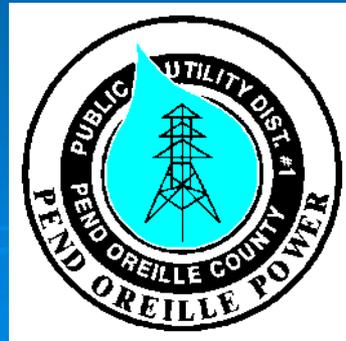


Sullivan Creek Project

Water Utilization Opportunities

Current and Future Operations

Pend Oreille PUD



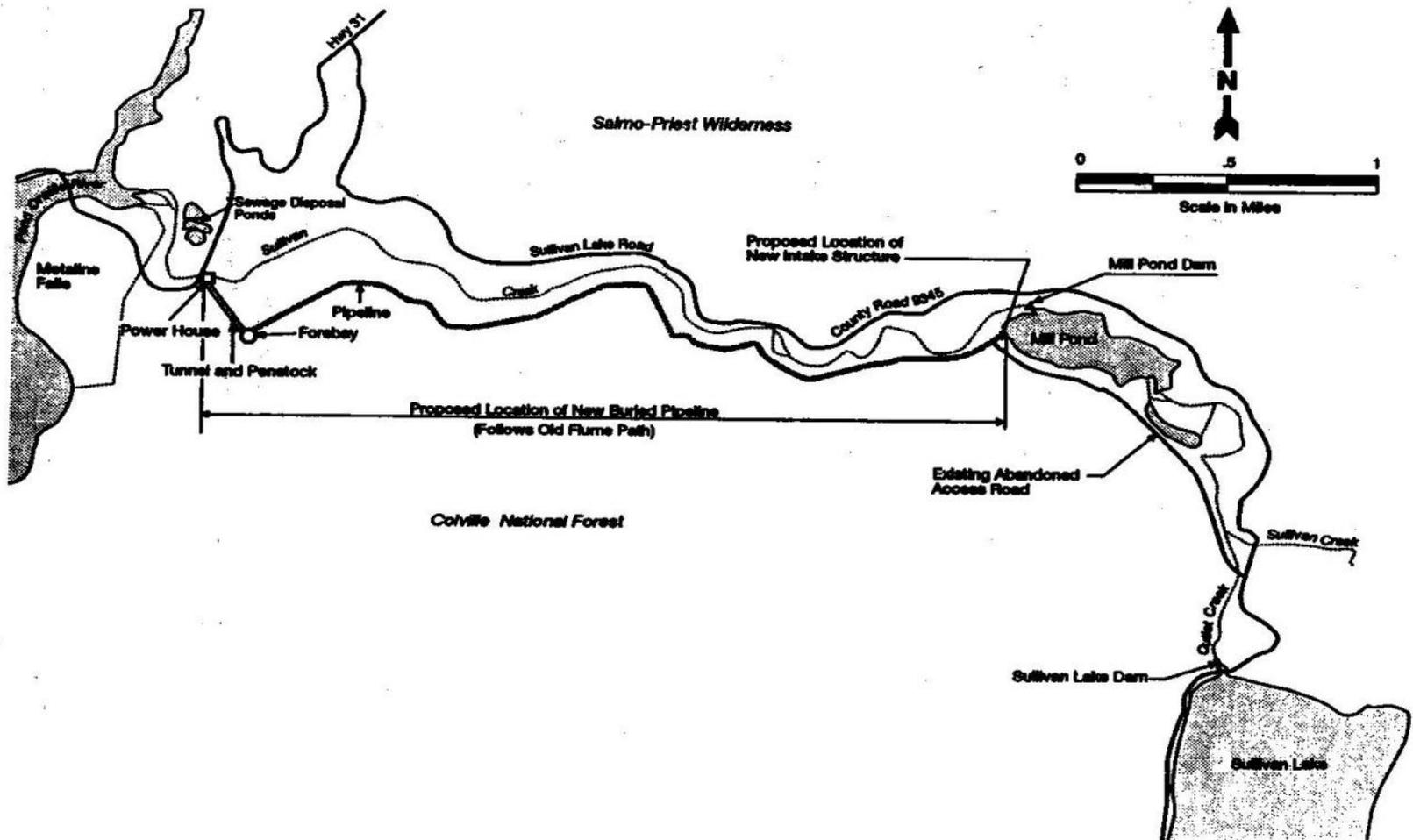
Brief History

- Sullivan Dam and small dam downstream (Mill Pond Dam) constructed in 1911.
- Small hydroelectric power plant (4MW) also constructed in 1911 and operated until 1956.
- Pend Oreille PUD purchased the project in 1959, including water rights and water storage rights, and obtained a FERC License, but power was never generated by the District.
- Project has been operated as directed in FERC License. FERC License is expiring and District plans to surrender the FERC License.
- The District, Seattle City Light, US Forest Service, Kalispel Tribe, WDOE, WDFW, The Lands Council, members of the public and several other agencies have reached a collaborative agreement on measures to be taken when the License is surrendered.

Project Location



Sullivan Lake Vicinity Map



Sullivan Creek Project Description

- The existing project includes:
 - Sullivan Lake and Sullivan Lake Dam
 - Mill Pond and Mill Pond Dam
 - An Abandoned Flume and Canal between Mill Pond and Sullivan Creek Powerhouse
 - Small Tunnel
 - Existing Abandoned Powerhouse Structure
 - Powerhouse is used as part of Town of Metaline Falls Water System

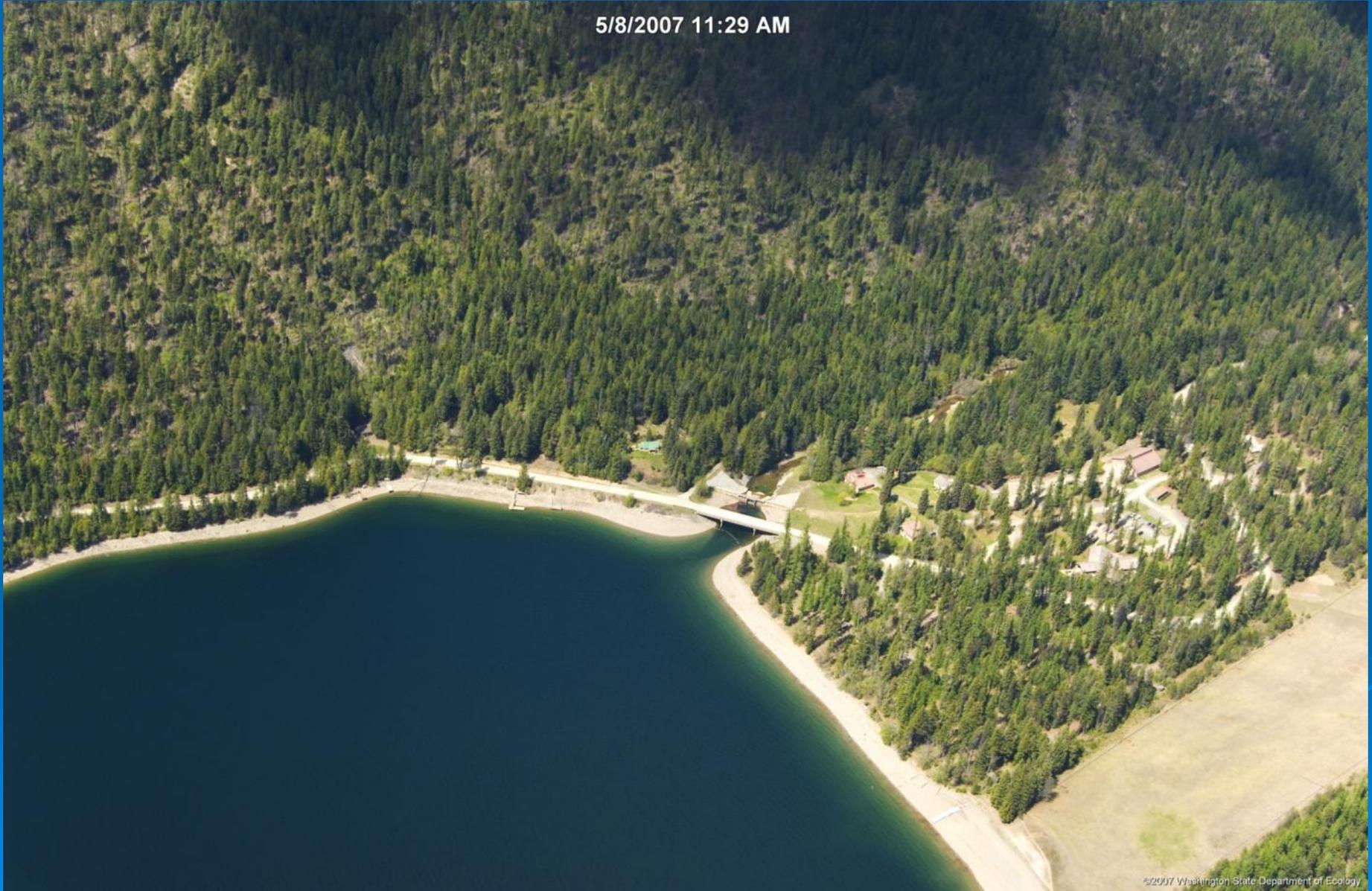


6 23 '05

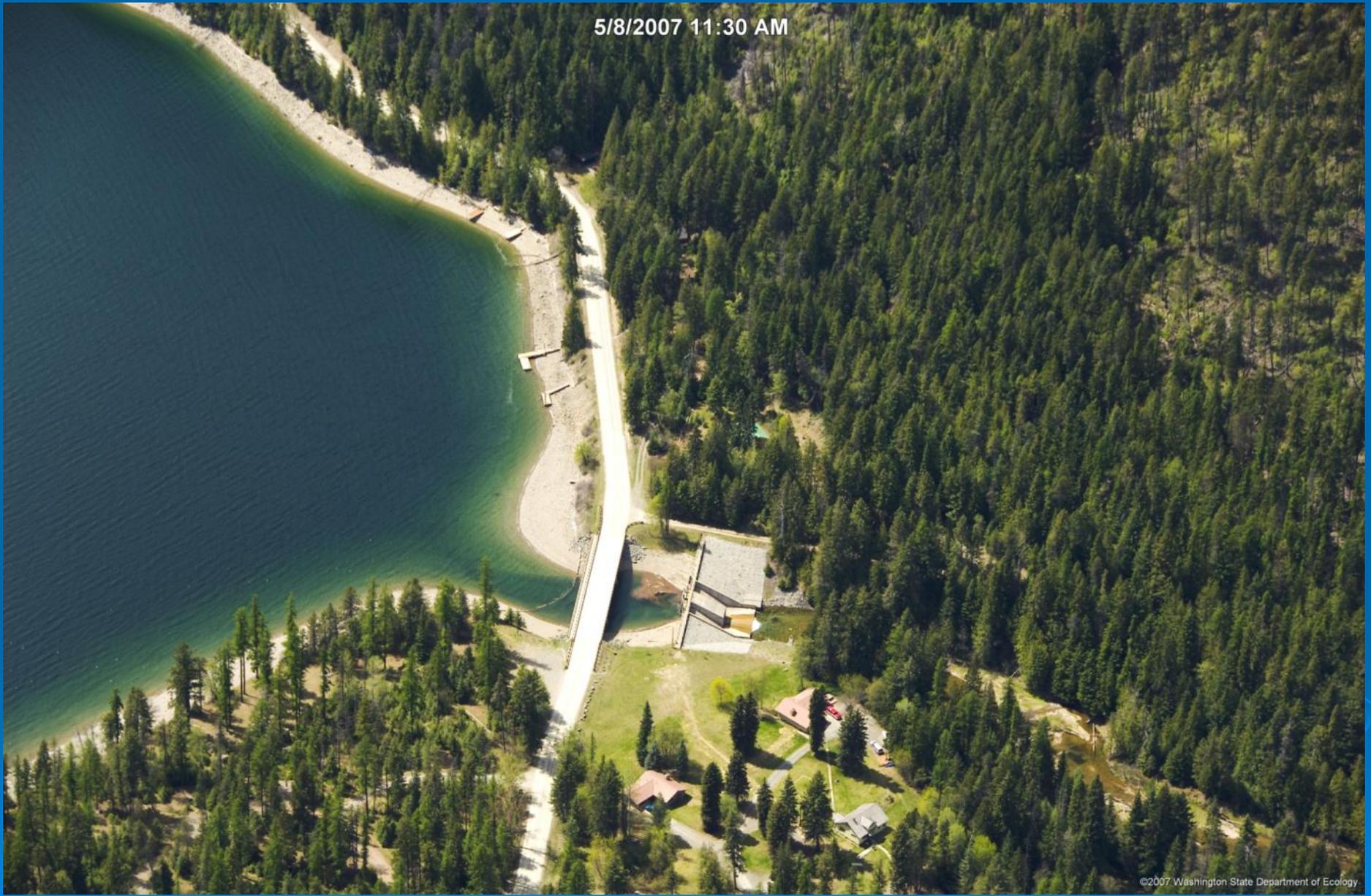


10 1:22PM

5/8/2007 11:29 AM



5/8/2007 11:30 AM





Three low level outlet gates can be used to release water



Upstream face of Sullivan Dam



Close-up of Sullivan dam low level outlet

Current Sullivan Lake Operation

- Sullivan Lake fills and empties each year in accordance with Pacific Northwest Coordination Agreement and its existing FERC license.
- The lake begins to fill each spring about April 1
- To the extent possible, the lake maintains a constant full elevation of 2,588.6 for the months of June through September for summer recreation. The gates on the dam are opened October 1 to begin lowering the lake to provide room to catch spring run-off and provide downstream power benefits.
- Lake is drained to elevation 2565.0 by about December 15 each year.
- Minimum instream flow release of 10 cfs (of inflow, if lower) is maintained year-round.
- US Forest Service has campgrounds and boat launches on Sullivan Lake.
- Flows at the dams are monitored. Gates are adjusted and maintained. Five-year dam safety inspections are conducted as part of the FERC License.

Historic Lake Operation

SULLIVAN LAKE DAM OUTFLOW MODEL

To Model Various Dam Discharge Rates for Impact on Filling and Draining
in Wet, Dry and Average Hydrologic Years

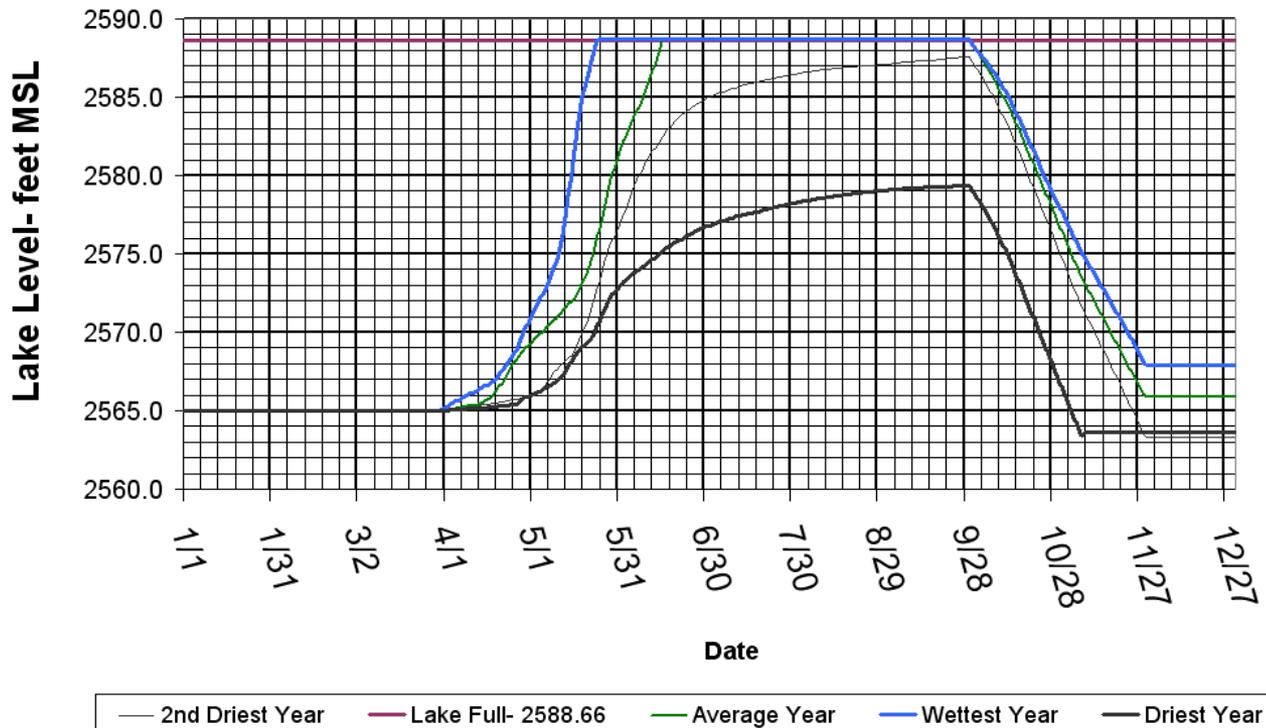
J. Snyder, EES Consulting, Revised Nov 6, 2009
425-889-2700

Changes Here Change All Years

Dam Discharge Outlet Flows-CFS

MONTH	RELEASE	Notes
Jan	inflow	(do not change)
Feb	inflow	(do not change)
Mar	inflow	(do not change)
April Week 1	10	
April Week 2	10	
April Week 3	10	
April Week 4	10	
May Week 1	10	
May Week 2	10	
May Week 3	10	
May Week 4	10	
Jun Week 1	10	
Jun Week 2	10	
Jun Week 3	10	
Jun Week 4	10	
July Week 1	10	
July Week 2	10	
July Week 3	10	
July Week 4	10	
Aug Week 1	10	
Aug Week 2	10	
Aug Week 3	10	
Aug Week 4	10	
Sep Week 1	10	
Sep Week 2	10	
Sep Week 3	10	
Sep Week 4	10	
Oct Week 1	200	
Oct Week 2	250	
Oct Week 3	300	
Oct Week 4	300	
Nov Week 1	300	
Nov Week 2	250	
Nov Week 3	250	
Nov Week 4	250	
Dec	inflow	(do not change)

Sullivan Lake Levels in Average, Wettest and Driest Years with Outflows per Model Table



(Note: Week 4 length adjusted to match # days in month)

Lake typically full by June 1. Historically, about 1 in 10 years it does not fill all the way.

Existing Water Temperatures

SULLIVAN LAKE DAM OUTFLOW TEMPERATURE IMPACTS MODEL

To Model Impact On Downstream Flow Temperatures From Various Dam Discharge Rates and Temperatures

J. Snyder, EES Consulting, Revised Dec 14, 2009

JULY 1 Thru NOVEMBER 15 ONLY

425-889-2700

(WDFW water temp data only available for creeks from July 1 thru Nov 15)

Change the **RED** Values to test various scenarios

Percent of Average Year Flow in Sullivan Creek	70%
Percent of Dam Release Through Low Level Gates	0%
Lake Depth (m) for cold water source (20, 16, 12, 8, 6 or 2)	6
Which Outlet Flow Scenario To Use? (1, 2, 3, 4 or 5)(Table below)	4
% Flow Coming From Cold Water Pipe	100%

(Auto Updated)

Dam Discharge Outlet Flows-CFS

(Table Auto Updates Based on Outlet Scenario Selected above)

MONTH	RELEASE	TEMP
Jan Week 1	42.3	2.8
Jan Week 2	39.7	2.8
Jan Week 3	44.1	2.8
Jan Week 4	36.8	2.8
Feb Week 1	34.3	1.1
Feb Week 2	28.9	1.1
Feb Week 3	26.0	1.1
Feb Week 4	25.3	1.1
Mar Week 1	24.3	3.3
Mar Week 2	24.1	3.3
Mar Week 3	28.2	3.3
Mar Week 4	29.4	3.3
Apr Week 1	10	Jan-June not modelled
Apr Week 2	10	Jan-June not modelled
Apr Week 3	10	Jan-June not modelled
Apr Week 4	10	Jan-June not modelled
May Week 1	10	Jan-June not modelled
May Week 2	10	Jan-June not modelled
May Week 3	10	Jan-June not modelled
May Week 4	10	Jan-June not modelled
Jun Week 1	60	Jan-June not modelled
Jun Week 2	60	Jan-June not modelled
Jun Week 3	60	Jan-June not modelled
Jun Week 4	60	Jan-June not modelled
July Week 1	18.20	updates automatically
July Week 2	18.93	updates automatically
July Week 3	18.66	updates automatically
July Week 4	15.03	updates automatically
Aug Week 1	15.01	updates automatically
Aug Week 2	15.17	updates automatically
Aug Week 3	15.68	updates automatically
Aug Week 4	16.00	updates automatically
Sep Week 1	15.90	updates automatically
Sep Week 2	15.00	updates automatically
Sep Week 3	15.01	updates automatically
Sep Week 4	15.84	updates automatically
Oct Week 1	80.58	updates automatically
Oct Week 2	108.38	updates automatically
Oct Week 3	103.02	updates automatically
Oct Week 4	126.52	updates automatically
Nov Week 1	177.95	updates automatically
Nov Week 2	189.54	updates automatically
Nov Week 3	230.00	updates automatically
Nov Week 4	150.00	updates automatically
Dec Week 1	112.1	3.3
Dec Week 2	78.4	3.3
Dec Week 3	63.4	3.3
Dec Week 4	52.6	3.3

Mixed Temperature Model Results For Outlet Creek & Sullivan Creek
Based on 2009 Measured Temperatures In Sullivan Lake and Creek
(July Through November)



When Lake draining begins October 1, water temperatures jump up in Sullivan Creek downstream of the dam (green line)

Issues and Concerns

When Sullivan Dam FERC License is surrendered, there is an opportunity to change project operations. Some of the issues of concern to agencies and the public include:

- 1) Desire to improve fishery in Sullivan Creek. Sullivan Creek has been identified as potential bull trout recovery habitat;
- 2) Desire to minimize water temperature increases during lake draining;
- 3) Whitewater recreation enthusiasts desire flows in 200cfs range for optimum kayaking during lake draining;
- 4) Desire to maintain lake full or near full in summer for recreation and for docks owned by local cabin owners;
- 5) Desire to increase minimum instream flow releases;
- 6) Desire to avoid rapid increases or decreases in dam discharge flows;
- 7) Desire to control costs of new measures;
- 8) Boundary Dam (downstream of Sullivan) is in FERC relicensing and Seattle City Light is interested in potential mitigation projects.

Settlement

To address the issues, stakeholders participated in settlement discussions beginning in September 2009. Participants included:

Pend Oreille PUD, Seattle City Light
US Forest Service, Kalispel Tribe, WDOE, WDFW
USFWS, American Whitewater, The Lands Council, members of the
public

Settlement was reached in February 2010 and was submitted to FERC
and US Forest Service for environmental review and approval.
WDOE 401 application also filed

Operational Changes

- Instream flow releases increased from 10 cfs to 60 cfs in June, to 30 cfs in July and August.
- Lake draining started sooner (day after Labor Day instead of October 1)
- Lake draining target elevation increase from 2565.0 to 2570.0 (5 feet less drawdown)
- Water temperatures and flows monitored and releases adjusted to avoid downstream temperatures over 16C.
- Cold water release pipe will be constructed to allow dam discharges to come from deep in the lake, with cooler water.
- Mill Pond dam will be decommissioned and removed.
- Flow rate changes will be controlled to meet agreed upon flow ramping rates.

Revised Operation Hydrograph

SULLIVAN LAKE DAM OUTFLOW MODEL

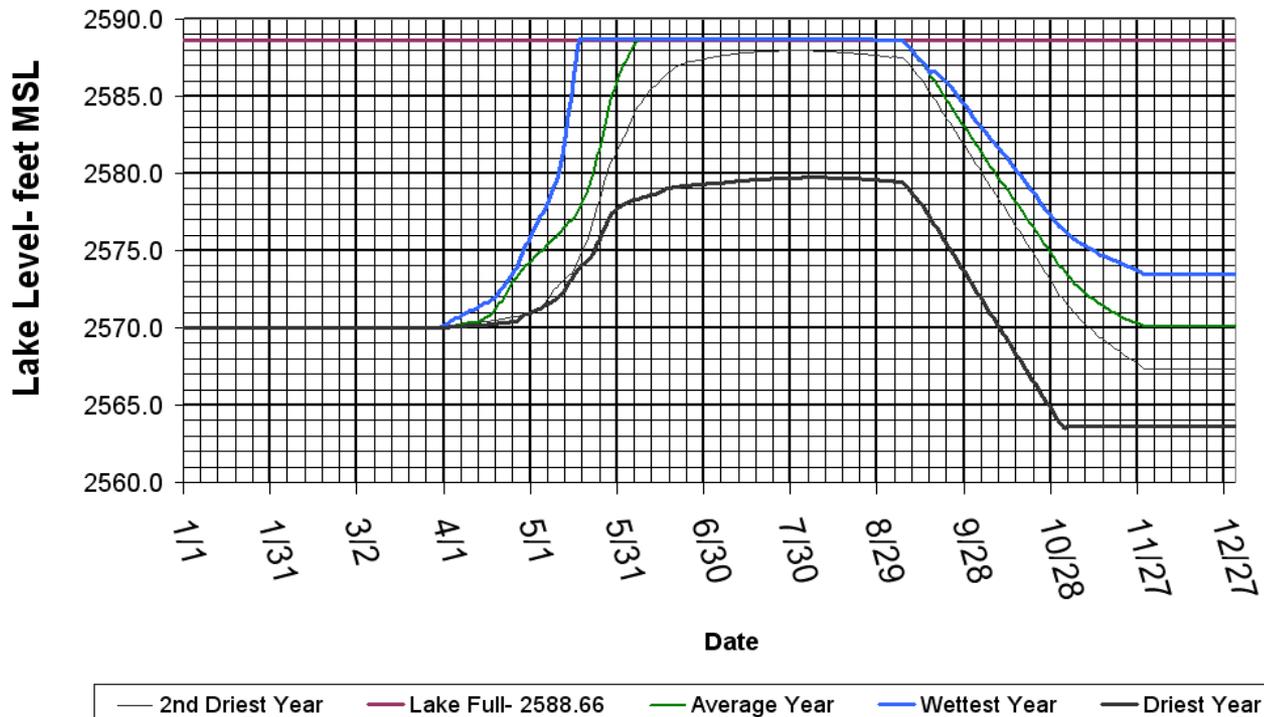
To Model Various Dam Discharge Rates for Impact on Filling and Draining
in Wet, Dry and Average Hydrologic Years

J. Snyder, EES Consulting, Revised Nov 6, 2009
425-889-2700

Changes Here Change All Years
Dam Discharge Outlet Flows-CFS

MONTH	RELEASE	Notes
Jan	inflow	(do not change)
Feb	inflow	(do not change)
Mar	inflow	(do not change)
April Week 1	10	
April Week 2	10	
April Week 3	10	
April Week 4	10	
May Week 1	10	
May Week 2	10	
May Week 3	10	
May Week 4	10	
Jun Week 1	60	
Jun Week 2	60	
Jun Week 3	60	
Jun Week 4	60	
July Week 1	40	
July Week 2	30	
July Week 3	30	
July Week 4	30	
Aug Week 1	30	
Aug Week 2	30	
Aug Week 3	30	
Aug Week 4	30	
Sep Week 1	30	
Sep Week 2	160	
Sep Week 3	200	
Sep Week 4	200	
Oct Week 1	200	
Oct Week 2	200	
Oct Week 3	200	
Oct Week 4	200	
Nov Week 1	160	
Nov Week 2	120	
Nov Week 3	100	
Nov Week 4	90	
Dec	inflow	(do not change)

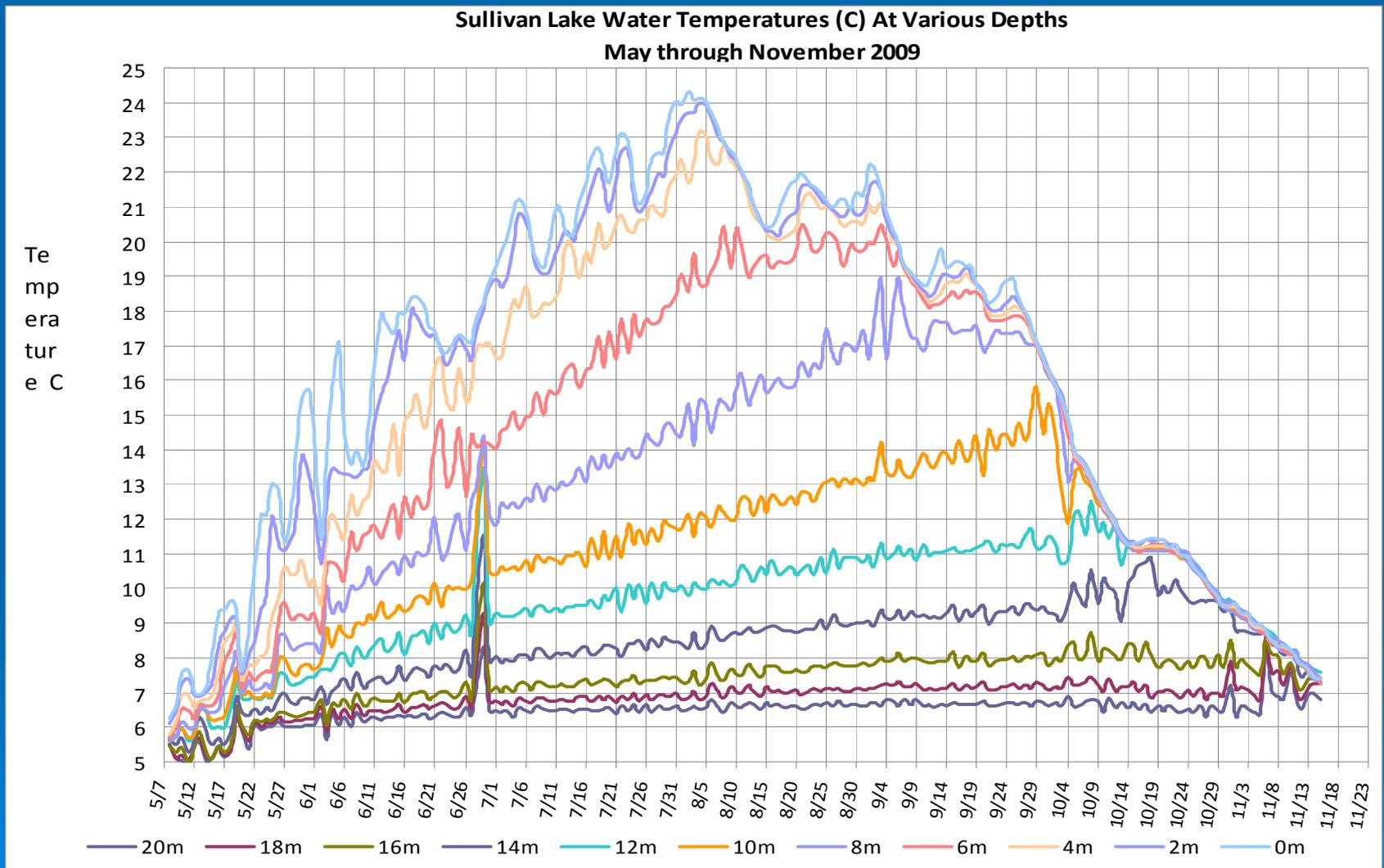
Sullivan Lake Levels in Average, Wettest and Driest Years with Outflows per Model Table



(Note: Week 4 length adjusted to match # days in month)

Starting with lake 5' higher in spring allows higher instream flows and lake still fills most years

Lake Temperatures Stratify in Summer



A cold water release pipe taking water from 20m deep in lake releases cool water all summer

Water Temperatures That Can Be Achieved With Cold Water Release Pipe

SULLIVAN LAKE DAM OUTFLOW TEMPERATURE IMPACTS MODEL

To Model Impact On Downstream Flow Temperatures From Various Dam Discharge Rates and Temperatures

July 1 to Nov 15 = 138 days	29	= Number of Days Mixed Water Is Cooler than Sullivan Creek Natural Temperature
All Season (Jul-Nov)	0.93	= Average Warming of Mixed Water compared to Sullivan Creek Natural Temps (July 1 to Nov 30)
Jul-Aug	0.16	= Average Warming of Mixed Water compared to Sullivan Creek Natural Temps (July 1 to Sept 14)
Sept, Oct, Nov	1.88	= Average Warming of Mixed Water compared to Sullivan Creek Natural Temps (Sept 15 to Nov 30)

J. Snyder, EES Consulting, Revised Jan 25, 2010
 425-889-2700 (WDFW water temp data only available for creeks from July 1 thru Nov 15)

Percent of Average Year Flow in Sullivan Creek **100%**

Change the **RED** Values to test various scenarios

Percent Of Dam Release Through Low Level Gates	per below
Lake Depth (m) for cold water source (20, 16, 12, 8, 6 or 2)	20
Which Outlet Flow Scenario To Use? (1, 2, or 3)(Table below)	2
% Flow Coming From Cold Water Pipe	Calc below

1=Wet (1999), 2=Average, 3=Dry(1970)

Dam Discharge Outlet Flows-CFS
 (Table Auto Updates Based on Outflow Scenario Selected above)

MONTH	RELEASE	TEMP
Jan Week 1	42.3	2.8
Jan Week 2	39.7	2.8
Jan Week 3	44.1	2.8
Jan Week 4	36.8	2.8
Feb Week 1	34.3	1.1
Feb Week 2	28.9	1.1
Feb Week 3	26.0	1.1
Feb Week 4	25.3	1.1
Mar Week 1	24.3	3.3
Mar Week 2	24.1	3.3
Mar Week 3	28.2	3.3
Mar Week 4	29.4	3.3
Apr Week 1	10	Jan-June not modelled
Apr Week 2	10	Jan-June not modelled
Apr Week 3	10	Jan-June not modelled
Apr Week 4	10	Jan-June not modelled
May Week 1	10	Jan-June not modelled
May Week 2	10	Jan-June not modelled
May Week 3	10	Jan-June not modelled
May Week 4	10	Jan-June not modelled
Jun Week 1	60	Jan-June not modelled
Jun Week 2	60	Jan-June not modelled
Jun Week 3	60	Jan-June not modelled
Jun Week 4	60	Jan-June not modelled
July Week 1	40.00	updates automatically
July Week 2	36.00	updates automatically
July Week 3	30.00	updates automatically
July Week 4	30.00	updates automatically
Aug Week 1	30.00	updates automatically
Aug Week 2	30.00	updates automatically
Aug Week 3	30.00	updates automatically
Aug Week 4	30.00	updates automatically
Sep Week 1	30.00	updates automatically
Sep Week 2	180.00	updates automatically
Sep Week 3	200.00	updates automatically
Sep Week 4	200.00	updates automatically
Oct Week 1	157.00	updates automatically
Oct Week 2	140.00	updates automatically
Oct Week 3	130.00	updates automatically
Oct Week 4	130.00	updates automatically
Nov Week 1	126.00	updates automatically
Nov Week 2	122.00	updates automatically
Nov Week 3	120.00	updates automatically
Nov Week 4	115.00	updates automatically
Dec Week 1	72.00	3.3
Dec Week 2	68.00	3.3
Dec Week 3	64.00	3.3
Dec Week 4	58.00	3.3

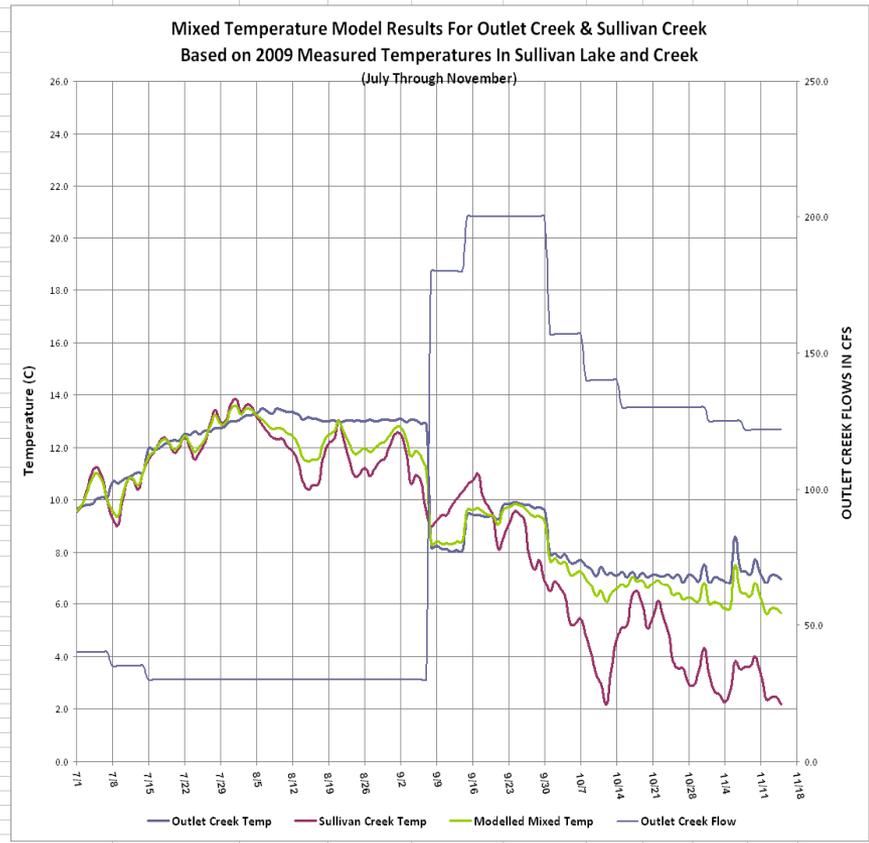
One Gate Opening (inches)	Calculated Discharge (cfs)
4	36
8	71
12	107
16	144
20	182
24	223
28	267
31	313
35	363
39	417

LAKE ELEVATION
 On Nov 15th 2574.32
 Target 2577.0 or less

Assumes Lake Level July 1 (Full) 2588.6

USER INPUT	(CALCULATED)			
Seepage or Out of Gate	Out of Cold Water Pipe	Check- Is Cold Pipe Flow OK?	Lake Level at End of Week	
15.0	25.0	YES	2598.66	
15.0	20.0	YES	2588.66	
15.0	15.0	YES	2588.66	
15.0	15.0	YES	2588.66	
15.0	15.0	YES	2588.66	
15.0	15.0	YES	2588.66	
15.0	15.0	YES	2588.66	
15.0	15.0	YES	2588.61	
15.0	15.0	YES	2588.55	
15.0	15.0	YES	2588.48	
22.0	158.0	YES	2586.72	
47.0	153.0	YES	2584.78	
57.0	143.0	YES	2582.23	
21.0	136.0	YES	2580.73	
15.0	125.0	YES	2579.43	
15.0	115.0	YES	2578.23	
18.0	112.0	YES	2576.52	
21.0	104.0	YES	2575.38	
26.0	96.0	YES	2574.32	
32.0	88.0	YES	2573.30	
38.0	77.0	YES	2572.04	
57.0	57.0	YES	2571.54	
53.0	53.0	YES	2571.04	
49.0	49.0	YES	2570.61	
43.0	43.0	YES	2570.02	

Mixed Temperature Model Results For Outlet Creek & Sullivan Creek
 Based on 2009 Measured Temperatures In Sullivan Lake and Creek
 (July Through November)



Temperatures downstream kept to 14 C or less all summer and fall.

Results of Revised Operations

- Most of the identified issues are addressed
- Additional flows are released from current situation as follows:
 - * June- 50 cfs average increase- 3,000 ac-ft additional release in June
 - * July and August- 20 cfs average increase- 1200 ac-ft additional release per month (2,400 total)
 - * September- previously only 10 cfs released. Now expect average year releases to be 150 cfs all month – about 9,000 ac-ft
 - * Total new releases June 1-Sept. 30 = 14,400 ac-ft

Next Steps

- Settlement has been signed by all Parties and submitted to FERC for review and NEPA analysis. FERC is reviewing.
- Special Use Authorization applied for with US Forest Service. USFS is reviewing.
- 401 Water Quality Certificate applied for with WDOE. WDOE is reviewing.
- Seattle has proposed Mill Pond Dam removal as part of Boundary Dam FERC relicensing mitigation package.
- Work will begin on Mill Pond dam removal and Cold Water Pipe construction after approval by FERC, USFS, and WDOE
- District and WDOE to develop a MOA and funding agreement outlining cost share for reoperation of the project. Current draft estimates are in the \$7.5 M to \$14 M range. Water would become available in 2012 to 2014.