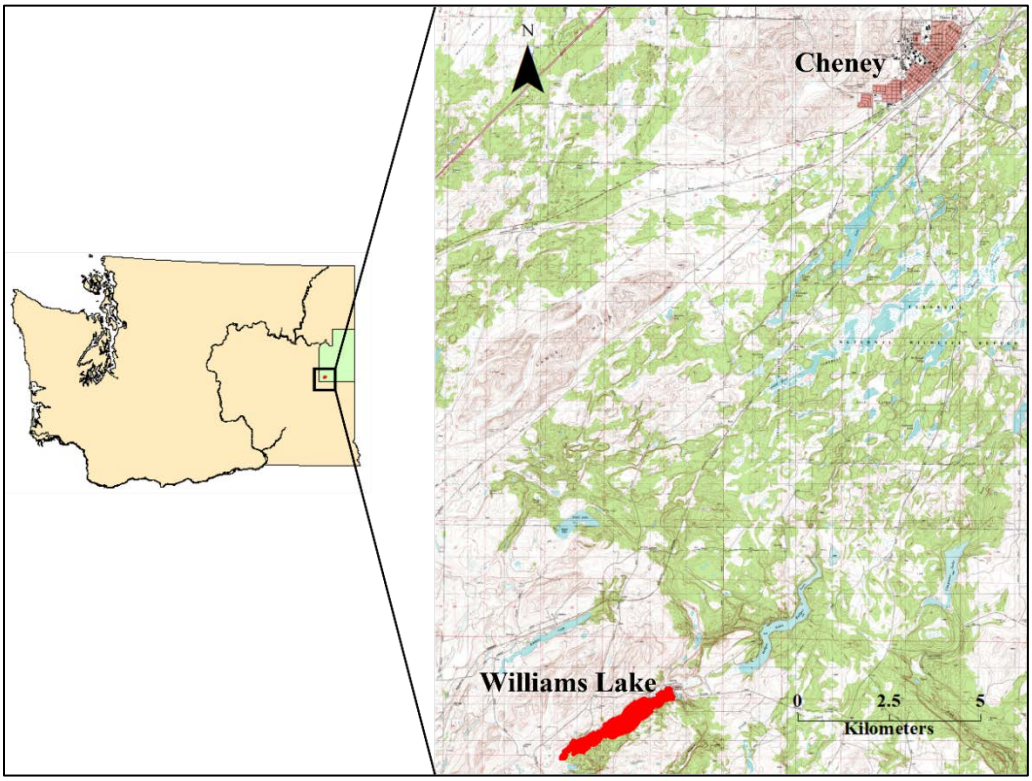

Figure 1. Williams Lake (red) area map, location in Spokane County (green), and Washington State.

2.0 WATER DESCRIPTION

1. **WATER:** Williams Lake
2. **COUNTY:** Spokane
3. **LOCATION:** T21N, R40E, S12 and S13; and T21N, R41E, S5, S6, S7, and S8. Center of Lake is located at 47.326897N, -117.685462W.
4. **LAKE DESCRIPTION:** Williams Lake has a seasonal inlet and outlet, but both are dry in the fall (time of treatment).
    - Area: 319 acres
    - Volume: 13,087 acre-feet
    - Maximum depth: 115 feet
    - Average depth: 37 feet.
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 outlet stream to Downs Lake (dry at time of treatment).
7. **STREAM:** Yes. Seasonally intermittent inlet and outlet will be dry at time of treatment.
8. **PUBLIC ACCESS:** Yes.
9. **LAND OWNERSHIP:** Public 1% (WDFW), Private 99%.
10. **ESTABLISHED RESORTS:** One (Bunker's Resort).

11. **TARGET SPECIES:** Pumpkinseed Sunfish, Tench, and Yellow Perch
12. **DATE LAST REHABILITATED:** October 28-29, 2015
13. **PROPOSED TREATMENT DATE RANGE:** October 10-14, 2022
14. **RESTOCKING DATE:** Spring 2023
15. **SPECIES:** Rainbow Trout and Westslope Cutthroat Trout
16. **CATCHABLES:** 20,000 Rainbow Trout (spring 2023)
    FRY/FINGERLINGS: 60,000 Rainbow Trout and 20,000 Westslope Cutthroat Trout (spring 2024); 90,000 Rainbow Trout and 20,000 Westslope Cutthroat Trout 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 150 gal liquid and 79,024 lbs powder.
4. **METHOD OF TOXICANT APPLICATION:** Pumper boat slurry and airboat spray.
5. **DEACTIVATION (OXIDIZER):** None. Lake will detoxify on its own, typically within 6-8 weeks following treatment.
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. WDFW manages both trout and warmwater recreational fisheries with a variety of fish species, requiring varying levels of skill. 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 the current fingerling-stocked trout fishery in Williams Lake with catchable-sized fish would require 80,000 to 95,000 catchable Rainbow Trout per year. Cost of stocking catchable-sized fish is more than ten times as expensive as fry planting, and Region 1 lacks the infrastructure, 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 Section C,

subsection 1, item a) that demonstrated poor survival of trout and increasing numbers (and high relative abundance) of panfish and/or predatory fish are each thresholds that justify lake rehabilitation (Bolding et al. 2015). Trout survival rates are 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 Williams 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 Williams 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.
- No designated critical habitat is present at Williams Lake.
- 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

Williams 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 20,000 angler trips per year made to Williams Lake as a result of the proposed management action would result in an economic impact totaling $800,000 annually (2011 dollars; based on USFWS estimate of $40.00 per trip; USFWS 2013). If the project maintains quality trout fishing for 8 years, it will generate an estimated $6,400,000 in economic activity. The total annual cost to plant this lake with trout fry and fingerlings is less than $10,000. The estimated cost of rehabilitation is $300,000 (including costs of rotenone, staff time, travel, etc.). The investment by the state 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 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 are sent to an accredited environmental laboratory within 48 hours for processing. Sample analysis for VOC's must be able to detect concentrations ≤ 0.5 ppb.

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 in the Project Area. 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 in the Project Area 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 Williams Lake following treatment (14 potable water rights x 0.2 = 2.8 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 within the Project Area, 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.

   - **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 will be sent to an accredited environmental laboratory within 48 hours for processing. Sample analysis for VOC's is conducted with minimum detection levels at or below 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 not likely to be occurring at the time of treatment, and the lake will have detoxified prior to irrigation beginning in spring 2023. Currently, there are no livestock watering restrictions for the rotenone products proposed for use in this treatment.

15.0 REFERENCES:

Behan, B. 2017. Intra-service section 7 biological assessment. Biological assessment of Washington Department of Fish and Wildlife's Lake and Stream Rehabilitation Program. United States Fish and Wildlife Service (Region 1), Portland, Oregon.

Billman, H.G., C. G. Kruse, S. St. Hilaire, T. M. Koel, J. L. Arnold, and C. R. Peterson. 2012. Effects of rotenone on Columbia Spotted Frogs *Rana luteiventris* during field applications in lentic habitats of southwestern Montana. North American Journal of Fisheries Management, 32:781-789.

Bolding, B. 2015. Discharge management plan for the Washington Department of Fish and Wildlife Lake and Stream Rehabilitation Program. Washington Department of Fish and Wildlife, Olympia.

Bradbury, A. 1986. Rotenone and trout stocking. Washington Department of Game, Fisheries Management Division. Fisheries Management Report 86-2.

Finlayson, B., D. Skaar, J. Anderson, J. Carter, D. Duffield, M. Flammang, C. Jackson, J. Overlock, J. Steinkjer, and R. Wilson. 2018. Planning and standard operating procedures for the use of rotenone in fish management – rotenone SOP manual, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Grisak, G. G., D. R. Skaar, G. L. Michael, M. E. Schnee, and B. L. Marotz. 2007. Toxicity of Fintrol (antimycin) and Prenfish (rotenone) to three amphibian species. Intermountain Journal of Sciences, 13:1-8.

Ling, N. 2003. Rotenone – a review of its toxicity and use for fisheries management. Science for Conservation #211. New Zealand Department of Conservation, Wellington.

McGann, B., and A. Strecker. 2018. Effects of rotenone on zooplankton communities: Summary report. Report to Washington Department of Fish and Wildlife. Portland State University, Portland, Oregon.

Osborne, R. 2015a. Lake management plan – Williams Lake (Spokane County). Washington Department of Fish and Wildlife, Spokane Valley.

Osborne, R. 2015b. Pre-rehabilitation plan – Williams Lake (Spokane County). Washington Department of Fish and Wildlife, Spokane Valley.

Osborne, R. 2015c. Post treatment and discharge monitoring report for Williams Lake, Spokane County, Washington. Washington Department of Fish and Wildlife, Spokane Valley.

United States Department of the Interior, United States Fish and Wildlife Service (USFWS). 2013. 2011 national survey of fishing, hunting, and wildlife-associated recreation: Washington. United States Department of the Interior, Washington D. C.

Washington Department of Ecology (DOE). 2015. Fishery resource management general permit: national pollutant discharge elimination system and State waste discharge general permit. Washington Department of Ecology, Olympia.

APPENDIX

Table A. 1. Williams Lake surface water rights.

Record #	Name	Source	Latitude	Longitude	Potable	Period of Withdrawal	Purpose
S3-27847C	Williams Lake Beach Club Inc.	Williams Lake	47.3322	-117.6719	N	Continuous	Fire protection and non-agricultural irrigation
S3-28227CWRIS	Fischer, Jack & Shirely	Williams Lake	47.3334	-117.6664	Y	Continuous	Domestic
S3-28386CWRIS	Suess, Henry & Thelma	Williams Lake	47.3327	-117.6659	Y	Continuous	Domestic
S3-78043JWRIS	Bunker, Frank S	Williams Lake	47.3231	-117.6932	Y	Continuous	Domestic and Irrigation
S3-78044JWRIS	McHenry, Bradley D. & Diane E.	Williams Lake	47.3224	-117.6971	Y	Continuous	Domestic and Irrigation
S3-78090JWRIS	Clark, Charles & Lauretta C.	Williams Lake	47.3341	-117.6679	Y	Continuous	Domestic and Irrigation
S3-78091JWRIS	Betz, Grace B.	Williams Lake	47.3322	-117.6657	Y	Continuous	Domestic and Irrigation
S3-78092JWRIS	Hartley, Harold J. & Joretta	Williams Lake	47.3322	-117.6655	Y	Continuous	Domestic and Irrigation
S3-78094JWRIS	Hartman, Delma L.	Williams Lake	47.3341	-117.6664	Y	Continuous	Domestic
S3-78105JWRIS	Patterson, Robert B.	Williams Lake	47.3341	-117.6666	Y	Continuous	Domestic
S3-78106JWRIS	Whitworth, C & V	Williams Lake	47.3315	-117.6736	N	April 1 - October 31	Irrigation
S3-78107JWRIS	Stahlborn, Ted & Hannah	Williams Lake	47.3313	-117.6741	Y	Continuous	Domestic
S3-78108JWRIS	Helm, Donald & Ethel	Williams Lake	47.332	-117.6654	N	April 1 - October 31	Irrigation
S3-78110JWRIS	Roach, Barry & Helene	Williams Lake	47.332	-117.6659	N	April 1 - October 31	Irrigation
S3-78111JWRIS	Giles, Ramond M. & Carolyn E.	Williams Lake	47.3324	-117.6657	Y	Continuous	Domestic
S3-78112JWRIS	Frost, John S.	Williams Lake	47.3315	-117.6734	Y	Continuous	Domestic
S3-78114JWRIS	Surbeck, Marion & Camilla	Williams Lake	47.3313	-117.675	Y	Continuous	Domestic
S3-78115JWRIS	Presnell, Edward T. & Bonnie J.	Williams Lake	47.3329	-117.6661	Y	Continuous	Domestic