PRE-REHABILITATION PLAN

Warden, South Warden, and Annex Lakes

I. PROPOSAL

NOTE: The proposal to rehabilitate Warden Lake in 2006 is a back-up proposal to other Regional waters in the event those lakes are not rehabilitated in 2006.

A. Justification for Proposed Rehabilitation

The Warden, South Warden, and Annex chain of lakes lie in the Seep Lakes Wildlife Area southeast of O'Sullivan Dam and Potholes Reservoir. Warden Lake is 211 acres and among the largest trout-only waters in Grant County, while the remaining waters in this system are rather small and have limited public access. Warden Lake has been a popular trout fishery since the mid-1950's, and as many as 2,000 anglers have attended the fishery on an opening day.

Carp and other spiny rayed fishes eventually invaded the system from Lind Coulee. It was not until an outlet barrier on the outflow of Warden Lake was constructed in 1979, and the third rehabilitation, that carp were successfully eradicated from the system. Yellow perch, however, persisted. This was probably due to that species early spawning behavior (~40 F water temperature), long incubation period (~21 days), and the inability of rotenone to kill fish in the egg stage. Perch eggs were actually observed during the fourth rehabilitation of Warden Lake in April of 1991. The fifth treatment was conducted in the fall of 1998, and no yellow perch have been observed since. While the perch population may have been eradicated, it is possible that some small number remain. Brown bullheads and pumpkinseed sunfish have persisted and currently comprise an overwhelming portion (> 90%) of fish numbers and biomass in Warden Lake (June 2005 electrofishing survey). Fisheries for these species do not attract many anglers to Warden Lake and are negligible.

Other factors have also plagued management of Warden Lake, complicating the consistent production and evaluation of the fishery. The March 1st opener remained in effect after the last rehabilitation, and unfavorable weather conditions often diminished participation and angling success (Table 1). In 2001, the season was changed to the statewide late-April opener (last Saturday in April through September 30). Opening day catch rates of fingerling-origin yearlings improved. Catchable-sized (9-10") rainbow had also been added to the fishery previous to opening day in 2001 and 2002; however, these additional fish failed to make a significant contribution to the catch during either year, so were discontinued.

Yearling size has regularly exceeded expectations to the extent that it was difficult to separate yearlings from carry-overs, especially in 2003. Excessive yearling size has been an indication of poor fingerling survival. In 2004, size began to diminish, and in anticipation of a failed fingerling-based fishery, catchables were added previous to the 2005 opener. Almost all the rainbow checked opening day 2005 and all rainbow observed in a subsequent survey were attributed to the addition of the catchables. Catchables were also added to prop up the 2006 opening day fishery.

Avian predation has also increased on Warden Lake and is assumed to be a factor in fingerling survival. Large numbers of cormorants (100's) and pelicans (dozens) are frequently observed feeding at the lake through spring and into mid-summer. Fish species consumed are unknown, and the impact to fingerling rainbow remains unquantified; however, even an average of 20 cormorants each consuming 2 lbs per day could remove 36,000 rainbow fingerlings (@ 30/lb avg.) per month. The stocking allotment for Warden Lake is only 70,000 rainbow trout.

Table 1. Warden Lake opening day catch and effort summary: 1991 - 2006.

Year	Fish/ angler	Fish/ hour	Age 1+ average length	Age 2+ average length	Age 2+ % of catch	Comments
91	**April Rehab**					
92	3.6	1.7	10.6			
93	2.3	0.7	12.0	14.9	41.0	Iced 100%
94	2.0	0.6	12.3	20.9	1.0	
95	0.2	0.1	14.4	18.3	67.0	
96	0.6	0.2	13.4	17.7	18.0	Ice cover 95%
97	0.1	0.1	none?	17.3	100.0	Ice cover 50%
98	1.5	0.9	9.2		0.0	Catchable RB added (30K)
98	**October Rehab**					
99	0.3	0.1	9-10		none	Catchable RB added (30K); Windy
00	1.2	0.2	12.0	14-16	92 ?	Yrlg-carryover sig size overlap?
01	change to late-April Opener					
01	4.7		13.0	19	3	Catchable RB added (30K) Yrlg-carryover sig size overlap
02	4.7		13.4	15+?	1-2	Catchable RB added (14K) Yrlg-carryover sig size overlap
03	2.1		14.7	18.5	1-2	RB all fingerling origin. Yrlg-co sig size overlap 12-17"
04	3.8		11.9	16.8	8	RB all fingerling origin.
05	3.6		10.0	15.5	5	Catchable RB added (25K)
06	3.5		12.2	15-16	4-5	Catchable RB added (25K)
06-07	**proposed October Rehab**					

It has been eight years since the last treatment of these lakes. Fingerling trout survival has been erratic at best. WDFW policy states that lake rehabilitation is an option for eliminating undesired fish in an effort to restore the intended management scheme. Alternatives to rehabilitation are costly or impractical. To maintain a comparable fingerling-stocked trout fishery in Warden Lake with catchable-sized fish would take 50,000 catchable rainbow. This would constitute about half of the District's entire normal allotment of catchable trout. Region Two lacks the hatchery space and water to institute a catchable fish- stocking program as a substitute for lake rehabilitation. Stocking catchable sized fish also costs almost ten times the

cost of a fry plant. Optimistic estimates of survival of even 4-6 inch advanced fry in these waters range from 10-20 percent. Spring fingerling survival in lakes free of competing species ranges from 50-80 percent.

B. Physical Description of Water Proposed for Rehabilitation

l. WATER: **Warden Lake**
2. LOCATION: Sec 10,15 T17N R29E Grant Co.
3. SURFACE ACRES: 211 MAXIMUM DEPTH: 70 feet
4. VOLUME: 5,721 acre-feet; 15,550,502,000 lbs. H2O
5. OUTLET: Permanent, small creek drains to Lind Coulee/Potholes Reservoir.
6. STREAM: ~1 mile FLOW: 5 cfs
7. PUBLIC ACCESS: Parking, toilets, shoreline access, and boat launch at northwest end; shoreline access at southwest end.
8. LAND OWNERSHIP: PUBLIC 20% PRIVATE 80 %
9. ESTABLISHED RESORTS: One resort on the north end of the lake, and a small semi-retirement community (Mallard Haven) on the northeast end of the lake.

l. WATER: **South Warden Lake**
2. LOCATION: Sec 15, T17N R29E Grant Co.
3. SURFACE ACRES: 25 MAXIMUM DEPTH: 30 feet
4. VOLUME: 348 acre feet; 945,914,000 lbs. H2O
5. OUTLET: Permanent, small creek drains to Warden Lake.
6. STREAM: 50 ft. FLOW: 1-2 cfs
7. PUBLIC ACCESS: Shoreline access through agreement with private landowner.
8. LAND OWNERSHIP: PUBLIC 0% PRIVATE 100 %
9. ESTABLISHED RESORTS: None; public fishing access by agreement with the landowner.

l. WATER: **Annex Lakes** (formerly referred to as Index Lakes, and including Shay Pond)
2. LOCATION: Sec 11,15 T17N R29E Grant Co.
3. SURFACE ACRES: 26 MAXIMUM DEPTH: 30 feet
4. VOLUME: 213 acre feet; 577,744,000 lbs. H2O
5. OUTLET: Permanent, small creek drains to Warden Lake.
6. STREAM: ~0.5 miles FLOW: 1-2 cfs
7. PUBLIC ACCESS: Shoreline access through agreement with private landowner.
8. LAND OWNERSHIP: PUBLIC 0% PRIVATE 100 %
9. ESTABLISHED RESORTS: None; public fishing access by agreement with the landowner.

C. <u>Proposed Management Actions</u>

1. WATER: **Warden Lake**
2. TARGET SPECIES: brown bullheads, pumpkinseed sunfish, possibly yellow perch
3. DATE LAST REHABED: October 1998
4. PROPOSED TREATMENT DATE: September-November, 2006
5. REPLANTING DATE: Spring 2007
6. SPECIES: rainbow trout, brown trout
7. CATCHABLES: 50,000 FINGERLINGS: 80,000
8. PROPOSED TOXICANT: Rotenone, powder and liquid CONCENTRATION: 3 ppm
   AMOUNT (ROTENONE AT 5% ACT. INGRED): 46,261 lbs., 45 gal.
9. METHOD OF APPLICATION: pumper boat slurry and airboat/ATV spray
10. CREW DESCRIPTION: Leader(s) Jeff Korth Personnel ~12

1. WATER: **South Warden Lake**
2. TARGET SPECIES: brown bullheads, pumpkinseed sunfish, possibly yellow perch
3. DATE LAST REHABED: October 1998
4. PROPOSED TREATMENT DATE: September-November, 2006
5. REPLANTING DATE: Spring 2007
6. SPECIES: rainbow trout, brown trout
7. CATCHABLES: 5,000 FINGERLINGS: 12,000
8. PROPOSED TOXICANT: Rotenone, powder and liquid CONCENTRATION: 3 ppm
   AMOUNT (ROTENONE AT 5% ACT. INGRED): 2,814 lbs., 15 gal.
9. METHOD OF APPLICATION: pumper boat slurry and airboat/ATV spray
10. CREW DESCRIPTION: Leader(s) Jeff Korth Personnel ~2-4

l. WATER: **Annex Lakes** (formerly referred to as Index Lakes, and including Shay Pond)
2. TARGET SPECIES: brown bullheads, pumpkinseed sunfish, possibly yellow perch
3. DATE LAST REHABED: October 1998
4. PROPOSED TREATMENT DATE: September-November, 2006
5. REPLANTING DATE: Spring 2007
6. SPECIES: rainbow trout, brown trout
7. CATCHABLES: 200 FINGERLINGS: 5,000
8. PROPOSED TOXICANT: Rotenone, powder and liquid CONCENTRATION: 3 ppm
   AMOUNT (ROTENONE AT 5% ACT. INGRED): 1,718 lbs., 60 gal.
9. METHOD OF APPLICATION: pumper boat slurry and airboat/ATV spray
10. CREW DESCRIPTION: Leader(s) Jeff Korth Personnel ~2-4

TOTAL PROPOSED TOXICANT: Rotenone CONCENTRATION: 3 ppm
AMOUNT (ROTENONE AT 5% ACT. INGRED): 50,793 lbs. powder and 120 gal. liquid.

II. PURPOSE:

The Washington Department of Fish and Wildlife (DFW) provides many types of fisheries in response to public desires. DFW manages both trout and warmwater recreational fisheries based on many different species of fish and levels of difficulty. Pubic demand for and participation in opening day trout fisheries is very high. These fisheries are prized as opportunities for families to recreate together as well as providing an appropriate challenge for occasional or novice anglers. Opening day trout fisheries are also integral to the state and many local economies.

Warden and South Warden lakes have a history of being managed as trout fisheries over the last 50 years. Only the complete rehabilitation or the stocking of catchable-sized fish can restore the trout fishery in these waters now. Rehabilitation will eliminate or drastically reduce inter-specific competition and predation, allowing the trout fingerlings to flourish. The cost of annually stocking of catchable-sized trout and creating a mixed species fishery would be an order of magnitude greater for the larger trout necessary to attract anglers. Without a very significant capital investment, current resources are not available to provide catchable-sized trout on a regular basis without severely impacting hatchery production for many other fisheries. Managing these waters as warmwater fisheries will not create the same amount of recreation, as evidenced by the decline in participation as the trout fishery ebbs.

The current management of Warden and South Warden lakes as opening day trout fisheries requires the periodic rehabilitation of these waters. Warden and South Warden lakes have been rehabilitated many times. Complete kills are difficult to attain in such large, deep bodies of water, but populations of undesirable species can be reduced to the point that trout fisheries are again economical to sustain for 6 to 8 years. The management plan for both waters lists periodic rehabilitation as a tool for controlling populations of competing fishes, and DFW policy states that lake rehabilitation is an option for eliminating illegally planted fish.

III. INTENDED OUTCOME/MEASURE OF SUCCESS:

DFW intends to restore Warden and South Warden lakes to popular, easily accessible opening day trout fisheries based on fingerling-stocked trout. The average catch rates should be at least three to four 10-12 inch trout per angler. Success will be measured during annual creel surveys. Given a reasonable chance of reducing the populations of undesirable species dramatically, the beneficial effects should last approximately 6 to 8 years under current management schemes. In addition to reasons listed under Resource, Recreational and Economic Impacts, to abandon these lakes as trout fisheries is to invite other incursions across the state.

IV. RESOURCE IMPACTS:

1. The populations of the target species, which are exotic species in Washington, will be severely and negatively impacted. Complete kills of any of the target species are unlikely.

2. Regional and District Habitat, Wildlife and Non-Game managers have been apprised of our rehabilitation plans. No unmitigated concerns have been expressed on the potential impacts to non-targeted species**.**

According to Bradbury (1986), the effects of rotenone on benthos are variable, depending on the concentrations and species. Crustaceans are most tolerant while the 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 pretreatment levels within two months. Zooplankton is more severely impacted, and communities generally take two to twelve months to fully recover. While relatively tolerant of even heavy doses of rotenone, amphibians (especially larval) are at risk, and herptiles are affected somewhat less so. Almost no chance of eliminating an entire population exists.

3. Water withdrawal from the lake for irrigation will be halted until the rotenone has degraded below levels detectable by bioassay (trout survive in the water for 48 hrs). Most irrigation will have ceased for the season by the time treatment occurs. These waters are not a source of potable water for humans. A portion of the waters treated are sources of drinking water for livestock. The product label does not restrict livestock watering at allowable concentrations of use, and the levels of rotenone used in this treatment (3 ppm) are lower than the maximum allowable (4 ppm).

.The lakes will be closed to angling and retention of fish during the treatment and until the season reopens the following spring. The following year's opening day fishery will occur as planned with an early plant of catchable sized rainbow. Other recreational uses such as hunting, boating, and swimming will be curtailed during the planned period of treatment (2-3 days, probably early or late Oct). Most of these activities would be limited by cold temperatures by the time treatment occurs.

Probably the largest resource impact to near-lake residents will be the dead fish accumulating along the shoreline. Besides aesthetic concerns, some odor may occur depending on the weather following the rehabilitation. Exactly where and how many dead fish accumulate will also depend on the weather, particularly wind speed and direction.

4. Professional biologists and other naturalists have visited this site frequently over the past 50 years. To our knowledge, no endemic, rare, threatened or otherwise listed species will be significantly impacted by the rehabilitation.

V. MITIGATING FOR ADVERSE IMPACTS:

1. Because rotenone will not kill fish in the egg stage, WDFW rehabilitates lakes during spring or fall to avoid the spawning seasons of the fish typically targeted. Spring rehabilitations are also chosen take advantage of the cold water, which lengthens the period during which the lake remains toxic. This results in more time for the rotenone to mix throughout the lake, resulting in a better kill. Initial treatments of Warden Lake occurred in the spring in order to avoid impacting downstream resources. Irrigation flows through an adjacent lateral canal delivered another 20 cfs of water at the lake’s outlet at this time, which dilutes the treated water so that rotenone residues are below toxic levels for most fish. Unfortunately, water temperatures frequently approached 40 F, the lower limit for the spawning of any remaining perch.

The last rehabilitation of Warden Lake was done in the fall of 1998 to avoid the perch spawn. As there appears to be a good chance that perch were eliminated during that treatment, the current rehabilitation proposal will also be for the fall of 2005, sometime during September, October, or November, to be sure any remaining perch are eradicated. Bullhead spawning should also have ceased. While not likely, sunfish may still spawn during this time; however, the eggs of this species hatch in a few days, and the lake would still be sufficiently toxic to destroy any resulting progeny. The deeper portions of large lakes are also often anoxic during the fall, and these conditions will add to the stress of fish attempting to escape into the depths of the lake.

2. The outlet will be blocked at the culvert on O'Sullivan Dam Road as long as possible (about three weeks at last treatment) to contain treated water until sufficiently detoxified to an estimated 0.1 ppm or less (0.3 ppm maximum). WA DOT and East Irrigation District will be apprised of these plans. At the time of lake water release, outflow toxicity will be monitored via bioassay. Irrigation return flows in the lateral canal adjacent to the lake's outlet will still deliver sufficient flow (~ 4 cfs) to dilute any treated water to less than 0.05 ppm (0.15 maximum). Oxygenation at a downstream falls would further decrease toxicity before the treated water entered Lind Coulee, where flows in excess of 20 cfs would quickly dilute any remaining rotenone below normally detectable levels. If the level water backed up against the road be at the outlet begins to exceed the level allowed by WA DOT, water will be released immediately. Detoxification will occur if necessary.

3. Provided catchable-sized fish are available the following spring, no loss of recreational fishing time will occur. Trout fingerling survival and growth will be greatly enhanced, and future trout fisheries will attain their previous status. No removal of dead fish is planned as the nutrient base contained therein enhances the productivity of the lake. A season extension from early September until the time of treatment and dropping the daily limit will be sought to allow harvest of as many of the remaining desirable fishes as possible by the public.

4. Livestock use of the waters to be treated will not be significantly affected. The concentration of rotenone used in the treatment will be far below that considered harmful to mammals. The landowners will be notified of the rehabilitation and consequent exposure of livestock to rotenone.

5. Fall rehabilitation will not interfere with waterfowl spring nesting. The eradication of spiny-ray fishes would also benefit waterfowl through increased production of invertebrates. Stocked populations of trout will not be anywhere near as numerous as the current spiny-ray population.

The treatment will either occur before waterfowl hunting season opens or will be timed to interfere as little as possible with hunters utilizing these waters.

Most cormorants typically migrate west during October, and few are expected during the proposed treatment. Any cormorants still utilizing the lake will be displaced to other near-by waters. No other endemic, rare, threatened or otherwise listed species are known to inhabit this area during the time proposed for this treatment. .

6. Protective wear for the eyes, face and hands will be available for all purveyors of rotenone. Superior techniques and equipment not available during previous rehabilitation attempts will be employed during this rehabilitation, further increasing the chances for success.

7. All landowners will be notified of the treatment, and access to the lakes will be posted during treatment according to Department of Ecology NPDES guidelines. Water withdrawals, swimming, possessing or consuming dead fish will cease during the period of toxicity.

VI. RECREATIONAL IMPACT: ALSO SEE PROPOSAL I.A.

Recreational opportunity will be increased. When free of competing species, these lakes may be conservatively estimated to provide at least 4,000 angler trips during the usual angling season. The lakes could sustain three to five times that amount of pressure if the anticipated levels of success are continued and anglers gain confidence in these waters once again.

Angler success should reach three to five fish per trip. Yearling trout should average about 11 inches. Carryovers should be expected to be about 10% of the catch and average 14-16 inches for 2-year-olds and 16-18 inches for 3-year-olds.

VII. ECONOMIC IMPACTS:

An estimated 4,000 trips made to these lakes as a result of the proposed management action would result in an increased economic impact totaling $151,160 per year (1991 dollars; based WDW estimate of $37.90 per trip). If used to its full potential, the annual value could be over $600,000 to the state's economy. The fishery as it now exists generates maybe $20,000 per year and will continue to decline. Rehabilitation would bring back the fishery and associated economic activity.

The total annual costs to stock these lakes with fingerlings is roughly $8,000. The rehabilitation as proposed will cost the Department about $100,000 (including costs of rotenone, time, travel). This is about three times as expensive as past treatments of this water due to the excessive amount of rotenone necessary to eradicate bullheads (3 ppm proposed compared to 1 ppm in the past to eradicate perch). If this rehabilitation provides a fishery for at least five years, the cost including fingerling plants (5 yrs.) and the rehabilitation totals $140,000. The cost of stocking catchable-sized trout, if this were possible (see IA), would be over $160,000 for this five-year period, and the quality of the fishery would be diminished due to the smaller, less desirable condition of the yearlings. The economic impact due this fishery, whether stocking fingerlings or catchables, over five years is at least $750,000 and as much as $3,000,000 to the state's economy.

VIII. RELATED MANAGEMENT ACTION:

See I.C.6. for fish planting data

IX. PUBLIC CONTACT:

A public hearing was held in Ephrata and in Olympia to explain Region Two 2005-06 rehabilitation proposals, assess public opinion, and address local concerns. The announcement was provided statewide and to area papers and radio stations and hand delivered or mailed to landowners and residents near the lakes.

The public meeting in Ephrata was held at 6 pm on July 13, 2006 at the Ephrata High School. Twenty-seven members of the public attended including at least one newspaper reporter. Local residents, primarily from Blue Lake, made up the majority of those present. After DFW's presentation explaining rehabilitations in general and the current proposals, eleven people provided comment. No comment concerning the proposal to rehabilitate Warden Lakes was provided. The public meeting in Olympia was held at 7 pm on July 19, 2006 at the Dept of Natural Resources Building. No one from the public attended. No other comment has been received to date via letters, e-mails, or calls.

With approximately 50% of the lake's users living outside Grant County, actual percentages pro and con are difficult to obtain. Public support may be best judged by the number of participants in the fishery (vis a vis Recreational Impacts).

Comments on the SEPA for rehabilitations statewide will also be accepted during the month of August. The SEPA can be found on WDFW or WA Dept of Ecology's web sites, or at County offices (usually Planning Commission). Additional comments may be sent directly to WDFW via mail or e-mail.

Initiated by: Region Two Fisheries Management